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## Play Behaviors and Physical Activity Patterns in Kindergarten Children in a Natural Playground Setting

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Play Behaviors and  
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## **INTRODUCTION:**

Over the past couple of decades the United States has been battling obesity, a disease that can form early on in life with unhealthy diet habits and a lack of physical activity. Because obesity is so prevalent in the United States, it is even more important for children to engage in physical activity in order to stay healthy and have good growing patterns. Good exercise patterns early on in life can translate to children creating the same healthy habits in adulthood. Children who are active frequently are much less likely to become obese as adults. Many risk factors for chronic conditions due to lack of physical activity also begin in childhood and during the adolescent years. These conditions include hypertension, osteoporosis, heart disease, hypertension, and type 2 diabetes, and can be avoided with the proper amount of physical activity (2008 Guidelines). Not only does physical activity have immense health benefits, multiple studies have shown that it helps increase cognitive functioning as well as academic performance (Mygind 173).

In order to keep children fit and healthy, it is up to the adults around them to make sure their young ones are getting enough activity to be beneficial. Beneficial exercise for children is outlined in Chapter 3 of the 2008 National Physical Activity Guidelines for Americans. The guidelines state that children should be acquiring at least 60 minutes of physical activity per day. This is the minimum time requirement needed to see benefits. Not only should the daily activity include aerobic exercise, it should also focus on age appropriate muscle- and bone-strengthening exercises. These activities are immensely important because research shows that the greatest increases in bone mass occur during the years before puberty (2008 Guidelines).

The guidelines also offer definitions for proper aerobic, muscle-strengthening, and bone-strengthening activities. In order for an activity to be considered aerobic it must increase

cardiorespiratory fitness and include rhythmic movement of large muscle groups. Muscle-strengthening activity consists of an “overload” on the muscle, which makes the muscle do work that is of a higher intensity than daily activity. Bone-strengthening can be defined as activities that promote bone growth and strength through an extra external force applied on the bones. Throughout the day physical activity should total 60 minutes and include aerobic activity daily. Muscle-strengthening physical activity needs to be incorporated three times a week. Also, bone-strengthening physical activity inclusion is important three times a week in daily activity (2008 Guidelines).

Transitioning from a home environment to a school environment can provide challenges for children in acquiring their necessary daily amounts of physical activity. Being in a school environment at a young age, forces children to stay inside most of the day and engage in activities that are primarily sedentary. In order to achieve the required amount of activity, preschool and kindergarten child care centers need to set aside time during the school day to take children outside and allow them to play in an outdoor setting. An increase in the level of sedentary lifestyle in preschool aged children has drawn attention to the preschool environments and activities that children are being exposed to (Cosco, Moore, Islam 513). We chose to observe and record physical activity levels during the specified time frame allotted for outdoor play activity for kindergarteners at the Early Learning Center in Knoxville, Tennessee. The study focuses on children’s play behaviors during a 10-minute time period and assesses their physical activity levels using two different testing protocols, the Observational System for Recording Physical Activity in Children-Preschool (OSRAC-P) and the Play Observation Scale (POS). Activity levels are marked down for both scales as well as type of activity, location of activity and peer or adult involvement in the activity. Using these scales, one can assess the physical

activity done in a certain location as well as determine the average level of activity at that location. Research completed in years past shows that a child's environment has an impact on his or her physical activity level. Past studies have shown that the greatest variation in 3- to 5-year-old children's physical activity comes from the preschool setting that they are in (Pate et al. 1258-63). A child's play setting is extremely important to his or her development and for preschool and kindergarten aged children, the playground is the most commonly built environment that they will experience outside of their home (Sonenstein et al. 3). The primary focus of this study is to determine physical activity levels of young children in a playground and garden setting. The secondary focus is to determine how much of an effect a child's environment has on his or her level of physical activity and play.

## **METHODS:**

This is a cross-sectional study designed to investigate levels of activity and patterns of play in children in a school playground environment. The study was completed with a sample size of eight children who attend the Early Learning Center (ELC) located on the University of Tennessee, Knoxville campus. The children observed were members of the Kindergarten classroom (5 year-olds). Collection of data was completed at the ELC during the facilities normal hours of operation. Before any research and observation was started, letters from the researchers and parental permission forms had to be distributed to the parents of the children who were enrolled in the ELC. Only those children whose parents returned the permission forms were used for the study.

Data collection began with investigators completing direct observations of each child using the Observational System for Recording Activity in Children – Preschool (OSRAC-P) and the Play Observation Scale (POS). The OSRAC-P was used to assess physical activity levels and

context on the playgrounds. OSRAC-P is a system designed to bring together various elements of children's play activity, such as activity level, activity type, environment, prompt of activity, initiation, and group composition (See Appendix A). Physical activity level was coded based on the child's movements from 1-5. Code 1 is described by the OSRAC-P as stationary or motionless movement. Code 2 is stationary with limb or trunk movements, code 3 is slow, easy movements, code 4 is moderate movements, and the final code for physical activity is code 5, fast movements. Results for group size were coded 1 through 5. Code 0 is solitary play, code 1 is 1-on-1 with an adult, code 2 is 1-on-1 child, code 3 is more than two children with an adult, and code 4 is more than 2 children with no adult.

The POS has a slightly different make-up of classifying children's play activity. Included on the assessment sheet are solitary, parallel, and group behaviors as well as interaction between children (See Appendix B). The behavior codes assigned to the POS data sheets are as follows: 0-2 onlooker, 1-1 solitary occupied, 1-2 solitary constructive, 1-3 solitary exploratory, 1-4 solitary functional, 2-1 parallel occupied, 2-2 parallel constructive, 2-3 parallel exploratory, 2-4 parallel functional, 3-1 group occupied, 3-2 group constructive, 3-3 group exploratory, 3-4 group functional, and 3-5 group dramatic.

In order to properly use the two different scales, all observers had to complete training videos for each of the manuals as well as practice doing observations at the ELC to ensure reliability before collecting the actual data used for the study. At the ELC data were collected by direct observations of each child participating in the study. The trained observers spent 10 minutes with each child recording the child's activity in 30-second increments. The first 5 seconds of the increment were spent observing the child's activity and the last 25 seconds of each increment were spent recording the observations on the OSRAC-P and POS data sheets.



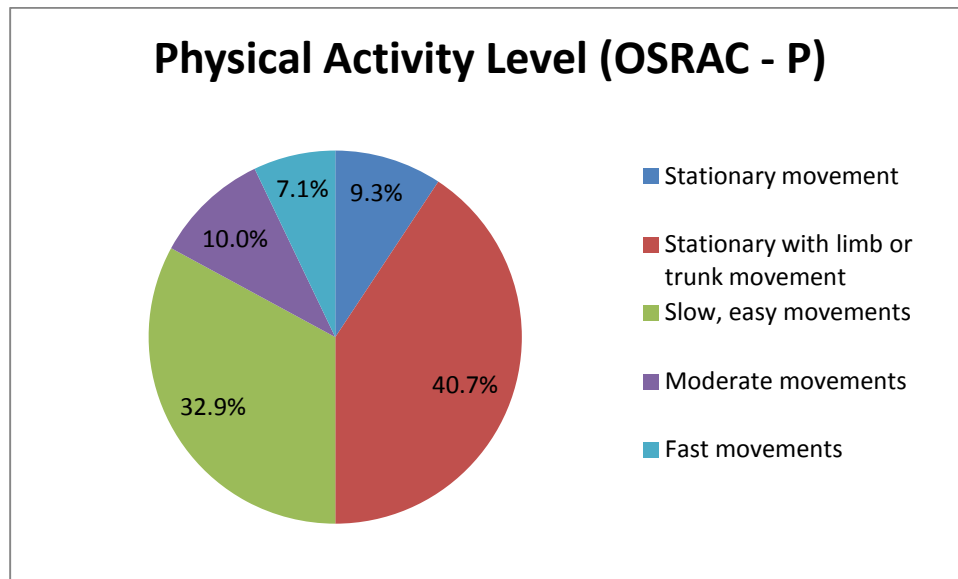
Once the data were collected, it was coded for analysis. Results for the Observational System for Recording Activity in Children – Preschool (OSRAC-P) were coded based on physical activity level, type of activity, outdoor play context, and group. There are five physical activity levels that were each given a code. The results for type of activity were also each labeled with a different code for each type of activity. The results for outdoor play context also received a different number for each specific play context. The five possible group types were coded separately as well. Coding for the Play Observation Scale was done by behavior. Each separate behavior on the data sheet was given its own code. After all codes were assigned, the data was analyzed by calculating frequencies using SPSS to look for any patterns and trends between different play behaviors, group size, type, and physical activity levels.

## **RESULTS:**

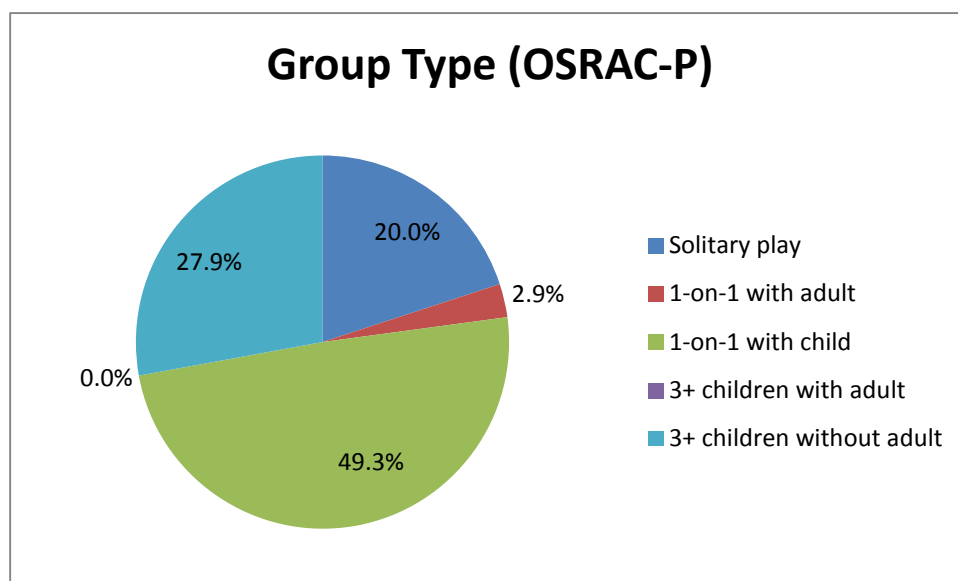
The primary focus of this study is to determine physical activity levels of young children in a playground setting. The secondary focus is to determine the effect a child's environment has on his or her level of physical activity and play. Results were derived from the Observational System for Recording Activity in Children – Preschool (OSRAC-P) and the Play Observation Scale (POS) for physical activity level, group type, and behavior type. Figure 1 shows the percentage of time spent in each of the five activity levels described in the OSRAC-P. Figure 1 is a representation of the total time spent by all the children in each physical activity level. The children spent approximately half of the time in sedentary behaviors and half of the time being physically active. Figure 2 shows the results for the total time that the children spent in each of the different OSRAC-P group categories. The most time spent was in the 1-on-1 with child category with 49.3% and the least time spent in a category was the group with adult with 0%.

Figure 3 represents the percentage that each of the different play behaviors was observed using the POS scale throughout the total time of observation of the children. The largest amount of time was spent in group behaviors (47%) being occupied or constructive.

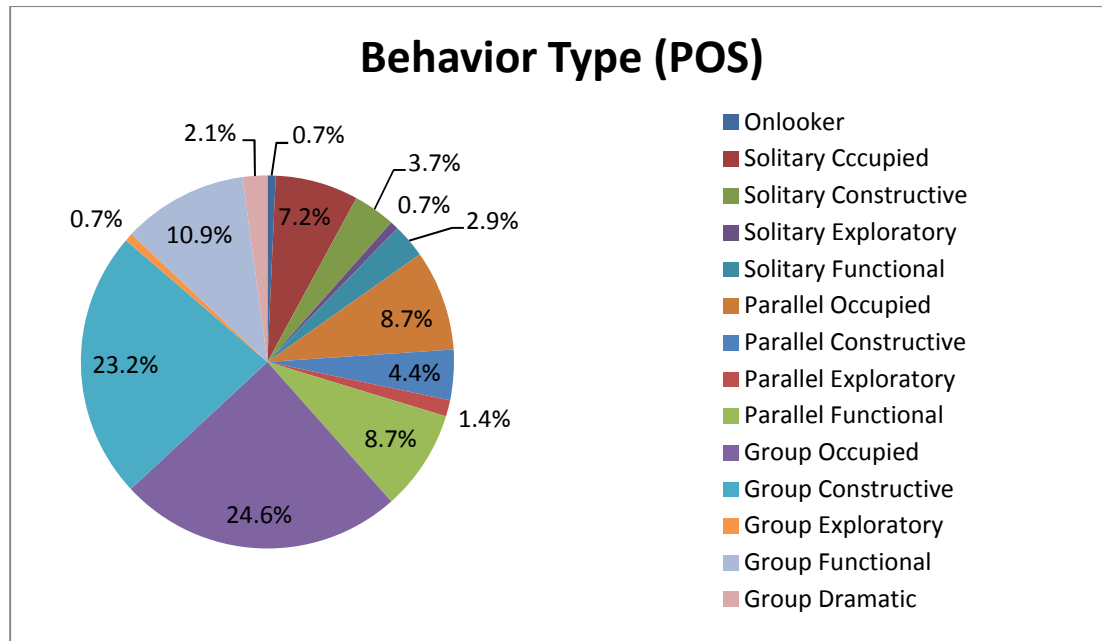
**Figure 1.**



**Figure 2.**



**Figure 3.**



There is a significant negative correlation between physical activity level and behavior type ( $r = -0.221$ ;  $p = 0.009$ ). There is a significant positive correlation between physical activity level and type of activity ( $r=0.236$ ;  $p = 0.005$ ). (See Appendix C)

## **DISCUSSION:**

Physical activity on this natural playground was comprised of a high proportion of time spent in group activity and approximately 20% of the activity being classified as moderate-to-vigorous intensity. Overall, the children spent about half of their time engaging in physical activity (light, moderate, and vigorous). When looking at the Observational System for Recording Physical Activity in Children-Preschool (OSRAC-P) data collection sheets, light, moderate, and vigorous activity correspond to physical activity levels 3, 4, and 5. The other half of the time the children occupied themselves with more sedentary activities, which corresponds to levels 1 and 2 on the OSRAC-P. The children also spent the majority of their time in group play, categorized as

1-on-1 with child in the OSRAC-P and as Group Behaviors in the POS. Both scales showed almost half the time total time was spent in group behaviors.

Throughout the research and the data collection we discovered that children who play in groups tend to have lower physical activity intensity. During our observation time there was a higher percentage of play time spent doing group activities. The children studied also preferred to spend a higher percentage of their play time performing lower level physical activity. The higher levels of physical activity were higher associated with solitary play activities. The reason for an increased level of physical activity during solitary activity could be explained by the type of solitary activity being executed by the children. Many of the instances for which this type of activity was coded involved a child running from a group setting to retrieve an item that he or she would then return with to continue playing in the group setting. This seems to be the majority of the explanations for high levels of physical activity. Although the child may have still been involved with the group, he or she had to be coded as solitary because the whole group of children were not running together to retrieve the item.

During a previous study completed by Cosco, Moore, and Islam on physical activity of children in a playground setting, two different playground settings were observed. This previous study showed a higher total level of moderate physical activity in the first childcare center, and higher sedentary level in the second childcare center. The study done by Cosco, Moore, and Islam had a different way of coding activity levels (516). Their activity levels were only split up into three different groups while our coding using the OSRAC-P split the activity in five levels. The levels used throughout their study coded walking as moderate level physical activity for any type of walking (516). Our coding was different because the OSRAC-P splits walking levels into two different levels. Physical activity level 3 is described as light physical activity with

movement of more than two steps in sequence. Physical activity level 4 is described as moderate physical activity with movement of more than 2 steps in sequence. For our study we coded any light level walking as a 3 and any moderate level walking, such as fast walking or skipping as a 4. This allows for a split in the data that shows a difference in between a light walk, which uses less energy, and a moderate or fast walk. Although there was a difference in coding between the two studies, both our study and the study conducted by Cosco, Moore, and Islam, provided similar results for physical activity levels (516).

The research process did run into several limitations. While completing the research, record low temperature weather did not allow for the children to be outside in the natural playground many of the days scheduled for research. The data were collected during very short increments of time. Each child was observed only one instance for 10 minutes while two researchers recorded their observations on the two different data sheets (OSRAC-P and POS). Such a short period of time does not provide a sufficient sampling of data to create a clear picture of an average school play day. Children cannot be expected to do the same exact type of activities done in the 10 minute observed time every day, and their activity levels will vary from day to day and from child to child. Aside from these limitations we did not encounter other problems. Strengths throughout our study included usage of a direct observation method of research. This gold standard provided us with the best sampling of data from the kindergarteners. In order to prevent any unneeded errors in data collection, each researcher was required to complete a thorough training process for both the OSRAC-P and POS protocols for data collection. This also eliminated unnecessary variance in data recording and provided assurance that play behaviors were correctly identified.

From this study, we can conclude that there is not enough monitoring of physical activity by teachers during normal Kindergarten play times. Children are not engaging in sufficient moderate to intense physical activity levels. A future study in our lab will look at ways to educate teachers on how to facilitate more active play on a natural playground. Daily physical activity is required, especially for children in this age group, in order to counteract the typical sedentary American lifestyle. Our research provides evidence that the play type these children engaged in was predominantly lower intensity, including sedentary physical activity. Throughout this study, sedentary behavior was noted mainly during group play, which comprised the majority of play time activity. Using this observation, it is evident that children need more involvement in group activities that require moderate to vigorous level activity. One way to gain this type of activity is through teacher or supervisor guidance during play time. Structured games that involve moderate to vigorous level activity need to be incorporated into Kindergarten play time in order to increase the daily physical activity levels to meet 2008 Guidelines.

Further research is needed to advance knowledge in the area of different playground settings. Although the children had lower levels of physical activity in a natural playground, this may not be the case with a different playground make-up. Investigations can be conducted in the future to enable the comparison of different settings. Another improvement that can be done to this research involves increasing the observation times as well as observing each child multiple times and during different days. This would provide a clearer view of an average day at the playground. Further research would also assist in developing more suitable physical activity plans for Kindergarten students.



# Appendix A

## OSRAC-P Data Sheet

Physical Activity		Location (Loc)		Group		Initiator (Init)		Prompt	
Code	Description	Code	Des	Code	Des	Code	Des	Code	Des
1	Stationary or motionless	I	Inside	S	Solitary	A	Adult	No	None
2	Stationary with limb or trunk movements	O	Outside	1-1A	1-on-1 with adult	C	Child	A ↑	Adult to increase PA
3	Slow, easy movements	T	Transition	1-1C	1-on-1 child			A ↓	Adult to decrease PA
4	Moderate movements			GrpA	Peers + A			C ↑	Child increase PA
5	Fast movements			GrpC	Peers – no A			C ↓	Child decrease PA

Int	PA Code	Type of Activity	Context	Loc	Group	Init	Notes
1	1 2 3 4 5						
2	1 2 3 4 5						
3	1 2 3 4 5						
4	1 2 3 4 5						
5	1 2 3 4 5						
6	1 2 3 4 5						
7	1 2 3 4 5						
8	1 2 3 4 5						
9	1 2 3 4 5						
10	1 2 3 4 5						
11	1 2 3 4 5						
12	1 2 3 4 5						
13	1 2 3 4 5						
14	1 2 3 4 5						
15	1 2 3 4 5						
16	1 2 3 4 5						
17	1 2 3 4 5						
18	1 2 3 4 5						
19	1 2 3 4 5						
20	1 2 3 4 5						



## Appendix B

## Play Observation Scale Coding Sheet

[illegible]

## Appendix C

### Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	PACode & Type	140	.236	.005
Pair 2	PACode & Context	138	.070	.415
Pair 3	PACode & Group	140	-.084	.323
Pair 4	PACode & V14	140	-.221	.009

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