

Children's Involvement in Free Play and the Use of Play Materials in the Outdoor Early Childhood Education and Care Environment

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Abstract

In this study, we investigated the relationship between children's involvement in free play and the use of play materials in outdoor environments. Our sample consisted of 935 video observations of the free play of 86 children in the outdoor spaces of eight Norwegian early childhood education and care (ECEC) institutions. Multilevel analysis revealed a positive association between children's involvement in free outdoor play and their play with loose parts and movable materials. The results suggest that affording easy access to a variety of play materials to be used simultaneously in the outdoor ECEC environment can intensify children's involvement in their play activities.

Keywords: outdoor play, involvement, loose parts, play materials, early childhood education and care, free play

Introduction

A growing consensus contends that physical environments play an essential role in children's development and learning (Berti, Cigala, & Sharmahd, 2019). By extension, the physical qualities of educational environments, including physical features in early childhood education and care (ECEC) institutions, are important for children's wellbeing, participation, development and learning outcomes (Huntsman, 2008; Koch, 2013; Neill, 1982; Sylva et al., 2003; Vassenden, Thygesen, Bayer, Alvestad, & Abrahamsen, 2011). In particular, those factors greatly influence children's perception and use of both indoor and outdoor environments (Waller, Sandseter, Wyver, Ärlemalm-Hagsér, & Maynard, 2010).

In Norway, the national Framework Plan for the Content and Tasks of Kindergarten especially emphasizes outdoor play: "Kindergartens shall enable the children to appreciate nature and have outdoor experiences that teach them to move around and spend time in the outdoors during the different seasons" (NMER, 2017, p. 52). The Framework Plan also stresses the importance of diverse, challenging play environments that accommodate a variety of activities and forms of play for all children by providing a wide range of toys, equipment and materials for them to use in their play.

Although the outdoor environment in preschools appears to bear important influence on children's physical active play, researchers have rarely examined the relationship between play and other key variables of children's development in respect to their learning in outdoor environments (Ernst, 2014; Miranda, Larrea, Muela, & Barandiaran, 2017).

Children's Perceptions of Physical Environments

The theory of affordances (J. J. Gibson, 1979) represents an ecological framework for considering the utility and flexibility of physical environments by prioritizing the individual's perception of his or her surrounding environment. At base, it maintains that the physical environments in which we live afford opportunities to engage in various actions and behaviors. According to the theory, that person-environment relationship is immediate and based on practical activities (Kyttä, 2004). At the same time, as Kyttä (2004) has claimed, actualized affordances are a subset of an environment's potential affordances that an individual perceives, uses or influences. In their case, children actualize affordances in their environments by way of exploration and play. In that sense, affordances depend upon the environment as well as the person, because affordances are unique for each individual. For instance, one child may perceive a milk crate as a seat, whereas another may perceive it as a material for constructing a hut.

Extending the theory of affordances, Herrington, Lesmeister, Nicholls, and Stefiuk (2007) conducted a multidisciplinary study on how children used physical environments in ECEC institutions for play and learning. Based on their results, those authors developed guidelines and criteria for creating stimulating environments that take into account children's interests and needs as well as promote their development and learning. In their informational guide to young children's outdoor play spaces, Herrington and colleagues present seven criteria for

child-friendly environments—the seven Cs—several of which relate to not only the diversity of space (e.g., *character*, *context* and *connectivity*) but also the diversity of contents in space, including play materials. Such diversity reflects another criterion—*change*—which prescribes a range of differently sized designed spaces in a play area and represents how the entire play space changes over time. In their study on the seven Cs, Herrington and Lesmeister (2006) found that children played for less time in play spaces with more limited components of change (e.g., mutable materials such as sand, mud, gravel and fallen or picked vegetation). Addressing another criterion, *chance*—meaning an opportunity for children to create, manipulate and leave an impression on a play space—Herrington and Lesmeister (2006) have argued that outdoor play spaces where loose parts afford materials for children's imagination, exploration and construction of their own play spaces offer outstanding opportunities for chance.

Play with Loose Parts and Movable Materials

Drawing on Nicholson's (1972) theory of loose parts, which stresses providing play environments with a wide range of play opportunities that stimulate creativity, researchers in several recent studies have focused on how loose parts and movable materials can influence children's play and activities. Among them, in an intervention study in Turkey, Acer, Gözen, Firat, Kefeli, and Aslan (2016) redesigned the classroom of 5-year-old nursery-school children to, among other ends, include more loose materials and make them more accessible to children by being placed on shelves and in more transparent containers. Observations revealed that after the intervention, the amount of play materials used in the children's play increased, as did the diversity of their use of those materials. Among other results, the duration of the children's play also increased, meaning that they spent longer time engaged in play situations than before the intervention.

In another study, Mahony, Hyndman, Nutton, Smith, and Te Ava (2017) investigated the relationship between playground equipment and children's social play outdoors in two schools by comparatively analyzing 5–12-year-olds' play in a playground with fixed equipment and in another with movable materials only. Their results indicated a limited range of play activities in the playground with fixed equipment compared to the one with movable materials. Children in the playground with fixed equipment were less active, showed more signs of boredom and disagreement, engaged in more parallel play, organized more team-based games and engaged in more regulated, structured, traditional activities than children in the playground with movable materials. In the latter environment, children performed a wider range of activities, engaged in more purposeful play, showed higher levels of social and cognitive engagement and were more innovative with using the unstructured material than in the fixed environment. They also engaged in more collaborative play involving teamwork, negotiation and planning for a common goal, as well as in a greater number of social interactions with others of different ages and abilities. However, even though loose parts and movable materials have been shown to benefit children's play outdoors, Olsen and Smith (2017) found in their study on access to play materials and loose parts provided on ECEC playgrounds in the United States that the storage of such materials is a critical but overlooked feature in outdoor play environments. To be available to and fully used by children,

such materials should be stored close to the spaces where children play, at children's heights and with full access. Similarly, in their systematic review, Berti and colleagues (2019) found that the accessibility and appropriateness of child-scale materials in outdoor spaces seem to increase the quality of children's play.

In studies exploring children's view of attractive play environments, scholars have also observed that having access to loose parts or manipulative, movable materials is important for children's play. For example, to examine 6–11-year-olds' perspectives on public playgrounds and their playground use, Jansson (2015) conducted group interviews supplemented with maps and photos with 141 children in two Swedish cities. Among her results, the children described their use of playgrounds in terms of challenges, manipulation and placemaking. When children described their preference for manipulation, which was most preferred by the oldest children (i.e., 9–11 years old), they described how they liked to alter their play environments by using, for example, stones, sand and various tools. In another series of interviews supplemented with photographs and drawings as well as in observations, Zamani (2016) similarly found that 4–5-year-olds preferred playgrounds with both loose natural materials—sand, leaves, twigs, stones, dirt and flowers, among others—and loose manufactured elements such as tires, ropes and toys. Likewise, during observations, the children preferred to use loose or modifiable elements that inspired their constructive, dramatic and rule-based game play. In a separate set of interviews conducted during the study, teachers confirmed children's preferences for loose materials for imaginary play, which they had observed lengthened the duration of children's play. More recently, in an analysis of 5–9-year-olds' ($N = 110$) drawings of their idealized play spaces, Ward (2018) also found that children predominantly depicted loose parts such as natural elements including water, and props for symbolic, fantasy or role play.

J. L. Gibson, Cornell, and Gill (2017) performed a systematic review of research on interventions involving play with loose parts assessed with quantitative outcome indicators for development, but found little evidence to support the impact of the interventions. Although some indications of participants' higher enjoyment, self-esteem and happiness at and satisfaction with school emerged, indications of developmental impact did not. However, the authors admitted that only five studies met the criteria for inclusion in their systematic review, and in turn, they called for more small- and large-scale quantitative studies on the impact of children's play with loose parts.

Children's Play, Involvement and Learning

Play is an activity in which children engage not as a means to an end but simply because they enjoy it (Sutton-Smith, 2009). From the perspective of children, play is voluntary, self-controlled, fun, active, spontaneous, free, unlimited, natural and self-initiated (Wiltz & Fein, 2006). In studies to date, scholars have observed that experiencing an activity such as play is important for children's learning from the activity (Howard & McInnes, 2013; McInnes, Howard, Miles, & Crowley, 2009), as well as that their wellbeing improves when they engage in play versus adult-led exercises involving the same activity (Howard & McInnes, 2013). As such, play promotes learning, including the learning of skills that are important for adulthood

(Bjorklund & Pellegrini, 2002; Pellegrini & Smith, 1998). In that sense, play and learning should be considered to operate as an indivisible whole whose two component parts stimulate each other (Pramling Samuelsson & Johansson, 2006).

In describing how children experience deep-level learning when operating in a mode of high involvement, Laevers (2000) has argued that accommodating high levels of involvement as well as persistence in children's play and activities is important to promoting optimal learning environments. Involvement is linked neither to specific types of behavior nor to specific levels of development. More generally, *involvement* means intense mental activity in which a person functions at the limits of his or her capabilities. Laevers and Heylen (2003) argue *involvement* refers to a dimension of human activity that is closely related to quality in learning processes. Thus, involvement can be characterized as entailing intrinsic motivation, fascination, an openness to stimuli and an intensity of experience at both the physical and cognitive levels, all of which affect children's learning (Laevers, 1997; Pascal & Bertram, 1997). As such, involvement should be studied not to examine direct learning outcomes but to explore the creation of optimal learning situations. Taking that perspective, Laevers and Heylen (2003) have argued that given a richer variety of play materials, children are afforded greater choice in their play activities and, as a result, experience higher levels of involvement.

Aim of the Study

To our knowledge there are no earlier studies exploring the relationship between children's interaction with play materials and their involvement in play. Examining how diverse play materials can contribute to creating optimal outdoor learning environments is therefore the main aim of this study. More specifically, our research question was: *What is the association between children's involvement in free play and the use of play materials in ECEC outdoor environments?*

Methods

The study was conducted as part of the Competence for Developing Early Childhood Education and Care (ECEC) Institutions' Indoor and Outdoor Environments project funded by the Research Council of Norway and approved by the Norwegian Social Science Data Services. Lasting from 2017 to 2020, the project followed a mixed-methods design (Creswell, 2015) and was conducted in close collaboration with three owners of ECEC institutions in Norway. Data collection involved systematic and randomized video observations of children in outdoor environments during free play at two data points, in which *free play* implied that children could decide what they wanted to do, where they wanted to be and with whom they wanted to interact. Results from the first period of data collection have been described in other published articles (Sando, 2019; Storli & Sandseter, 2019).

Participants

The participating ECEC institutions in the study were selected from facilities operated by three partnering ECEC owners. The owners made at least twice as many ECEC institutions available as were required for the study and provided relevant information about each of them, including their size, location, age, spatial qualities, number of departments and number of children in attendance. An

important criterion for selected institutions was having at least 20 children aged 4–5 years old who could be recruited as participants. The researchers selected eight ECEC institutions based on a strategic choice to include different types of institutions in terms of the size, quality and age of the spaces therein. On average, Norwegian ECEC institutions have a fenced playground of 2,619.5 square meters, or 47.1 square meters per child (Moser & Martinsen, 2010). In this study, the largest playground was 13.0 square meters. While there were large variations in the sizes of playgrounds in the study, the design and fixed playground equipment in the ECEC institutions were quite similar in terms of type, e.g. swings, slides, sandpits and climbing equipment. All institutions provided play materials like tricycles, buckets, toy trucks, cups and spades. In one of the urban playgrounds the children had no access to nature such as trees, flowers, grass, or natural elements like stones, gravel, logs, or sticks.

The strategy for sampling children to participate was to seek informed consent from all the children's parents, then randomly draw 10 children who consented to participate—five boys and five girls—from each institution. As a result, the first period of data collection (T1) included 80 children. Because the second period of data collection (T2) occurred a year after T1, some amendments were made to the sample at T2. In particular, six of the 80 participants no longer attended the institutions at T2, and one child was not included at T2 for ethical reasons. Following the likelihood of dropout anticipated at T1, a list of other children who consented to participate was used to randomly select seven additional children for T2 to replace the dropouts. However, one of the children was sick on the day of observation, which left only six children as replacement participants. Ultimately, the sample consisted of 86 children: 80 at T1 and 79 at T2. The distribution of gender between T1 and T2 was nearly equal, with 51 percent of the observations being of boys and 49 percent being of girls. Children's mean age was 3.8 years ($SE = 0.6$) at T1 and 4.7 years ($SE = 0.6$) at T2.

Procedure and Data

T1 occurred in the fall of 2017, whereas T2 occurred a year later in the fall of 2018. All observations were video-recorded and performed in accordance with a strict protocol that ensured a random sampling of observational sequences and identical methods of data collection at each institution. Researchers selected two children to be observed on each day of observation, and each child was observed for six two-minute sequences during free play outdoors. The protocol instructed the data collector to perform each observation by recording Child 1 for two minutes, followed by a six-minute break to locate the next child in the play area. Next, Child 2 was recorded for two minutes as well, followed by another six-minute break to find Child 1 for his or her second round of observation, and so forth. If the data collector encountered a child in a situation that could not be filmed (e.g., using the toilet or changing clothes), then the observation was postponed until filming was permitted. If the child was in such a situation for more than 10 minutes, then the data collector proceeded to continue observing the other child and performed the missing observations at the end of the observation period.

Although a full sample of six observations of 80 children at two data points would have included 960 observations, the final sample included only 935 video observations, meaning that 25 observations were missing (2.6 percent). Some missing observations occurred because children were sick or picked up early from school, while other observations were excluded because the child was hidden from view, the child was preoccupied with the recording equipment or a technical or human error occurred. The final sample reflected a fairly equal distribution of observations at the two data points, with 471 observations at T1 and 464 at T2.

Measures

The Leuven Involvement Scale (Laevers, 2005) used in the study is designed for two-minute observations scored on a 5-point scale (1 = *The child hardly shows any activity*, 5 = *The child is continuously engaged in the activity and completely absorbed with it*). Each video-recorded observation was scored independently by two researchers, who reviewed the data when disagreements greater than 1 point arose and discussed their interpretations until consensus was reached. For differences of 1 point, an average of the two scores was used. In terms of weighted kappa (Cohen, 1968), inter-rater agreement was 89 percent, with a kappa value of 0.56, which indicates moderate agreement. Agreement greater than 80 percent and with a kappa value exceeding 0.40 is often viewed as acceptable (McHugh, 2012).

Observers coded the use or presence of materials when a child was holding, using or interacting with a material. To capture the possibility that children may use several materials at once, the categories of materials were not mutually exclusive. Those categories were sand, water, mud, nature materials, toys, open-ended materials and wheeled toys. Observers coded every material category in terms of the percentage of time in which the material was used during each observation. A single researcher coded the materials, and a random sample of 10 percent of the video observations was reviewed by a second researcher to ensure consistent coding and interpretation.

Analysis

Researchers scored involvement in an Excel spreadsheet, and coded the use of materials with Noldus Observer XT 12.5, a type of behavioral coding, analysis and management software for observed data (Zimmerman, Bolhuis, Willemsen, Meyer, & Noldus, 2009). Observer XT data were paired with the spreadsheet of scores for involvement and imported to Stata (MP 15.1) for statistical analysis. Given the hierarchical structure of the data with nested observations of children in ECEC institutions, researchers also used multilevel regression analysis (Goldstein, 1986), which enables researchers to control for contextual factors and increases the accuracy of predictions (Gelman, 2006).

Results

The mean duration of the 935 video observations was 122 seconds ($SE = 5$), and the mean score for involvement was 3.6 ($SE = 0.8$). Descriptive statistics of the observations appear in Table 1.

Table 1. Descriptive statistics (N = 935 observations)

	Mean (SE)	Min.	Max.
Involvement	3.6 (.8)	1	5
Age	4.2	2.8	5.8
Sand %	11 (28)	0	100
Water %	8 (23)	0	100
Mud %	1 (9)	0	100
Nature materials %	14 (31)	0	100
Toys %	32 (44)	0	100
Open-ended materials %	7 (23)	0	100
Wheeled toys %	13 (32)	0	100

The material used the most was toys, which participants used 32 percent of the time on average. Sand (11 percent), water (8 percent), nature materials (14 percent), open-ended materials (7 percent) and wheeled toys (13 percent) were also used quite frequently. By contrast, mud was used only 1 percent of the time and, for that reason, was excluded from further analysis.

The correlation matrix presented in Table 2 shows that involvement positively correlated with age ($r = .25, p < .001$), being a boy ($r = .11, p < .01$), use of sand ($r = .21, p < .001$), use of water ($r = .14, p < .001$), use of nature materials ($r = .15, p < .001$), use of toys ($r = .24, p < .001$) and use of open-ended materials ($r = .13, p < .001$). However, involvement negatively correlated with the use of wheeled toys ($r = -.14, p < .001$).

Table 2. Correlation matrix (N = 935 observations)

	1.	2.	3.	4.	5.	6.	7.	8.
1. Age	—							
2. Boy (0 = Girl)	.11**	—						
3. Involvement	.25***	.07*	—					
4. Sand	.03	-.01	.21***	—				
5. Water	-.08*	.02	.14***	.05	—			
6. Nature materials	-.06	-.02	.15***	-.12***	.00	—		
7. Toys	.03	.06	.24***	.49***	.33***	-.02	—	
8. Open-ended materials	.15***	.04	.13***	-.09**	-.03	.05	-.15***	—
9. Wheeled toys	-.18***	-.01	-.14***	-.12***	-.13***	-.16***	-.22***	-.05

* $p < .05$, ** $p < .01$, *** $p < .001$

To analyze the association between involvement and the variables describing the use of materials while controlling for the nested data structure and children's age and gender, researchers performed multilevel regression analysis with a random

intercept model. The data were nested at three levels: the level of observation (Level 1, $n = 935$), the level of the child (Level 2, $n = 86$) and the level of the institution (Level 3, $n = 8$). A variance partition coefficient with a limit of 5 percent variance was used to determine the number of levels in the model (Mehmetoglu & Jakobsen, 2017). Calculations of the variance partition coefficient for involvement indicated 2 percent variance at the institutional level and 21 percent variance at the child level. A two-level model was employed for further analysis.

A stepwise inclusion of variables, starting at the lowest level in the model (Hox, 2010), was also performed. The researchers first ran an intercept-only model (M0), followed by a model including variables describing the use of materials (M1). Last, the second-level variables describing age and gender were added (M2). Values of deviance, Akaike's information criterion and Schwarz's Bayesian information criterion for all three models are shown in Table 3 to indicate how well the models fit the data and to compare them (Hox, 2010).

Table 3. Multilevel model for involvement and use of materials

Model	M0	M1	M2
	Coeff. (SE)	Coeff. (SE)	Coeff. (SE)
Fixed part			
Intercept	3.55 (.05)	3.31 (.05)	2.26 (.19)
Sand		.005 (.001)***	.005 (.001)***
Water		.003 (.001)**	.004 (.001)***
Nature materials		.004 (.001)***	.004 (.001)***
Toys		.003 (.001)***	.003 (.001)***
Open-ended materials		.005 (.001)***	.004 (.001)***
Wheeled toys		-.001 (.001)	.000 (.001)
Age			.24 (.04)***
Boy			.07 (.08)
Random part			
Level 1 variance	.55 (.03)	.49 (.02)	.48 (.02)
Level 2 variance	.14 (.03)	.12 (.03)	.08 (.02)
Deviance	2208	2089	2058
AIC	2214	2107	2080
BIC	2229	2151	2133

Note. AIC = Akaike's information criterion; BIC = Bayesian information criterion

* $p < .05$. ** $p < .01$. *** $p < .001$.

Controlling for the effect of the other independent variables, the final model (M2) indicated that involvement was 0.5 points greater on the Leuven Involvement Scale when children used sand throughout their observation periods (100 percent). The use of water, nature materials and open-ended materials was also positively associated with involvement, and the model revealed an increase in involvement by 0.4 points when children used those materials throughout the observation. Using

toys was also positively associated with involvement, with an estimated 0.3-point increase, whereas using wheeled toys had no association with involvement. A positive association also surfaced between age and involvement; being a year older was estimated to increase involvement by 0.2 points. By contrast, no significant association surfaced between gender and involvement. According to the results of a likelihood-ratio test, each model marked a significant improvement from the previous model ($p < .001$).

To test whether any differences in gender occurred in the association between each material and involvement, researchers ran separate models for each material, in which age, gender and an interaction term for the specific material and gender were included. Because no significant interaction effects emerged, there was no apparent difference between the genders in terms of each material's association with involvement.

Discussion

Our analyses allowed us to investigate the relationship between children's involvement in free play and the use of play materials (i.e. loose parts) in outdoor environments at ECEC institutions in Norway.

The descriptive statistics in Table 1 afford an overview of which play materials were most frequently used in children's free play outdoors. Toys such as buckets, spades, cups and trucks are play materials often provided as supplements in play spaces such as sandboxes and outdoor kitchens and surfaced as the play material most used on average (32 percent). Other popular play materials were nature materials (14 percent), sand (11 percent), water (8 percent) and open open-ended materials (7 percent).

These results suggest that children are strongly attracted to and prefer playing with loose parts and movable materials, which underscores the importance of providing such materials and making them easily accessible for children in adapting and improving playability in play environments (Acer et al., 2016; Olsen & Smith, 2017). According to Nicholson (1972), play materials or loose parts increase children's inventiveness and creativity as well as the possibility of discovery. In his criticism of many playgrounds, Nicholson (1972) has claimed that, without such materials, children are deprived of fun and creativity in play environments that are clean, static and impossible to play in. By extension, Kyttä (2004) has argued that a diversity of environmental resources and access to play and exploration are two central criteria of child-friendly environments. Movable play materials afford multidimensional possibilities for play and are perceived as functionally meaningful, or "play-able," from the perspective of children (Ward, 2018; Zamani, 2016).

As Table 1 shows, providing a diversity of natural (e.g. sticks, logs, cones and rocks) and open-ended materials (e.g. planks, tubes and car tires) along with more predefined toys, can contribute to creating spaces with more open-ended opportunities for various types of play in outdoor ECEC environments. Because the usability (i.e., affordances) of such materials is not predefined, children may behave more freely in using them in challenging, creative and transformative ways

(Jansson, 2015). Herrington and colleagues (2007) have referred to loose parts as tools that allow actions to be performed and that alter opportunities for children's imagination, exploration and construction of their own play spaces. Moreover, Herrington and Lesmeister (2006) have found that children play for less time when the ability for environments to change is more limited (e.g., lacking mutable materials such as sand, mud, gravel, and fallen or picked vegetation).

The results in Tables 2 and 3 reveal that a positive association emerged between involvement and children's play with loose parts and movable materials, except for wheeled toys, in their free outdoor play. The results of the multilevel model for involvement and use of materials in Table 3 also reveal a significant association between children's involvement and use of play materials when the effect of the other independent variables in the model was controlled. If participating children used the play materials for throughout the two-minute observation, then their involvement was estimated to increase by 0.3 points on the Leuven Involvement Scale for play with toys, by 0.4 for play with water, nature materials and open-ended materials and by 0.5 for play with sand.

The results in Table 2 indicate that children often used two or more different play materials at once. The researchers calculated the estimated effect on involvement of using each play material. Among them, playing with toys, water and sand at the same time for two minutes was estimated to increase involvement by 1.2 points on the Leuven Involvement Scale. That finding coincides with earlier findings suggesting that increased endurance (Acer et al., 2016; Herrington & Lesmeister, 2006), a wider range of activities (types of play), more purposeful play (Mahony et al., 2017) and greater involvement (Laevers & Heylen, 2003) in children's play occur when they have access to a variety of play materials that they can use simultaneously.

Wheeled toys did not have the same positive associations with involvement as the other play materials examined. In fact, wheeled toys—mostly tricycles—were negatively correlated with involvement (Table 2); however, in the more robust multilevel model (Table 3), that negative association disappeared. Taken together, the results suggest that wheeled toys such as tricycles are neither positively nor negatively associated with children's involvement. As an explanation, the video recordings indicate that the number of tricycles at each ECEC institution was limited and that children, having accessed one of them, tended to spend their time guarding it from other children instead of using it in play activities. The video recordings also suggest that tricycles were features on which children sat while not engaging in play.

The multilevel model for involvement and use of materials (Table 3) included two factors related not to the environment but to the individual: gender and age. On the one hand, no significant differences arose between boys and girls in terms of the associations between involvement and different play materials. In a study on the relationship between social play and involvement in outdoor play environment Miranda and colleagues (2017) did not detect gender-based differences, either. On the other hand, a positive association between age and involvement in outdoor play

did emerge in our study (Table 3), as being a year older was estimated to increase involvement by 0.2 points on the Leuven Involvement Scale. Although our study's data did not provide information to explain that association, theoretical assumptions can nevertheless inform some reasons why it occurred. For instance, Miranda and colleagues (2017) have reported that group play is the type of play that best predicts higher involvement. Moreover, older children are generally more experienced and expected to have cognitive, social and emotional competencies greater than those of younger children.

Regardless of the richness and diversity of opportunities that children encounter in play environments, individual differences between children are inevitable, particularly in how they perceive those environments and the degree to which they experience involvement while playing there. Since children's individual interests, sources of fascination and motivations in outdoor play are wide-ranging, individual variance in involvement should be expected. Our results support that assumption; variance in involvement was 21 percent at the level of the child compared to only 2 percent at the institutional level. That finding illuminates the complexity of the relationship between children's play and their perceptions of environments as consisting of potentially meaningful affordances (Kyttä, 2004). For ECEC practitioners, such knowledge is important, for being able to recognize children who are not showing signs of high involvement in play and activities can enable such practitioners to accommodate both an environment and activities that promote high involvement among all children and, in turn, increased learning potential (Laevers & Heylen, 2003).

The results in Table 2 also show that children tended to use a combination of loose materials such as sand, water and toys, as well as buckets, spades and toy cars, at the same time in their play. That trend calls for practitioners to become aware of the importance of storing such materials together or close to each other in a play environment where children can easily access them (Acer et al., 2016; Berti et al., 2019; Olsen & Smith, 2017; Zamani, 2016). More specifically, Olsen and Smith (2017) have recommended using storage with a combination of large units for large equipment (e.g., tricycles and balls) and small, child-accessible shelves for art supplies, materials for dramatic play, cars and other loose materials.

Conclusion

The aim of our study was to explore how children interact with play materials outdoors at ECEC institutions and how such interaction relates to their level of involvement during free play. The results revealed a positive association between involvement and children's play with loose parts and movable materials, as well as suggest that children's involvement in their play increases when they can easily access a variety of play materials that they can use simultaneously. At the same time, because our study constituted cross-sectional research focused on measuring children's involvement in their ECEC institutional environments, the study design and analytical approach do not allow reliable causal inferences. Only associations between the children's involvement and their use of loose parts and movable materials in the outdoor environments can be established. Even so, the associations detected in the study support earlier findings that accessibility and appropriate

loose parts and movable materials in outdoor play spaces seem to increase the quality of play behavior, which affords insights into how that relationship can be accommodated to increase children's involvement in their play and other activities. In that sense, the study's findings further emphasize that ECEC institutions and practitioners should provide easily accessible, sufficiently diverse play materials for children to use in their outdoor play environments.

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