



University of Nebraska at Omaha  
**DigitalCommons@UNO**

---

Health and Kinesiology Faculty Publications

School of Health and Kinesiology

---

2-14-2019

## An exploration of infant and toddler unstructured outdoor play

Danae Dinkel

Kailey Snyder

Tyler Patterson

Shane Warehime

Miriam E. Kuhn

*See next page for additional authors*

Follow this and additional works at: <https://digitalcommons.unomaha.edu/hperfacpub>

 Part of the [Health and Physical Education Commons](#), and the [Kinesiology Commons](#)



---

**Authors**

Danae Dinkel, Kailey Snyder, Tyler Patterson, Shane Warehime, Miriam E. Kuhn, and Deborah Basler Wisneski

---

1 **An Exploration of Infant and Toddler Unstructured Outdoor Play**

2

3 Authors: Danae Dinkel, PhD\*; Kailey Snyder, PhDc; Tyler Patterson, BS; Shane Warehime,  
4 PhDc; Miriam Kuhn, PhD; Debora Wisneski, PhD

5 *College of Education, University of Nebraska at Omaha, 6001 Dodge St, Omaha, United*

6 *States*

7 \*Corresponding author:

8 Danae Dinkel

9 ORCID ID: 0000-0002-0262-4429

10 [dmdinkel@unomaha.edu](mailto:dmdinkel@unomaha.edu)

11 402.554.3259

12

13 Kailey Snyder

14 [kesnyder@unomaha.edu](mailto:kesnyder@unomaha.edu)

15 402.554.4843

16

17 Tyler Patterson

18 [tpatterso@unomaha.edu](mailto:tpatterso@unomaha.edu)

19 402.554.4843

20

21 Shane Warehime

22 [swarehime@unomaha.edu](mailto:swarehime@unomaha.edu)

23 402.554.4843

24

25 Miriam Kuhn

26 [miriamkuhn@unomaha.edu](mailto:miriamkuhn@unomaha.edu)

27 402.554.3360

28

29 Debora Wisneski

30 [dwisneski@unomaha.edu](mailto:dwisneski@unomaha.edu)

31 402.554.2783

32

33

1 **Abstract**

2 Unstructured outdoor play is important for children’s development. The present study  
3 examined infants’ and toddlers’ physical and social unstructured outdoor play behaviors  
4 within childcare centers. Children’s outdoor play behaviors were video recorded at two  
5 centers (A&B) and assessed using a modified version of the Observational System for  
6 Recording Physical Activity in Children in Preschool (OSRAC-P). Children in this study  
7 primarily took part in active play (56.7%) and engaged in play without any type of prompting  
8 from a teacher (91.2%). There was a significant interaction between the effect of center and  
9 location on physically active play ( $p<0.001$ ). Children at Center B were most active in open  
10 play areas (77.6%), while children at Center A were most active in gross motor play areas  
11 (72.2%). In sum, the outdoor play environment influences infants’ and toddlers’ physical and  
12 social play behaviors; however, more research is needed to determine the optimal  
13 environment for development.

14 **Keywords:** Play, Infant, Toddler, Childcare, Outdoor, Activity

15

16

17

18

19

20

21

22

23

24

25

# 1 **Introduction**

2           Providing opportunities for play is a crucial component of the overall health and well-  
3 being of young children. Unfortunately, young children are spending a concerning amount of  
4 time in sedentary behaviors (Lauricella, Wartella, and Rideout 2015; Pioreschi et al. 2017).  
5 For example, a study by Pioreschi et al. (2017) found 3-month old infants were already  
6 watching 30 minutes of television per day and spending over 2 hours per day in restrained  
7 activities (e.g., car seat). Evidence suggests that increased time spent in sedentary behaviors  
8 such as television viewing is associated with increased adiposity as well as decreased  
9 psychosocial health and cognitive development in children less than 4 years of age (LeBlanc  
10 et al. 2012). Thus, it is imperative to reduce sedentary behaviors to promote proper physical,  
11 psychosocial, and cognitive development. One way to accomplish this is by providing  
12 opportunities for active play (Clements 2004). For example, play allows children to develop  
13 physically, by promoting gross and fine motor skills; socially, by supporting peer interaction;  
14 and cognitively, by allowing children to use problem solving and investigation skills  
15 (Clements 2004; Ginsburg 2007).

16           While promotion of all play types are important, there are meaningful benefits to  
17 children's engagement in unstructured outdoor play. Unstructured outdoor play consists of  
18 open-ended play that allows freedom to construct rules, goals, and meaning (De Valk,  
19 Kekker, and Eggen 2013). Unstructured outdoor play provides children opportunities to  
20 create their own sensory experiences in various play environments, such as playing in a

1 sandbox or running in the grass. Outdoor unstructured play also provides opportunities for  
2 improvement of physical and social competencies by playing with peers on a variety of  
3 surfaces and structures such as grass, sand, and slides (Iioven et al. 2016; Pellegrini 1992).  
4 It supports children’s autonomy and imagination, as children get to select how and with  
5 what they play (Clements 2004). It can also support overall health as pre-schoolers (3-5  
6 year olds), in outdoor play environments, when compared to indoor environments, have  
7 been shown to take part in more vigorous physical activity (Iioven et al. 2016). Due to  
8 many of these benefits, there has been a call for more unstructured outdoor play time in  
9 lieu of more passive forms of entertainment such as listening to stories (Murray et al.  
10 2013). Despite this evidence, additional research is needed to explore how to support  
11 children’s engagement in unstructured outdoor play.

12         One setting that has the potential to offer unstructured outdoor play opportunities on a  
13 regular basis is formal childcare (Story, Kephingst, and French 2006). Reports of the  
14 percentage of children in formal childcare in developed countries range from 20-39%  
15 (Eurostat 2018; Laughlin 2013). Thus, childcare facilities are prime locations to promote  
16 play.

17         Exploration of outdoor play environments within childcare settings has determined  
18 the vast majority of outdoor play spaces offer a multitude of play opportunities via  
19 playground structures, open surfaces, and loose parts (e.g., cardboard boxes, fabric) (Acar  
20 2014; Dowda et al. 2009; Olsen and Smith 2017). However, minimal research has been done

1 to examine how children utilize these play opportunities. The research that has been done has  
2 primarily focused on preschoolers' (3-5 years) social and physical play behaviors (Gubbels,  
3 Van Kann, and Jansen 2012; Li and Wang 2016). Research examining social play behaviors  
4 determined pre-schoolers primarily engage in high amounts of pretend play behaviors (Li and  
5 Wang 2016). The physical play line of inquiry has shown directly observed physical activity  
6 was positively associated with the availability of portable jumping equipment and an outdoor  
7 track, and negatively associated with portable slides, swinging equipment, and sandboxes  
8 (Gubbels et al. 2012). In addition, four-year old children appeared to engage in greater  
9 amounts of activity when engaging in solitary play versus peer group play or adult-led play  
10 (Iioven et al. 2016). This information can assist providers in selecting equipment to promote  
11 physically active play. However, little research has explored the unstructured outdoor play  
12 behaviors of children three years of age and younger. It is crucial to understand how infants  
13 (0-1 year of age) and toddlers (1-2 years of age) engage in outdoor play, as children of this  
14 age are undergoing fundamental physical and social development (UNICEF 2014).  
15 Therefore, the purpose of this study was to determine infants' and toddlers' physical and  
16 social unstructured outdoor play behaviors within childcare.

## 17 **Methods**

18 This observational cross-sectional study examined the unstructured outdoor play of  
19 infants and toddlers (age 0-3 years) at two childcare centers – licensed childcare providers  
20 that typically offer care in larger groups with multiple staff providers. This study was  
21 approved by an Institutional Review Board and conducted in the spring of 2017.

1 ***Setting and Participants***

2           The childcare centers were located in a large metropolitan city within the Midwestern  
3 United States. The centers were recruited to participate through existing contacts of the lead  
4 investigator. Centers were chosen in order to represent diverse characteristics and teaching  
5 philosophies. Center A was a Montessori site primarily serving Caucasian and middle-to-high  
6 income families. The size of the classroom ranged from 20-24 children with one lead teacher  
7 and four assistants. Center A had two toddler classrooms and one infant classroom. Center B  
8 was an Early Head Start center-based site that served minority families - primarily African  
9 American - and low-income families. The size of the classroom consisted of no more than  
10 eight children with one lead teacher and two assistants. Center B had four toddler and four  
11 infant classrooms. The ages of children in the infant classrooms typically ranged from 6  
12 weeks-18 months, while the age of children in the toddler classrooms were 18-36 months.  
13 Data were collected during March and April of 2017 and the average temperature was 9.86  
14 degrees Celsius (range 2.7-22.7°C).

15           The lead investigator contacted the executive director of each center to explain the  
16 study. Once the executive directors agreed to participate, they discussed the study with their  
17 teachers and provided the contact information of teachers who agreed to participate to the  
18 research team. The research team then met with the teachers and assistants to explain the  
19 study and complete the consent form. To obtain parental permission for the video  
20 observation, parents were first informed about the study by researchers at a parent's night  
21 event and/or in a short e-mail developed by the researchers that was sent to parents by  
22 teachers. Once parents were notified, the executive directors and lead teachers disseminated  
23 and collected the parental consent forms. Children were included in the study if their parents  
24 returned a signed consent form. Any child whose parent did not complete the parental  
25 consent form or staff who did not want to participate were provided a separate play area

1 outside of the viewing area during data collection. Overall, 49 parents completed consent  
2 forms for their child (n=18 infants, n=31 toddlers).

### 3 ***Measures***

4 A modified version of the Observational System for Recording Physical Activity in  
5 Children in Preschool (OSRAC-P) was utilized. The OSRAC-P has demonstrated the ability  
6 to provide contextually rich information regarding children's play behaviors; and  
7 observations have previously been undertaken with children as young as two years of age  
8 (Gubbels et al. 2012). Further utilization of this tool within infant and toddler populations  
9 could allow childcare providers and researchers to determine what factors best support  
10 unstructured outdoor play opportunities. Since physical and social outdoor play were the  
11 focus of the study, only the following categories from OSRAC-P were utilized: physical  
12 activity level, activity type, play context, initiator of activity, group composition, and prompt  
13 for activity (Brown et al. 2006). Physical activity level codes (n=6) were modified from the  
14 Children's Activity Rating Scale to indicate sedentary (stationary + stationary with limb  
15 movement), light (slow, easy movement), moderate to vigorous (moderate activity and  
16 vigorous activity) and active (slow, easy movement, moderate activity, vigorous activity)  
17 behaviors (Pate et al. 2008; Puhl et al. 1990). Activity type codes (n=19) consisted of  
18 identifying specific types of movement such as climbing, running, sitting, squatting, and  
19 standing among others. Play context codes (n=15) focused on identifying usage of outdoor  
20 play surroundings (e.g., balls, fixed equipment, open space). Initiator of activity codes (n=3)  
21 consisted of identifying who initiated the play activity (adult, child, or peer). Group  
22 composition codes (n=6) identified whether a child was alone or with an adult or peer in a  
23 group. Prompt for activity codes (n=6) determined whether a teacher or peer promoted  
24 increases or decreases in active play.

1            In addition to the categories outlined by OSRAC-P, a play area category was added to  
2 identify and differentiate between general play areas of infants and toddlers within the  
3 outdoor play spaces. The play areas were divided into three distinct locations: open space,  
4 gross motor play area, and fine motor play area. The areas were identified based on the  
5 primary function of the equipment within that area. Open spaces were defined as green  
6 spaces and sidewalks. Gross motor play areas were defined as areas with large play structures  
7 that allowed for gross motor movements such as running or walking. Fine motor play areas  
8 were categorized as areas with small equipment (e.g., pails, shovels) that allowed for fine  
9 motor skills like grasping or pulling. At Center A, approximately 94.1% of the play area was  
10 categorized as open space, 4.8% gross motor play area, and 1.1% fine motor play area within  
11 both the 804.6 sq. meters infant play area and the 1839.2 sq. meters toddler play area. At  
12 Center B, approximately 82.1% of the play area was categorized as open space, 11.2% gross  
13 motor play area, and 6.7% fine motor play area within the 430.7 sq. meters play area.

14



15

16 **Figure 1. Overview of Center A**



1

2 **Figure 2. Sample of Center A Infant and Toddler Areas**



3

4 **Figure 3. Overview of Center B**



5 **Figure 4. Sample Center B Infant Area**



**Figure 5. Sample of Center B Toddler Area**

6 ***Protocol***

7 Children and staff were observed through video recordings during their typical  
8 unstructured outdoor play time once per day for five days. Classroom schedules at and  
9 between each site varied indicating a range of a total of 25-90 minutes of scheduled outdoor

1 play time one to two times a day. Data were recorded during a morning unstructured outdoor  
2 play time if more than one time was offered. For each data collection session, three iPads  
3 were set up on movable tripods throughout the space that the class primarily used. At least  
4 two research personnel were at each site for every data collection. Research personnel were  
5 instructed that if there were no children in the play area, they could move the tripod to find  
6 the nearest child not currently being videotaped. A fourth iPad was available, as needed, to  
7 capture additional child movement outside of the other areas being video recorded.  
8 Recordings began as soon as a child entered the outdoor play area and ended when the last  
9 child left the outdoor area. Length of recordings for both centers ranged from 15-40 minutes,  
10 with an average of 26 minutes.

#### 11 ***Data Analysis***

12 To analyze the data, the lead author, experienced in direct observation, conducted  
13 training for three observers on the OSRAC-P. The training consisted of reviewing the  
14 OSRAC-P manual, achieving a score of 90% or above on a 45-question test about the manual  
15 developed by the lead author, as well as group and individual practice with the lead author.  
16 Inter-observer reliability checks were completed on 10% of observations intermittently  
17 throughout data analysis. Average kappa scores ranged from .96-.98, indicating excellent  
18 inter-observer reliability. Kappa scores for each categorical variable were as follows: outdoor  
19 play context - .96, physical activity level - .97, physical activity type - .96, group composition  
20 - .98, initiator of activity - .98, prompt for physical activity - .98. All categories and responses  
21 were entered into an Excel document. Each observation interval consisted of observing the  
22 child for five seconds with 25 seconds for recording within the Excel document. Overall,  
23 3,007 observations were completed of Center A and 3,039 observations were completed of  
24 Center B.

1 Descriptive statistics were first computed to evaluate combined physical activity  
 2 level, activity type, play context, initiator of activity, group composition, and prompt for  
 3 activity for both sites. An additional analysis was conducted to compare activity level and  
 4 type between centers. A 2-way ANOVAs was used to examine the effect of center and play  
 5 area location, and center and play type.

6 **Results**

7 When assessing OSRAC-P findings overall, a few key results emerged. In regard to  
 8 physical activity level, infant and toddler children most often participated in active movement  
 9 (56.7%) or sedentary behaviors (41.9%). Children were most frequently engaging in walking  
 10 (27.6%) or standing (20.5%). When evaluating the context of play, children primarily played  
 11 in open space areas (43.2%) and fixed playground areas (37.6%). The majority of the time  
 12 children were initiating play activities (91.3%) rather than having play initiated by an adult;  
 13 however, children were most frequently found playing with an adult present (49.0%) or by  
 14 themselves (20.8%). Further, the majority of the time children engaged in play without any  
 15 type of prompting from a teacher (91.2%). Less than 1.5% of the time researchers were  
 16 unable to record a behavior or activity as displayed by the “can’t tell” variable seen in Table  
 17 1.

Table 1. Combined frequencies of observed behaviours for Centers A and B

Physical Activity Level	<i>n</i>	%
Sedentary	2532	41.9
Light	2045	33.8
Moderate	1385	22.9
Active	3430	56.7
Can't Tell	84	1.4
Physical Activity Type		
Climb	288	4.8
Crawl	190	3.1
Dance	5	0.1
Jump/Skip	48	0.8
Lie Down	37	0.6
Pull/Push	164	2.7
R & T - Rough and Tumble	17	0.3
Rock	41	0.7
Run	785	13.0
Sit/Squat	1152	19.1

Stand	1242	20.5
Swing	243	4.0
Throw	76	1.3
Walk	1667	27.6
Other	6	0.1
Can't Tell	85	1.3
Outdoor Play Context		
Ball	334	5.5
Fixed	2273	37.6
Game	5	0.1
Open Space	2611	43.2
Portable	352	5.8
Sandbox	30	0.5
SocioProps	249	4.1
Wheel	154	2.5
Other	4	0.1
n/a	17	0.3
Can't Tell	17	0.3
Initiator of Activity		
Adult	457	7.6
Child	5517	91.3
Can't Tell	72	1.1
Group Composition		
Solitary	1259	20.8
1-1 Adult	441	7.3
1-1 Peer	381	6.3
Group Adult	2964	49.0
Group Peer	951	15.7
Can't Tell	50	0.8
Prompt for Activity		
None	5515	91.2
Teacher Prompt to Increase	307	5.1
Teacher Prompt to Decrease	107	1.8
Peer Prompt to Increase	35	0.6
Peer Prompt to Decrease	8	0.1
Can't Tell	74	1.2

1

2

A few key differences were apparent when comparing Center A and Center B. There

3

was a significant interaction between the effects of center and location on physically active

4

play  $F(2, 5267)=81.41, p<0.001$ . Center B children were more active in open play areas

5

(77.6%) than children in Center A (57.4%). Children at Center A achieved the most active

6

time in the gross motor play areas (72.2%) and the least active time in fine motor play areas

7

(45.3%). Further, moderate to vigorous physical activity was highest within gross motor play

8

areas (28.3%) and sedentary activity was greatest in fine motor play areas at Center A

9

(51.4%). When examining Center B, children were most active in the open play areas

1 (77.6%) and also least active in the fine motor play areas (33.9%). Center B children were  
 2 also most likely to be sedentary when located in the fine motor play areas (66.0%).

3

Table 2. Percentage of time spent in activity in relation to play area

Location	Center A				Center B			
	Sedentary	Light	MVPA*	Active	Sedentary	Light	MVPA*	Active
Open Play Area	42.3	29.4	28.0	57.4	22.2	46.8	30.8	77.6
Gross Motor Play Area	23.4	43.9	28.3	72.2	33.2	33.1	30.1	63.2
Fine Motor Play Area	51.4	38.2	7.1	45.3	66.0	24.9	9.0	33.9

\* MVPA=Moderate to Vigorous Physical Activity

\*\*Percentages do not equal 100 due to combined physical activity level data.

4

Table 3. Percentage of time spent in types of physical activity by center

PA Type	Center A (%)	Center B (%)	
	Climb	2.6	7.0
Crawl	1.7	4.6	7
Dance	0.0	0.1	8
Jump/Skip	0.7	1.0	9
Lie Down	0.2	1.1	10
Pull/Push	1.9	3.6	11
Rough & Tumble	0.3	0.3	12
Rock	0.1	1.3	13
Run	12.2	13.8	14
Sit/Squat	20.5	17.6	15
Stand	17.2	23.9	
Swing	8.1	0	
Throw	1.0	1.6	
Walk	32.7	22.5	
Other	0.8	1.6	

16 Significant differences were also seen between center and activity type,  $F(2,$   
 17  $784)=109.65, p<0.001$ . Specifically, children at Center A were most frequently walking  
 18 (32.7%) or swinging (8.1%), whereas children at Center B more often took part in standing  
 19 (23.9%), climbing (6.9%), or crawling on equipment (4.5%; Table 4). When evaluating  
 20 children's behaviors based on location, significant differences were also seen,  $F(2,$

1 2503)=64.03,  $p<0.001$ . At both sites children engaged in running (Center A = 21.69%, Center  
 2 B = 21.47%), walking (Center A = 48.77%, Center B = 22.99%), and standing behaviors  
 3 (Center A = 14.61%, Center B = 27.97%) most often in open space areas, and in  
 4 sitting/squatting behaviors in fine motor areas (Center A = 40.43%, Center B = 24.38%).  
 5 Additional findings can be found in Table 4.

Table 4. Percentage of time spent in play area

PA Type	Center A			Center B		
	Open Area	Gross Motor	Fine Motor	Open Area	Gross Motor	Fine Motor
Climb	1.0	6.2	2.8	2.1	25.8	14.1
Crawl	1.1	0.7	2.9	2.4	1.6	14.3
Dance	0.1	0.0	0.0	0.3	0.0	0.0
Jump/Skip	1.1	0.2	0.3	1.0	1.2	0.9
Lie Down	0.1	0.5	0.1	0.2	7.4	1.1
Pull/Push	2.8	2.6	0.2	2.4	2.5	1.2
Rough & Tumble	0.4	0.2	0.2	0.0	0.0	0.0
Rock	0.1	0.0	0.0	1.8	0.0	2.1
Run	21.7	1.3	5.0	21.5	2.9	1.6
Sit/Squat	6.5	17.9	40.4	13.8	20.9	24.4
Stand	14.6	9.2	24.7	29.0	7.4	17.5
Swing	0.2	44.9	0.0	0.0	0.0	0.0
Throw	1.4	0.0	0.9	2.3	0.0	0.4
Walk	47.8	10.7	22.4	23.0	26.2	19.4
Other	1.0	0.0	0.0	0.1	0.0	0.0
Can't Tell	0.1	5.6	0.1	0.1	4.1	3.0

6

## 7 Discussion

8 The purpose of this study was to determine infants' and toddlers' physical and social  
 9 unstructured outdoor play behaviors within childcare. The findings from the present study  
 10 provide key information regarding the unstructured outdoor play behaviors of infants and  
 11 toddlers that can be utilized for future practice and research. Important findings regarding  
 12 physical and social play are discussed in more detail below.

13 Overall, children took part in physically active play for a little over half of the time  
 14 they were outdoors. Current best practice in childcare recommends daily outdoor play time

1 for both infants and toddlers (Caring for our Children 2018). Specifically, recommendations  
2 suggest infants be taken outside 2-3 times per day and toddlers be offered 60-90 minutes of  
3 outdoor play daily. Practices in both centers did not always align with these best practices.  
4 For example, not all infants were taken outside multiple times a day and toddlers were not  
5 always offered 60+ minutes of outdoor time. To ensure children are receiving all of the  
6 benefits associated with outdoor unstructured outdoor play, efforts are need to help staff  
7 schedule outdoor time. Additionally, future research studies are needed to examine the  
8 amount of unstructured outdoor play provided, along with the amount of physically active  
9 play accumulated in relation to a child's physical health (e.g., weight), mental health, and  
10 cognitive health. Understanding this connection, could further motivate teachers to meet best  
11 practices for outdoor time.

12 Consistent with research in older children, open play areas and gross motor play areas  
13 were associated with higher amounts of physically active play (Nicaise, Kahan, and Sallis  
14 2011; Nicaise et al. 2012; Trost, Ward, and Senso 2010). Thus, to allow for active play and  
15 subsequent health benefits, educators should consider offering open play and gross motor  
16 play areas if possible. Interestingly, children at Center B were more physically active in open  
17 play areas compared to Center A. This finding was especially interesting given Center A had  
18 larger amounts of open play areas. There are several possible explanations for this finding.  
19 One explanation could be related to the characteristics of the children (e.g., race/ethnicity,  
20 weight) involved in the study, characteristics or behaviors of the caregivers (e.g., engagement  
21 with children outside of outdoor play time), or that there might be an optimal amount of open  
22 space that promotes active play. However, more research is needed specific to infants and  
23 toddlers to provide best practice recommendations regarding these items.

24 Alternatively, this finding could be due to the availability of portable play equipment  
25 in these spaces such as balls or hula hoops as other research suggests the availability and

1 quality of portable play equipment can greatly influence active play (Gubbels et al. 2012;  
2 Trost, Ward, and Senso 2010). While not reported in this paper, we did examine but found no  
3 significant differences in the amount of portable play equipment provided. However,  
4 providers should be encouraged to provide enough quality portable play equipment to  
5 encourage active play. Another potential explanation for this finding is in regard to the  
6 characteristics of the space (i.e., surface, proximity to other play areas, obstructions). For  
7 example, at Center A the open space was primarily on a hill in the corner of the play space  
8 whereas at Center B the open space was flat and more centrally located. Children may have  
9 been interested in being closer to other play structures, teachers, or peers at Center B due to  
10 the central location. Future development of outdoor play areas could also consider offering  
11 open play spaces of various grading levels. A space with flat areas may be more easy to  
12 navigate for those mastering gross motor ability but hills could also challenge and improve  
13 the motor skills of others.

14 While children were less likely to be active in fine motor areas, these areas may  
15 provide opportunities to develop other important physical skills such as fine motor skills and  
16 social skills such as relationship building. Interestingly, research in landscape design suggests  
17 that playgrounds with a more nature-based design not only facilitate physical and social  
18 development, but also promote fine motor development, creative play, and sensory  
19 stimulation (Woolley and Lowe 2013). Thus, while it is important to encourage active play,  
20 other areas of development should not be neglected and playground environments should be  
21 designed to encourage multiple areas of development for children.

22 Additional differences were found between the centers and several of these findings  
23 may be due to the type of fixed playground equipment that was available. For example,  
24 children at Center A were more frequently swinging – this behaviour was not prevalent at  
25 Center B because this site did not have swings available. Further, while both sites had a

1 playground structure, at Center B this was the focal point of the play areas while at Center A  
2 there were other areas of fixed equipment and open play spaces. This could explain why  
3 children at Center B were more often climbing than children at Center A. Importantly  
4 children at Center A were most frequently walking while children at Center B were more  
5 frequently standing. More research is needed on influential sociodemographic or additional  
6 environmental factors for infant and toddler outdoor play experiences. Unfortunately, this  
7 study was unable to obtain this data in order to understand if this influenced our findings.  
8 Future research should consider comparing similar play environments to determine the role  
9 of the environment or sociodemographic variables in children's unstructured outdoor play  
10 behaviors.

11 In regard to social play, children were the primary initiators of play and there were  
12 limited observations of teachers prompting activity. It should be noted that in personal  
13 conversations with teachers, it was mentioned that they are encouraged to allow children to  
14 lead play activities during unstructured outdoor playtime. Thus, this finding likely represents  
15 a pedagogical practice of both centers. Specifically, Montessori trained educators are often  
16 encouraged to promote free play with natural play materials (Saracho and Spodek 1995). In  
17 addition, Early Head Start program teachers are encouraged to support children's self-  
18 awareness through exploration and environment manipulation. They are also encouraged to  
19 support the use of natural play materials (Early Head Start National Resource Center 2013).  
20 Despite the obvious benefits of supporting autonomous free play, research in childcare  
21 centers for preschool-aged children found staff behavior significantly influences children's  
22 behaviors (Bell et al. 2015; Trost et al. 2010; Vanderloo et al. 2014). Specifically, when staff  
23 prompt children to be active and join in on active play, children's participation in physically  
24 active play can improve (Trost et al. 2010). Thus, future efforts should continue to encourage

1 infant and toddler staff to actively promote children’s participation in active play  
2 opportunities.

3         There were several limitations to this study. First, observations were coded via video  
4 recordings resulting in occasional periods in which the observers’ view was obstructed or the  
5 child was out of the field of view and they were unable to see the observed child. Thus,  
6 optimal coding of playground behaviors was not always possible. Additionally, although  
7 audio was recorded, it was challenging to hear teachers if they were far from the camera, had  
8 their back to the camera, or if other noise was present (e.g., wind, children playing). This  
9 issue made it challenging to accurately code verbal prompts by teachers and children. Future  
10 research could examine differences between video observation and in-person coding of the  
11 OSRAC-P (Loprinzi and Cardinal 2011). Second, the OSRAC-P has not been validated with  
12 infants and toddlers (ages 0-3). Given that a similar tool is not available, the authors believed  
13 this was still a viable tool for describing young children’s play; however, results should be  
14 interpreted with caution until further studies can validate these findings. Lastly, there was  
15 variance in weather while video data was being recorded. At both locations, because  
16 recordings did not occur simultaneously at each center, there may have been a significant  
17 difference in the outdoor conditions on the days when data were recorded which could have  
18 impacted the behaviors of teacher and children, making it difficult to compare between  
19 centers. For example, on a colder day, some teachers may have prompted more active play  
20 compared with a warmer day when activities like sandbox or chalk play might have been  
21 initiated.

22         This study is strengthened by using an observational system with over 6,000  
23 observations to describe infants and toddlers physical and social play in an unstructured  
24 outdoor play environment within childcare. Additionally, this study was one of few to utilize  
25 the OSRAC-P with infants and toddlers. Although the OSRAC-P has not been validated

1 for use in young children, after completing data collection and analysis the research team felt  
2 as if this tool was still able to provide contextually rich information regarding children's play  
3 behaviors. Specifically, the revised coding framework of the OSCRAC-P contained the  
4 necessary content to code all of the play behaviors observed in infants and toddlers. In order  
5 to promote optimal outdoor play environments, it is necessary to first understand how  
6 children play and interact outdoors. Thus, this study provides a foundation for future research  
7 studies. An additional strength regarding this study is that it employed a vastly diverse  
8 sample in regard to the participants and childcare locations.

## 9 **Conclusion**

10 Although unstructured outdoor play is essential to the growth and development of  
11 children, little is known about the outdoor play behaviors of children less than three years  
12 old. The present study used direct observation to examine infants' and toddlers' outdoor play  
13 behaviors at two childcare centers. Findings indicate the environment of outdoor play areas  
14 influences infants' and toddlers' behaviors. By offering time, an open play space, and staff  
15 who promote active play, infants and toddlers could accumulate more physically active play.  
16 These results can help guide researchers and practitioners aiming to understand and/or  
17 improve the development of children as well as their outdoor environment. Additional  
18 research is needed to continue to explore the impact staff promotion efforts,  
19 sociodemographic variables, and environmental factors have on infant and toddlers  
20 unstructured outdoor play. Further, it is important to think of the development of outdoor  
21 play environments as a process. When trying to create an optimal outdoor play environment it  
22 is crucial to not only consider the optimal amount of outdoor space but all impacted entities  
23 including children, families, educators, administration, and any outdoor play regulations  
24 (Olsen and Smith 2017).

25

1 **Funding**

2 This work was supported by the University of Nebraska Foundation.

3 **Disclosure Statement**

4 The authors have no conflicts of interest to report.

5 **Data Availability**

6 The data set can be made available by contacting the corresponding author.

7 **Compliance with Ethical Standards**

8 Ethical approval: All procedures performed in studies involving human participants were in  
9 accordance with the ethical standards of the institutional research committee and with the  
10 1964 Helsinki declaration and its later amendments or comparable ethical standards.

11 Informed consent: Informed consent was obtained from all individual participants included in  
12 the study.

13

1 **References**

- 2 Acar, Habibe. 2014. "Learning Environments for Children in Outdoor Spaces." *Procedia –*  
3 *Social and Behavioral Sciences* 141: 846–853. doi.org/10.1016/j.sbspro.2014.05.147.
- 4 Bell, A. Colin, Meghan Finch, Luke Wolfenden, Michael Fitzgerald, Philip J. Morgan,  
5 Jannah Jones, Megan Freund, and John Wiggers. 2015. "Child Physical Activity  
6 Levels and Associations with Modifiable Characteristics in Centre-Based Childcare."  
7 *Australian and New Zealand Journal of Public Health* 39 (3): 232-236.  
8 doi.org/10.1111/1753-6405.12314.
- 9 Brown, William H., Karin A. Pfeiffer, Kerry L. McIver, Marsha Dowda, Joao MCA  
10 Almeida, and Russell R. Pate. 2006. "Assessing Preschool Children's Physical  
11 Activity: The Observational System for Recording Physical Activity in Children-  
12 Preschool Version." *Research Quarterly for Exercise and Sport* 77 (1): 167-176.  
13 doi:abs/10.1080/02701367.2006.10599351.
- 14 Caring for Our Children, 3<sup>rd</sup> Edition. 2018 Chapter 3: Health Promotion and Protection.  
15 <http://nrckids.org/CFOC/Database/3.1.3.1>
- 16 Clements, Rhonda. 2004. "An Investigation of the Status of Outdoor Play." *Contemporary*  
17 *Issues in Early Childhood* 5 (1): 68-80.
- 18 De Valk, Linda, Tilde Bekker, and Berry Eggen. 2013. "Leaving Room for Improvisation:  
19 Towards a Design Approach for Open-Ended Play." Paper presented at  
20 the Proceedings of the 12th International Conference on Interaction Design and  
21 Children, 92-101. doi: 10.1145/2485760.2485771.
- 22 Dowda, Marsha, William H. Brown, Kerry L. McIver, Karin A. Pfeiffer, Jennifer R. O'Neill,  
23 Cheryl L. Addy, and Russell R. Pate. 2009. "Policies and Characteristics of the  
24 Preschool Environment and Physical Activity of Young Children." *Pediatrics* 123 (2):  
25 e261–e266. doi:10.1542/peds.2008-2498.

- 1 Early Head Start National Resource Center. 2013. "Supporting Outdoor Play and Exploration  
2 for Infants and Toddlers (Technical Assistance Paper No. 14)." Retrieved from  
3 <https://eclkc.ohs.acf.hhs.gov/sites/default/files/pdf/ehs-ta-paper-14-outdoor-play.pdf>
- 4 Eurostat Press Office, 2018. "Almost 4 in 10 children in the EU Receive Formal Childcare  
5 Services." Retrieved from:  
6 [http://ec.europa.eu/eurostat/documents/2995521/8681785/3-20022018-AP-  
7 EN.pdf/59fcfaa7-0c72-48a6-8603-899b5b730773](http://ec.europa.eu/eurostat/documents/2995521/8681785/3-20022018-AP-EN.pdf/59fcfaa7-0c72-48a6-8603-899b5b730773).
- 8 Ginsburg, Kenneth R. 2007. "The Importance of Play in Promoting Healthy Child  
9 Development and Maintaining Strong Parent-Child Bonds." *Pediatrics* 119 (1): 182-  
10 191. doi: 119/1/182.short.
- 11 Gubbels, Jessica S, Dave HH Van Kann, and Maria WJ Jansen. 2012. "Play Equipment,  
12 Physical Activity Opportunities, and Children's Activity Levels at  
13 Childcare." *Journal of Environmental and Public Health* 2012: 1-8.  
14 doi:org/10.1155/2012/326520.
- 15 Iivonen, Susanna, K. Sääkslahti, Anette Mehtälä, J. Villberg, Anne Soini, and Marita  
16 Poskiparta. 2016. "Directly Observed Physical Activity and Fundamental Motor  
17 Skills in Four-Year-Old Children in Day Care." *European Early Childhood  
18 Education Research Journal* 24 (3): 398-413. doi:  
19 10.1080/1350293X.2016.1164398.
- 20 Laughlin, Lynda. (2013). "Who's Minding the Kids? Child Care Arrangements: Spring  
21 2011." Current Population Reports, P70-135. U.S. Census Bureau, Washington, DC.
- 22 Lauricella, Alexis, Ellen Wartella, and Victoria Rideout. 2015. "Young Children's Screen  
23 Time: The Complex Role of Parent and Child Factors." *Journal of Applied  
24 Developmental Psychology* 36 (2015): 11-17. doi.org/10.1016/j.appdev.2014.12.001.

1 LeBlanc, Allana, John Spence, Valerie Carson, Sarah Connor Gorber, Carrie Dillman, Ian  
2 Janssen, Michelle E. Kho, Jodie A. Stearns, Brian W. Timmons, and Mark S.  
3 Tremblay. 2012. "Systematic Review of Sedentary Behaviour and Health Indicators  
4 in the Early Years (Aged 0-4 years)." *Applied Physiology Nutrition and Metabolism*  
5 37 (4): 753-72. doi:10.1139/h2012-063.

6 Li, Jiayao, Linda Hestenes, and Yudan Wang. 2016. "Links Between Preschool Children's  
7 Social Skills and Observed Pretend Play in Outdoor Childcare Environments. *Early*  
8 *Childhood Education Journal* 44(1): 61-68. doi:10.1007/s10643-014-0573-2.

9 Loprinzi, Paul D, and Bradley J. Cardinal. 2011. "Measuring Children's Physical Activity and  
10 Sedentary Behaviors." *Journal of Exercise Science & Fitness* 9 (1): 15-23. doi:  
11 10.1016/S1728-869X(11)60002-6.

12 Murray, Robert, Catherine Ramstetter, Cynthia Devore, Mandy Allison, Richard Ancona,  
13 Stephen Barnett, Robert Gunther et al. 2013. "The Crucial Role of Recess in  
14 School." *Pediatrics* 131 (1): 183-188. doi: 10.1542/peds.2012-2993.

15 Nicaise, Virginie, David Kahan, and James F. Sallis. 2011. "Correlates of Moderate-to-  
16 Vigorous Physical Activity Among Preschoolers During Unstructured Outdoor Play  
17 Periods." *Preventive Medicine* 53 (4-5): 309-315. doi: 10.1016/j.ypmed.2011.08.018.

18 Nicaise, Virginie, David Kahan, Karen Reuben, and James F. Sallis. 2012. "Evaluation of a  
19 Redesigned Outdoor Space on Preschool Children's Physical Activity During  
20 Recess." *Pediatric Exercise Science* 24 (4): 507-518. doi: 10.1123/pes.24.4.507.

21 Olsen, Heather. 2013. "Creating and Enriching Quality and Safe Outdoor Environments."  
22 *Dimensions of Early Childhood* 41(3): 11-17.

23 Olsen, Heather, and Brandy Smith. 2017. "Sandboxes, Loose Parts, and Playground  
24 Equipment: A Descriptive Exploration of Outdoor Play Environments." *Early Child*  
25 *Development and Care* 187 (5-6): 1055-1068. doi: 10.1080/03004430.2017.1282928.

- 1 Pellegrini, Anthony D. 1992. "Preference for Outdoor Play During Early  
2 Adolescence." *Journal of Adolescence* 15 (3): 241-254. doi: 10.1016/0140-  
3 1971(92)90028-4.
- 4 Pate, Russell R., Kerry McIver, Marsha Dowda, William H. Brown, and Cheryl Addy. 2008.  
5 "Directly Observed Physical Activity Levels in Preschool Children." *Journal of*  
6 *School Health* 78 (8): 438-444. doi: 10.1111/j.1746-1561.2008.00327.x.
- 7 Prioreschi, Alessandra, Soren Brage, Kylie D. Hesketh, Jill Hnatiuk, Kate Westgate, and Lisa  
8 K. Micklesfield. 2017. "Describing Objectively Measured Physical Activity Levels,  
9 Patterns, and Correlates in a Cross Sectional Sample of Infants and Toddlers from  
10 South Africa." *International Journal of Behavioral Nutrition and Physical Activity*  
11 14: 176. doi: 10.1186/s12966-017-0633-5.
- 12 Puhl, Jackie, Kathryn Greaves, Mary Hoyt, and Tom Baranowski. 1990. "Children's Activity  
13 Rating Scale (CARS): Description and Calibration." *Research Quarterly for Exercise*  
14 *and Sport* 61 (1): 26-36. doi: 10.1080/02701367.1990.10607475.
- 15 Saracho, Olivia N., and Bernard Spodek. 1995. "Children's Play and Early Childhood  
16 Education: Insights from History and Theory." *Journal of Education* 177(3): 129-148.
- 17 Story, Mary, Karen M. Kaphingst, and Simone French. 2006. "The Role of Child Care  
18 Settings in Obesity Prevention." *The Future of Children* (2006): 143-168. url:  
19 <http://www.jstor.org/stable/3556554>.
- 20 Trost, Stewart G., Dianne S. Ward, and Meghan Senso. 2010. "Effects of Child Care Policy  
21 and Environment on Physical Activity." *Medicine and Science in Sports and*  
22 *Exercise* 42 (3): 520-525. doi: 10.1249/MSS.0b013e3181cea3ef.
- 23 UNICEF, 2014. "The Formative Years: UNICEF's Work on Measuring Early Childhood  
24 Development. Retrieved from: [https://data.unicef.org/wp-](https://data.unicef.org/wp-content/uploads/2015/12/Measuring-ECD-Brochure-HR-10_8_116.pdf)  
25 [content/uploads/2015/12/Measuring-ECD-Brochure-HR-10\\_8\\_116.pdf](https://data.unicef.org/wp-content/uploads/2015/12/Measuring-ECD-Brochure-HR-10_8_116.pdf).

- 1 Vanderloo, Leigh M., Patricia Tucker, Andrew M. Johnson, Melissa M. van Zandvoort,  
2 Shauna M. Burke, and Jennifer D. Irwin. 2014. "The Influence of Centre-Based  
3 Childcare on Preschoolers' Physical Activity Levels: A Cross-Sectional  
4 Study." *International Journal of Environmental Research and Public Health* 11 (2):  
5 1794-1802. doi: 10.3390/ijerph110201794.
- 6 Woolley, Helen, and Alison Lowe. 2013. "Exploring the Relationships between Design  
7 Approach and Play Value of Outdoor Play Spaces." *Landscape Research* 38 (1): 53-  
8 74. doi: 10.1080/01426397.2011.640432.