



# Young children's exploration of the indoor playroom space in center-based childcare<sup>☆</sup>



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## ABSTRACT

Exploration plays a key role in the development of children. While exploring, children develop new skills by perceiving and acting upon the possibilities for action that are specified in the environment. This study examined the relations between young children's exploration during free play and the spatial characteristics of the indoor playroom space in childcare centers, using an observation scheme based on Gibson's theory of perception-action affordances. The study was carried out in mixed-age groups, with ages ranging between 11 and 48 months. The results showed that depth of exploration of space was positively related to the use of tables and activity centers, and also to the child's task-orientation as rated by the caregivers. Breadth of exploration revealed a reversed pattern of relations. The findings indicate that studying children's exploration of indoor playroom space as affordances-guided perception-action cycles can contribute to a more comprehensive understanding of the role of spatial attributes in children's exploratory play.

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## 1. Introduction

Young children discover the world around them by actively exploring the possibilities for action their environment offers and by doing so they not only acquire information about the environment, but they also improve their abilities to act upon the environment. A growing number of children worldwide attend a day care center or preschool in the first years of their lives before enrolling in primary school (OECD, 2014), raising interest in the developmental effects of child day care. Most studies into the effects of child care on children's social-emotional and cognitive competence development have focused on the quality of caregiver-child interactions and on structural quality characteristics such as group size, adult-to-children ratio and caregivers' pre- and in-service professional training (Burchinal, Vandergrift, Pianta, & Mashburn, 2010; Slot, Leseman, Verhagen, & Mulder, 2015). Studies relating developmental effects to the physical environment provided by child day care centers, however, are scarce. The present study

focused on a particular aspect of child development, exploratory play, seen as driver of both cognitive and social-emotional development. We examined how young children in childcare centers, in mixed-age groups with ages ranging from one to four years, explore the playroom during episodes of free, unguided play. We studied differences in intensity (depth) and variety (breadth) of exploration as related to characteristics of the child and the playroom characteristics. More specifically, we examined how children's exploration is related to the physical-spatial layout and presence of particular components in the environment provided by the centers.

The present study relates to previous work on the role of exploratory play in children's cognitive development (e.g., Oudgenoeg-Paz, Leseman, & Volman, 2015; Ginsburg, Cannon, Eisenband, & Pappas, 2006). However, the current perspective differs from that of the earlier work. We did not examine how exploration of spatial characteristics relates to cognition, but instead how particular constellations of spatial characteristics of playrooms relate to the nature of children's exploration of the playroom space.

### 1.1. Exploration and development

Exploration is an essential condition for development. Having opportunities to discover the environment and to practice skills in acting upon the environment, stimulates the development of new,

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more complex skills (Oudgenoeg-Paz, Boom, Volman, & Leseman, 2016). By actively exploring the features in the environment that are accessible to them, children learn to solve context-dependent problems (Thelen, 2000) and they discover the causal relations between actions and outcomes, which can facilitate logical reasoning (Legare, 2014). Exploring the spatial-relational properties of objects, for example by stacking objects or by putting objects in containers, provides children with opportunities to learn about spatial relations and sets the stage for acquiring spatial language such as prepositions and verbs of movement (Oudgenoeg-Paz et al., 2015). Likewise, exploring the spatial properties of objects and environments provides children with opportunities to develop basic mathematical ideas about shape, size, order and number (Ginsburg et al., 2006). Exploratory play in young children can have long-lasting effects on cognitive functioning in middle childhood and adolescence. In a longitudinal study a significant relation was found between infants' motor maturity and active exploration at age 5 months and their academic achievement at age 14 years (Bornstein, Hahn, & Suwalsky, 2013). Similarly, parent-reported exploration behavior in infancy and toddlerhood was found to predict children's spatial memory at age 6, while controlling for fluid intelligence, gender and socioeconomic background (Oudgenoeg-Paz, Leseman, & Volman, 2014).

Exploration has often been defined as a goal-oriented activity, the goal being to learn about an object or a situation, and to simultaneously learn how to interact with that object or situation (Rusher, Cross, & Ware, 1995; Weisler & McCall, 1976; Wohlwill, 1984). Recent studies of young children (Kozioł, Budding, & Chidekel, 2012; Smith & Gasser, 2005; Thelen, Schöner, Scheier, & Smith, 2001) indicate that exploration often starts with a spontaneous movement, which elicits an effect, for instance a noise or the displacement of an object. Perceiving this effect, in turn, leads to acquisition of knowledge, at first coincidentally, and next to a new stage, where movement and cognition become coordinated to reach a goal or to master a skill (Kozioł et al., 2012). The child that accidentally causes an effect can use this experience to intentionally repeat, alter or extend his or her activities by reproducing the newly discovered effect and by elaborating on it.

Children's exploration of spatial characteristics is obviously related to their motor development. For example, in order to be able to explore and manipulate particular objects the stage of neuromuscular development of the child's hand skills and the body-scaled relations for grasping should afford grasping these objects (i.e., the objects may be too big or too heavy for the child). Similarly, reaching important motor milestones such as sitting, crawling and walking enables new ways of exploring the environment (Oudgenoeg-Paz et al., 2015). Yet, exploring the environment while being guided by the spatial structures of the environment, in turn, leads to new motor skills and thereby propels motor development (e.g., Adolph & Robinson, 2015; Thelen, 2000).

Most studies investigating exploration behavior in young children have focused on children's use of play objects (e.g., Caruso, 1993; Fitneva, Lam, & Dunfield, 2013; Oudgenoeg-Paz et al., 2014; Power, Chapiesky, & McGrath, 1985; Schuetze, Lewis, & DiMartino, 1999), using various methods to assess exploratory play (e.g., Oudgenoeg-Paz et al., 2016; Soska, Adolph, & Johnson, 2010). Some studies found a relation between object exploration and motor skills, indicating that the way a child explores and uses a three-dimensional object is linked to his or her motor abilities, such as being able to crawl or to sit (Oudgenoeg-Paz et al., 2014; Soska et al., 2010). Power et al. (1985) investigated exploratory styles, using the concepts of breadth of exploration, referring to the diversity of ways a toy was used, and depth of exploration, referring to the amount of time a child was engaged in playing with an object. Both breadth and depth of exploration were related to children's developmental level. In studies among infants between 9 and 12

months of age, Caruso (1993) and Schuetze et al. (1999) found that a greater variety in use of an object was related to more time spent on exploring and higher problem-solving ability.

### 1.2. Exploration of the playroom space

Various aspects of exploration of space in young children have been studied in laboratory and home situations. Studies have shown that once a child is able to move independently, by crawling and subsequently by walking, he or she is able to perceive the environment in new ways and to explore it by moving objects, by going from one place to another, and by manipulating the spatial arrangement of the environment (Karasik, Tamis-LeMonda, & Adolph, 2011). Other studies have shown a connection between the way in which children explored their environment and the characteristics of this environment. For instance, the onset of locomotion was found to be delayed in infants growing up in an environment that restrained their movement by placing them on a soft mattress (Campos et al., 2000). A study testing young children's walking on uneven floors demonstrated that subtle variations in floor height led children to adjust their steps to stay upright, indicating real-time coupling of perception and action (Gill, Adolph, & Vereyken, 2009). In a cross-cultural study into unsupported sitting of 5-month-old infants remarkable differences were found between sitting habits of children which were related to mother's behavior toward the child and to postural positions. In cultures where children sit on the floor unsupported, children sit stable at an earlier age than in cultures using supportive child furniture (Karasik, Tamis-LeMonda, Adolph, & Bornstein, 2015). These studies indicate that having opportunities to practice and develop new skills, made possible by both the social and the physical environment, stimulate children to gather knowledge about the environment and to simultaneously acquire new skills. Possibilities for exploration thus not only depend on the child's exploratory abilities, but also on characteristics of the physical environment. Also adults can influence children's exploration, either directly by guiding children's attention or by modelling exploration behavior, or indirectly by arranging the physical environment (Weisberg, Hirsh-Pasek, Golinkoff, Kittredge, & Klahr, 2016).

To the best of our knowledge only a few studies to date have investigated the relation between exploratory behavior and spatial characteristics of the environment in center-based childcare (Kantrowitz & Evans, 2004; Moore, 1986). Exploration in these studies was defined as the type of play behavior that is directed toward investigating an object, a person or a space. Moore (1986) introduced the concept of well-defined settings, referring to recognizable areas within the playroom that are limited to one activity and well-equipped with relevant materials, as opposed to ill-defined activity settings. He found that exploratory behavior occurred more frequently in well-defined than in ill-defined settings. Kantrowitz and Evans (2004) discovered a relation between the child-activity-area ratio and the time children spent off-task. If there were more children per activity area, children spent less time on play activities. In this study, an activity area was defined as a section of the environment delineated by specific materials and physical boundaries, for instance an area for arts and crafts, dramatic play or construction play.

### 1.3. The concept of affordances as theoretical framework

Although sophisticated methods were used in the studies reviewed above, a coherent and comprehensive theoretical framework for relating exploration behavior to physical characteristics of the environment is still lacking. A promising framework is provided by the ecological psychology theory developed by James and Eleanor Gibson (Gibson, 1986, 1988). The core of this framework

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