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Affordances of outdoor settings for children in preschool: revisiting heft's functional taxonomy

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ABSTRACT

Heft's functional taxonomy for children's outdoor environment based on the concept of affordances was applied and investigated in a Danish preschool context. Affordances here refer to *the meaningful action possibilities of the environment*. Two groups of children (3–6 years) enrolled in preschool were observed during times for 'free play' in their usual outdoor settings: traditional playground and forest (12 visits, respectively). Modified classes of outdoor features are suggested along with new practical class names: *open ground, sloping terrain, shielded places, rigid fixtures, moving fixtures, loose objects, loose material, water, creatures and fire*. Each class is specified by distinctive and attractive key activities found by observation. Examining each class indicated that important characteristics apart from *availability* were *variation, sizes* and *change*. The concept of affordances emphasises the ongoing user–environment–activity relationship important for planning with children in mind, but clarification is needed when using the term.

KEYWORDS

Forest preschool; playground; kindergarten; woodland; outdoor feature

> Functional possibilities of environmental features that exist at one time in life may not exist at a later age, and conversely, new affordances emerge throughout development as maturation and experiences interact to expand the individual's behavioral repertoire. (Heft, 1988, p. 37)

Introduction

The number of Danish children attending preschool on a daily basis rose from 76 to 92% between 1990 and 2000 for age 3–5, and the number has been stable at around 97% for the last 6 years (Danmarks_ Statistik, 2013). The overall aim of preschools in Denmark is declared in the national Law for Day care: children in day care should be provided with a physical, psychological and aesthetic children's environment that enhances their ability to thrive and encourages health, development and learning (Ministeriet for Børn & Integration og Sociale Forhold, 2007, § 7.1).

Outdoor settings constitute a part of the physical environment in preschools. These are usually fenced playgrounds with traditional equipment such as swings, slides, sandpits, playhouses and climbing structures in a setting with more or less greenery. In Scandinavia and Northern Europe at large, alternative preschools exist with groups of children staying outdoors on a daily basis in woodlands, parks and other natural and semi-natural green settings.

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Playgrounds and green spaces are planned, managed and used by professionals with different educational backgrounds. The 'language' and terminologies used to characterise these settings differ between different professions; this also applies to research in children's outdoor settings. As examples, Herrington and Lesmeister (2006), in a study based on literature, observations and interviews with preschool leaders in 12 childcare centres in Vancouver, Canada found that the qualities could be structured according to the 7 C's: character, context, connectivity, change, chances, clarity and challenge. Refshauge, Stigsdotter, Lamm, and Thorleifsdottir (2013) from Denmark suggested affordances of importance for preschoolers to be climb-able, jump-on-able, run-able, balance-able, swing-on-able, imagine-able, touch-able, move-able, mould-able and construction-able, and in the post-occupancy evaluation of a playground, they used mapping of play types such as functional play, dramatic play, constructive play, games and non-play. A recent observational study in Denmark concluded that the following eight kinds of places were of general significance across five different types of public playgrounds: the surprising play place, the hiding place, the risky play place, the vertical play place, the well-known play place, the rough and tumble play place, the social place and the self-created play place (Petersen, 2014). Based on experiences from a long career in research and landscape architecture for children in the USA, Moore (2014) listed 19 important activity settings in nature play and learning places for children (p. 26), where an activity setting is defined as a subspace with affordances that offer a predictable type of activity (Moore, 2014, p. 54). A simple assessment tool specifically for preschools and based on observation of children's play was proposed by Mårtensson et al. (2009) in Sweden using three categories: the total size of the area, the proportion of trees, shrubs and hilly terrain and the integration between open areas, play equipment and vegetation.

In order to make knowledge about children's outdoor areas transferable, at playgrounds as well as in public green spaces, a common terminology for the environment is looked for. This study aims at a practical way to describe and classify outdoor settings for children's self-initiated activities in preschool, with affordances as the synthesising concept. Affordances here refer to *the meaningful action possibilities of the environment*. Considering that a functional taxonomy for children's outdoor environments based on the concept of affordance has already been proposed by Heft (1988), this taxonomy is the point of reference in the present study. The research question is specified as follows: *Which terms are appropriate for analysing and understanding affordances of outdoor settings for children in preschool?*

Theoretical background

Affordances: an ecological approach

In ecological psychology theory, the person–environment is regarded as mutually linked in an 'eco niche' (Gibson, 1979). An eco niche is the part of the environment that is utilised or occupied by an organism and refers to a way of living. Properties of the eco niche establish action possibilities and constraints; at the same time, organisms often play an instrumental role in shaping their setting in a set of activities called 'niche construction' (Odling-Smee, Laland, & Feldman, 2003).

When J. J. Gibson studied perceiving considered as an activity of the organism moving in the environment, he coined the concept of 'affordances':

> The *affordances* of the environment are what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill … I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment. (Gibson, 1979, p. 127)

He also stated: 'Affordances are properties taken with reference to the observer' (Gibson, 1979, p. 143). To see the environment will often be to perceive what it affords (Gibson, 1979, p. 240). J. J. Gibson stated that often affordances are the same for all members of a species while connected to the interests and bodily abilities of the species (Gibson, 1979, p. 141); affordances are, though relational, often general on an overall level.

Heft defined affordances as: '… affordances … refer to functional significances of environmental features for an individual' (Heft, 1988, p. 29). Later Heft stated: 'Affordances are perceptible properties of

the environment that have functional significance for an individual' (Heft, 2010, p. 18) and 'Affordances are properties of the environment that are both objectively real *and* psychologically significant' (Heft, 2010, p. 19). This is not in contradiction with J. J. Gibson, but underlines the developing character of affordances as shown in the citation at the outset of this article. Over time the individual perception of affordances will change according to changes in size and abilities, experiences and learning (Gibson, 1979, 2000; Heft, 1988); from a time perspective some affordances will fade and new affordances will be perceived as the child grows in size and competences and interests alter. For groups of children within the same age span the sum of the affording features of a setting may be more stable over time, but may also change with new ideas and actions emerging and other ideas and actions no longer being expressed.

The definition of affordances used in this study is *the meaningful action possibilities of the environment*. The 'action possibilities' state what is afforded. 'Of the environment' signifies the environmental prerequisites: the affording features. 'Meaningful' implies that the action possibilities are perceptible and of value for the person or persons. This definition incorporates three significant and intertwined factors of an affordance: *the setting, the person* and *the action*. All three are necessary for a valid description of affordances.

Descriptive factors

The concept of affordances has been suggested as a starting point for a description of environments as an alternative to form-based descriptions. The affordance concept might be a tool for planners and designers interested in planning with users in mind (Heft, 1988, 2010). Describing the characteristics of features making valued activities possible for a person or a user group could be a way of describing the environment in a meaningful way.

When we observe others in action, we see the actors, the features in use, and the afforded actions, indicating that actions and features have value at that moment. Children at times of free play were assumed to be concerned with activities regarded as meaningful and with features that were regarded as attractive. Observations of a group of persons over a period of time may lead to approximations of affordances of a setting for a group of this kind. The advantage is that bodily activities and the involved features may be observed directly (Heft & Kyttä, 2006). The limitation is that only actions in the observed period are included and that action possibilities are simplified to observable actions thus toning down less visible actions such as observing others.

Actions are nested into other actions and a terminology and level of description has to be chosen. In J. J. Gibson's original presentation of the concept, affordances were described in everyday terms for activities. The affording features were categorised in slightly different ways throughout his book, but the terms used here are places, attached objects, detached object, substances and events (Gibson, 1979, pp. 240–242). Events refer to perceived changes in places, objects and substances; J. J. Gibson mentioned three kinds: replacement of objects, colour and texture changes and coming into/going out of existence.

Heft's functional taxonomy of children's environments

To construct a preliminary functional taxonomy based on the concept of affordances in children's outdoor environments, Heft combed an extensive behavioural report of a seven-year-old boy for activities involving environmental features (Heft, 1988). The boy was living in a small town in the American Midwest, and his behaviour on a day in April 1949 was described in detail in everyday terms for activities. Heft grouped the activities 'in terms of their distinctive functional properties, their affordances, which are the environmental counterparts to the expressed activities' (Heft, 1988, p. 33). The terms used for functional properties were, e.g., climb-on-able-feature, hide-in-able feature, throw-able object. Afterwards Heft grouped environmental features with similar functional properties in 10 classes. Once activities were grouped and functional classes of features were identified, the activities were supplemented with other activities related to the classes and known from research (Heft, 1988, p. 36), see Table 1.

Table 1. Preliminary functional taxonomy of children's outdoor environments (Heft, 1988).

Classes of features with distinctive functional properties	Afforded activities
Flat, relatively smooth surface	Walking, running // cycling, skating
Relatively smooth slope	Coasting down // rolling, sliding, running down // rolling objects down
Graspable/detached object	Drawing, scratching // throwing // hammering, batting // spearing, skewering, digging, cutting // tearing, crumbling, squashing // building of structures
Attached object	Sitting-on // jumping-on/over/down from
Non-rigid attached object	Swinging-on
Climbable feature	Exercise/mastery // looking out from // passage from one place to another
Aperture	Locomotion from one place to another // looking and listening to adjacent places
Shelter	Microclimate // prospect/refuge // privacy
Mouldable material	Construction of objects // pouring // modification of its surface features
Water	Splashing // pouring // floating objects // swimming, diving, boating, fishing // mixing with other materials to modify their consistency

In Heft's taxonomy the afforded activities are described in everyday terms for observable behaviour; the group in focus is children in general. The classes of environmental features are named by a physical property related to children's body scale and weight, such as 'attached object', 'non-rigid attached object', 'flat, relatively smooth surface' and 'relatively smooth slope'. Some class names refer to features with properties directly related to activities and abilities such as 'climbable feature' and 'mouldable material'. One class name contains both: 'detached/graspable object'. Some class names refer to the function or the feature only: 'shelter' and 'aperture'. The last class is 'water', which designates a chemical element and at the same time is relative to humans as a species; whereas, some insects can walk on it, humans cannot.

Method

Observing activities involving the setting

The focus was on children's activities in two Danish preschools using very different outdoor settings: a traditional preschool using a playground and a forest preschool using a number of sites in a nearby forest. In contrast to the playground, the forest was not designed with children in mind, but the places in the forest were at some point selected by staff as sites to stay. The term 'activities' refers to all kinds of observable actions. It was chosen for its inclusiveness and used in plural to distinguish it from the more narrow 'activity' in singular, which is often read as brisk physical activity. Activities and features used were seen as the children's nonverbal answer to the question about the meaningful action possibilities of the settings. The observations showed what may happen in playground and forest settings, but not what will inevitably happen.

In order to make the concept of affordances operational, a specific action afforded by a specific feature for a specific user situated in time and space was simplified to *observed activities* afforded by *classes of features* for *two specific groups of children* in preschool settings in Denmark during two winter months in early 2011. A method inspired by ethnographic fieldwork was chosen. In ethnographic studies it is important to be present, preferably for longer periods of time, to be open to surprises and to observe and make field notes in search of patterns (Gulløv & Højlund, 2003). The research strategy was inductive/reflexive and constructive including describing, classifying and interpreting the observations made (Swaffield & Deming, 2011).

Field work

The fieldwork included 12 visits to each of two preschool groups from January to March 2011. The first author observed children for 1–2 h during times of 'free play', i.e., children's self-initiated activities

during preschool hours. The method of observation was participatory observation with the limitations and possibilities of being an atypical adult (Gulløv & Højlund, 2003). Observations were done in rounds in the settings. Field notes and handheld video recordings were made of activities and features in use, and the general atmosphere was noted. Activities were described in everyday terms and interpretation was kept to a minimum (Wright, 1967). Features for resting were included as an area of interest. The features were described in mixed vocabularies from landscape architecture and playground design.

The video angle was mostly from adult height. Standing up and having a camera made it clear that the observer was a non-intervening participant and neither a playmate nor a staff member. This was soon realised by the children as shown in the remarks: 'You are always happy, you never scold' and: 'Please go get an adult, we're in trouble'. The children sometimes asked the observer to stop recording and often gave her a knowing glance, but it was clearly the impression that most of the time they didn't mind her company, while a number of non-permitted activities were undertaken in spite of her presence. Activities in relation to the setting, which were new for the observer, were recorded on video with the intention to recall and review, not to quantify.

The video recording would not have been possible without the *in situ* consent of the children. Permission was obtained from parents concerning observation, recording and use of video sequences for research and education.

Presentation of the preschool groups

The preschools followed a traditional Danish preschool programme with no specific educational line. A group of 28 children attending a traditional preschool (playground group) was observed, as were 21 children attending a forest preschool (forest group) in the outdoor settings they were accustomed to. The staff/child ratio was the same; the forest group included 21 children and a staff of 3, the playground group included 28 children and a staff of 4 and 1 staff member in each group had no formal pedagogical education. The two groups covered the same ages (from 3 to 6 years) and were from the same middle-class residential area in a small town 80 km west of Copenhagen, Denmark.

In winter, the forest group walked to different sites in the forest and usually stayed there from about 10:45 AM to 12:45 PM. The playground group usually stayed at their playground from 12:00 to 2:00 PM.

Presentation of the settings

The playground by the preschool was fenced, and the area was 760 m^2 (sketch in Appendix 1). The area was divided into two parts and was surrounded by a wire fence, board fences and brick walls (Figure 1). Surveillance by the staff members was good in each part. The ground cover was flat and consisted of tarmac, tiles, gravel and grass/soil. The play equipment consisted of two sandpits, a climbing structure (including stairs, slide, a sloping side with climbing rope, platforms, fenced suspension bridge and tube), a climbing pole, two playhouses, a stationary play car, a turning cup, a seesaw on two springs, a slide, two car tyre swings and a number of vehicles. An old mattress for jumping was brought out occasionally. The toys were green milk crates, balls and sand play toys in three bright colours (including strainers, hand shovels, spades, rakes, tins, buckets, watering cans and small play vehicles). The vegetation, apart from grass, consisted of two pruned conifers, a fence with ivy and jars and boxes for plants. A playground inspector from the municipality regularly approved the playground.

The forest was situated 200 m from the preschool building (Figure 2). It is an old mixed forest of mostly oak (*Quercus robur*), beech (*Fagus sylvatica*), spruce and fir (*Abies nordmanniana, Picea abies, Pinus sitchensis*) and various self-sown trees and shrubs, such as maple, willow, birch, ash, elder and bird cherry. The forest is owned by a foundation and used for wood production. More than 25 named forest sites were in use and the sizes ranged from approximately 600 to 1900 m^2 (sketch of a single forest site in Appendix 2). The boundaries were specified to the children by the rule that children must be able to see a staff member. The forest sites were often glades between various plantings, and the terrain was uneven. The ground cover was forest floor with leaves, needles, branches and sticks, moss, rush

Figure 1. Playground with activities on traditional play equipment.

Figure 2. Forest site with activities on fallen tree.

and grass. There were trees of various ages and more or less dense plantings, fallen trees, stumps and bunches of branches. Also present were stones, plant parts, fungi, small creatures, animal residue and many places with water. The staff brought real tools, hammocks, ropes, string, magnifying glasses and firewood once a week. Three forest sites had places for bonfires; two forest sites had stationary swings in tall trees. The forest sites would probably not meet the safety norms for playgrounds, but no formal inspection was made since the forest was not established as a place for children.

Analysis

Primary data were the observable actions of the children and the features in use, regarded as nonverbal statements of children about meaningful activities and affording features. Videotapes and field notes were analysed and interpreted in several steps by reading and rereading and viewing and reviewing

the material, looking for themes and trying to identify activities that seemed to matter and features that seemed to be of value for children in preschool.

Heft's functional taxonomy of children's outdoor environments (Heft, 1988) was then applied to organise the observed activities and affording features in order to examine the degree of correspondence between the taxonomy and the observations. The terms places, attached objects, detached object, substances and events used by J. J. Gibson about affording features were used for structuring the classes (Gibson, 1979, pp. 240–242). New practical class names were chosen that related to significant properties of the class without referring to a specific action. Attractive and distinctive activities in each class, here called the key activities, were then pointed out. Finally, the videotapes and field notes were re-examined in order to get a more precise description of characteristics of attractive features for preschoolers.

Methodological limitations

The use of a functional taxonomy as the one proposed by Heft and adjusted here will illuminate some features and leave others unnoticed. In this study the features supporting visible bodily movements will be recorded, while the features supporting less visible actions may be overlooked.

The results are based on observations in two preschool groups for two winter months in a specific context. Strictly speaking, the results are only a snapshot of what happened for these groups at this time and place, and only about the small part of life observed and described here. The activities in the outdoor settings are never independent of the actual sociocultural context including the staff, even though the overarching educational goals were the same and the observations were made in time allocated for free play. In order to generalise, one would have to take for granted the idea that the relationship between settings and actions are shared for specific groups, that, for instance, children perceive meaningful action possibilities of settings somewhat alike. They could do to some degree, but this assumption, basic for all design with generalised groups in mind, is always worth questioning.

Results

In this section, study results are presented under these headings: Observations fitting into Heft's taxonomy, adjustments of classes, new classes and observation outside the classes. Each paragraph is a short condensation of field notes and video recordings. Lastly, the characteristics of attractive affording features are briefly described.

Table 2 shows the observations arranged within Heft's functional taxonomy of outdoor environments for children. The first column shows J. J. Gibson's terminology. The second column shows Heft's functional classes. The third column contains the activities mentioned by Heft and observed in this study. The fourth column shows how Heft's classes are slightly modified and renamed by the authors. The classes are still related to the user: perceiving a place as shielded depends on your size, and what is fixed for a child may not be fixed for an adult; a flexing branch may be stiff if you are lighter, and what is loose depends on your size and strength. Although the activities were not exclusive for each class, every class offered distinctive activities observed to be of interest for children in preschool, here called key activities and listed in the last column in Table 2 as a part of the taxonomy. For short video clips of the adjusted classes, see Appendix 3. It is worth noting that classes of outdoor features represent 'possibly affording features'. To be affording the actual shape of the feature has to meet the abilities, needs and interests of the actual user, that is, to offer meaningful action possibilities.

Observations that fit into Heft's functional taxonomy

Combining Heft's functional classes with observations made in playground and forest settings showed good agreement for most classes. Each class represented a number of opportunities for actions that certainly seemed to be meaningful for children in preschool (Table 2).

Table 2. Activities and classes of outdoor features.

Affording features (Gibson, 1979)	Functional classes of outdoor features (Heft, 1988)	Activities[a] (Heft, 1988) and (Authors)	Classes of outdoor features (Authors)	Key activities[b] (Authors)
Places (Immobile)	Flat, relatively smooth surface	Walking, running, cycling, (skating, skateboarding), *driving, playing ball, song games, games in bigger groups*	Open ground	Run, drive, walk
	Relatively smooth slope	(Coasting down), rolling/sliding/running down, rolling objects down, *jumping down, climbing up; for ditches: jumping over, building over, hiding in, sitting in*	Sloping terrain	Roll, slide, clamber
	Shelter	Microclimate, prospect/refuge, privacy, *hiding in, lying in, sitting in*	Shielded places	Hide, as frame
	Aperture	Locomoting from one place to another, looking and listening to adjacent places		
Attached Objects, (Immobile, countable)	Attached object	Sitting-on, jumping-on/over/down-from, *running around, hiding behind, building on*	Rigid fixtures	Climb, balance, jump
	Climbable object	Exercise/mastery, looking out from, passing from one place to another, *lying-on, climbing, balancing-on, hanging by arms, hanging in legs*		
	Non-rigid attached object	Swinging-on, *swaying-in, seesawing-on*, *looking out from*, *spinning, sitting in, lying on, springy jumping*	Moving fixtures	Swing, sway, seesaw, spin
Detached Objects (Movable, countable)	Graspable/ detached object	Drawing, scratching, throwing, hammering, batting, (spearing, skewering), digging, cutting, tearing, crumbling, squashing, building of structures, *picking, gathering, sorting, arranging, making patterns, as accessories, as tools, throwing, sawing, carving, bending, breaking, thatching, crushing, hacking, tasting, eating, kicking in, walking on foot extensions*	Loose objects	Arrange, modify, as tools, props, treasures
Substances (Movable, not countable)	Mouldable material	Construction of objects, pouring, modification of its surface features, *moving around, moulding, smearing, kneading, smashing, digging-in, raking, sifting, kicking in, gliding in*	Loose material	Dig, move, mould, smear
	Water	Splashing, pouring, floating objects, (swimming, diving, boating), fishing, mixing with other materials to modify their consistency, *gathering, throwing into, jumping in, floating with the stream, building of dams*	Water	Pour, mix, splash, float
Events (Changes)		*Following, catching, caring for*	Creatures	Look for, handle, care
		Feeding, poking with sticks, sitting by, follow cooking, drawing with charcoal, putting out	Fire	Feed, look after, sit by

[a]Regular font: Heft and authors. In brackets: Heft only. Italics: Authors only.
[b]Key activities = distinctive and attractive activities for each class.

Flat, relatively smooth surfaces

Flat, open surfaces afforded distinctive and attractive activities in both groups, especially running, driving and walking. 'Open ground' is suggested as a name for this class covering smooth and flat as well as less smooth and sloping open ground where walking, running or driving in play vehicles is possible.

Relatively smooth slopes

Sloping places were attractive in both settings and afforded distinctive and attractive activities, especially gliding, rolling and clambering. 'Sloping terrain' is suggested as a class covering sloping terrain as well as sloping parts of play equipment.

Shelters

Playhouses and huts made of branches were sought for shielding children's activities from view and other disturbances as well as from sun, rain and wind. They were also used for framing activities and

marking spaces of influence. Nooks, corners, dense plantings and places between trees or behind fallen tree trunks or play equipment also partially or fully shielded the activities. Shelters and other shielded places certainly afforded distinctive and attractive activities such as shielding, hiding and framing activities, and 'shielded places' is suggested as a class to cover fully as well as partly enclosed places.

Attached objects

In both settings, children seemed to have an urge to move in all directions. All possible attached objects were moved in, on, over, under and from, and built on and against. Attached objects afforded distinctive and attractive activities such as climbing, balancing and jumping from. 'Rigid fixtures' is suggested as a name for this class covering all stable and countable objects, which might be moved on; including built structures as well as trees, logs and boulders.

Non-rigid attached objects

Non-rigid features to move with, in or on were very attractive. The fact that staff carried ropes and hammocks to the forest to make temporary swinging and swaying arrangements was a sign of the significance of this class. In both settings, the moving structures also seemed to be in use for rest and contemplation when children were swinging or swaying quietly back and forth. Non-rigid attached objects afforded distinctive and attractive activities specified by moving with and inside. 'Moving fixtures' is suggested as a class covering all fixtures you can move with or within or which provide springy support for jumping.

Graspable/detached objects

All kinds of graspable objects were found and used for various activities in both settings. Graspable objects afforded a great variety of activities under the headings: arranging, modifying, as tools, props and treasures. Loose objects besides the graspable were also in use, either carried on the arms or shoulders or pushed when children were helping each other, carrying boards and branches or pushing heavy objects, so 'loose objects' is suggested as a name for this class. The activities with loose objects were so many and varied that subdivision of this class might be worth considering.

Mouldable material

Sand, soil and mud plus clay, snow and ice all seemed to be materials of everlasting interest. Mouldable material afforded distinctive and attractive activities such as digging, moving, moulding and smearing. Other loose material such as leaves and small cones were also dug up and moved around. 'Loose material' is suggested as a name for this class to include mouldable as well as loose, not countable material.

Water

In both settings, the attraction of water was obvious. Because observations took place during the winter, water was sometimes found in the form of ice and snow, and water in these forms was also intensely sought after and used. As an affordance, ice pieces and snow belong to the classes of 'loose objects' and 'loose material', respectively. Water afforded distinctive and very attractive activities, especially pouring, mixing, splashing and floating. 'Fluids' would be a more precise term to distinguish water from ice and snow, but this is not recommended, since 'water' is a more common term and is the fluid available outdoors.

Adjustment of classes

Climbable features

In both settings, all attached objects seemed to be interesting in relation to climbing, whether intended for it or not. Of these reasons it is suggested that 'climbable features' are included in the class 'rigid fixtures'. In this class, Heft notes *exercise/mastery* as an afforded activity. Exercise/mastery could be claimed as a possibility in all classes, as well as observing, sensing, exploring, experimenting, performing, creating, group gathering, dialogue, negotiations and role activities.

Apertures

Apertures are openings, which can be found within several classes. In both settings the activities mentioned for 'apertures' crossed the classes. 'Moving from one place to another' was connected with paths, huts, balancing on bridges, trunks and play equipment, jumping over ditches or crossing dikes and other obstacles. 'Looking and listening to adjacent places' were connected to huts, dense plantings and climbable structures, mostly belonging to 'shielded places', so the suggestion is to include most activities connected to apertures in this class.

New classes

Two new classes are proposed: 'creatures' and 'fire'. Both represent events of the type perceived as 'coming into/going out of existence'. Creatures come and go, fire is ignited and burns out.

Creatures

A strong interest in small creatures was found in both groups, despite the observations taking place during winter. The activities with small creatures were following, picking up, handling, closer observation of behaviour, caring for and reflecting on. The interest extended to animal tracks and residues. Talking about and reflecting on were not exclusive for this class, but broader themes were touched upon, such as what they eat, where they sleep, how they live and die. Although creatures were in fact loose objects, they offered special and attractive activities such as looking for, handling and caring for. For these reasons 'creatures' is suggested as an additional class of affording features.

Fire

Approximately once a week, fire was ignited in the forest. This event was very attractive. The children collected sticks and other organic material for the fire, followed the igniting and burning process, burned sticks on one end, sat together and chatted by the fire and participated when the fire had to be extinguished. The charcoal was used for drawing on stones and branches, and sometimes the fire was used for making various edible dishes. Fire was affording specific activities such as feeding the fire, looking after and sitting by; for these reasons 'fire' is suggested as an additional class of affording features, although of a special kind because it has to be ignited and attended to by staff.

Observations outside the classes

Some affordances that seemed to be of importance were not included in the classes. Two topics will be mentioned here: other persons and space.

Other persons

Other persons and animals were also among the affording features mentioned by Gibson (1979). Other children were certainly affording for activities of all kinds in both settings, and they probably constituted the most attractive affordances of all. Most important were friends for sharing and inspiration, as well as children ahead in size and abilities for imitation. Additionally the staff members played an important role as caretakers, initiators, role models and sometimes fellows. Activities such as observing and talking to other adults such as people passing by, workmen and forest visitors were also attractive. Peers and staff members are certainly capable of offering special action possibilities and add to, and sometimes restrict, activities. A class for peers, staff and other people is not suggested, but their highly important influence is recognised.

Space and unknown places

When Heft's taxonomy was made, it was based on children moving freely in the surroundings. Now childhood in Denmark is institutionalised and the outdoor environment is often restricted making space and unknown places for exploration scarce. Every corner of the playground and the forest sites seemed

to be investigated, and children were fond of expeditions to new places. Space was vital in making all other affordances possible. Exploring new spaces was especially attractive. Although space is extremely important, a class for space and new places is not suggested, since space is of different dimension.

Characteristics within classes of outdoor features

The following characteristics seemed of significance in children's choices of features:

Variation and uniqueness

The variety in form, colour, texture, structure, smell, taste and other properties seemed to be attractive in all settings. Special and unique fixtures, objects and nooks were sought out, such as a slanted tree, a specific vehicle, and a tree by a hollow. The single play car or sand toy differing from the rest was selected and the feather or the oddly shaped bones were treasures admired and investigated.

Sizes and gradation

Children seemed to favour climbing up as high as possible, building as tall as possible, digging as deep, driving and swinging as fast and jumping as far as possible, carrying the heaviest stones and finding the biggest leaf and the smallest snail or cone. Size seemed to be of importance. Features in many sizes meant possibilities for different children growing in sizes and competences.

Novelty and change

Children in both groups seemed to enjoy novelty and surprises, taking advantage of every new feature found. Of course, a well-known environment is the prerequisite for perceiving novelty as attractive and enjoyable. New features seemed to ignite ideas for experiments and new associations and encourage reflection among the children and between children and staff members. New features were created as a result of weather and seasonal patterns, such as frost on the tiles, ice on the pits, a wind-felled tree; mud when snow had melted, water after rain and the manifestation of small creatures.

Abundance

Apart from the basic joy of abundance of sand, leaves or snow, abundance was important in making affording features available for all. Scarcity sometimes restricted the experiences for some of the children. On the playground this was the case with water and ice, with nooks and sometimes with the most favoured vehicles. In the forest, restrictions were observed once in a while when a line was made waiting for the hammock.

Discussion

Advantages and disadvantages of the affordance term

The concept of affordances underlines the ongoing intimate relationship between environment, person and actions. Children perceive action possibilities in the setting of significance/of value/with meaning. Perception and action goes hand in hand, and this counts for all senses, not only vision. Perception changes in the course of action and with time; new action possibilities are discovered, skills are achieved and possibilities communicated in various ways.

The affordance perspective highlights the task of offering children settings with possibilities for many, varied and changing actions. According to Gibson (1979), activities will always be based on and accompanied by perception of the environment as well as self-perception and obtaining first-hand knowledge. Features affording meaningful activities offer experiences and knowing. Activities in a varied and changing environment lead to varied experiences and knowing.

The disadvantage of the affordance term is that it is ambiguous; sometimes it is used as 'affordances of a setting' referring to the action possibilities offered by a setting, in other cases such as 'affordances

for an activity' it refers to the features facilitating specific actions, and sometimes as 'affordances for someone' referring to either of the two.

A factor causing confusion in use of the affordances term is the user: whether it is a generalised user/user group or a specific user/group of users, and if it is concerning a single moment, a day or an interval of time. Another point of confusion is the source of knowledge: whether it is observed affordances of a setting, interviews about affordances, own experiences, written sources or imagined or intended affordances. A third point is the question of point of view. When a term such as 'affordances for risky play' is used, the staff might see the possibility for training risk handling, while the child might see a possibility for thrilling action. It might be valuable to distinguish between what children perceive as meaningful activities and what adults and caretakers consider as possibilities for training and obtaining specific skills although the one goes with the other: activities are intimately intertwined with experiences and experience/knowing.

All this calls for caution and for clarification about the vocabulary and level of descriptions. A suggestion when using the affordance term could be to state the feature, the person/group in focus and the action possibility—in addition to the source of information: if it is observed, communicated or intended as the affordances the planners have in mind for a user group.

Advantages and pitfalls of the taxonomy

Choices about children's settings are inevitably tangled up with the presumed needs, abilities and interests of the children and the intentions and attitudes of the staff, but also with values and motives of the parents, the organisers of children's institutions and society. Furthermore, the language and terms chosen to describe the setting influence the focus and vice versa.

A taxonomy based on the concept of affordances has the hallmark that children's point of view is in focus. Observing children's everyday activities in different existing settings over some time implies that our taxonomy is based on children continually engaged in the environment. The coincidence of observations mentioned in Heft's taxonomy and observations in this study with more than 60 years time lag, covering ages from 3 to 12 years or more in different environmental and institutional frames, is also worth noting.

Another advantage is the simplicity: 10 classes of outdoor features is a manageable number. This is especially important when you want to communicate with various professions, although it might seem too simple in relation to the multifarious activities going on in children's settings. But without further specification the classification is near to worthless; features in each class have to be viewed with children in mind to imagine the specific features that may support ongoing meaningful action possibilities including, but also exceeding, the key activities. Each class has to be examined in relation to variation, sizes, change and abundance in order to offer valued action possibilities for all children over a period of time. As stated in the quote at the top it is important to remember that children grow, develop and learn, so the task is to offer a setting with *continuously* meaningful action possibilities.

Conclusion and perspectives

Affordances understood as *the meaningful action possibilities of the environment* underline the unity of *person, environment* and *action*. When focusing on pre-schoolers' institutional outdoor settings, this study supports the idea that the affordance concept is valuable, insisting on the intimate, ongoing and developing user–environment–activity relationship.

The observations in playground as well as forest settings showed that most features used in child-initiated activities fitted into Heft's functional classes. The features within each class seemed to be of importance in both groups of children within the possibilities of the settings. As stated by Heft (1988) the classes were not exclusive; more than one class afforded some activities, and some activities relied on features from two or more classes.

Based on the observations of children's activities, two of Heft's functional classes were included in other classes and two classes were added. New practical names intended for planners and managers were proposed for the classes, ending up with the following 10 classes: open ground, sloping terrain, shielded places, rigid fixtures, moving fixtures, loose objects, loose material, water, creatures and fire. Key activities distinctive for each class and attractive for preschoolers were pointed out as an integrated part of the classification.

The taxonomy of outdoor features for preschoolers might be used as a starting point in planning, renovating and assessing playgrounds as well as common green spaces and woodland with focus on this user group, but only at a basic level. Incorporation of features from all 10 classes, where challenges fit the abilities and interests of preschool children in amounts making them available for *all* children in a preschool group could be a way of creating a setting rich in affordances. Within each class the following characteristics seemed to be of importance: *variation and uniqueness, sizes and gradation and novelty and change*.

Many pieces of play equipment at the playground seemed to mimic valued features in the forest, such as slides for sloping ground, and some of the constructed features in the forest were known from the playground, such as swings. This calls for considerations about the affordances of constructed versus 'natural' features in order to take advantage of both.

Finally, it should be emphasised that features may offer possibilities for actions, but this does not inevitably lead to actions; there is no simple causal relationship. Time for discovery and exploration or introduction by peers or staff members may be needed for discovering meaningful action possibilities of environmental features.

Disclosure statement

No potential conflict of interest was reported by the authors.

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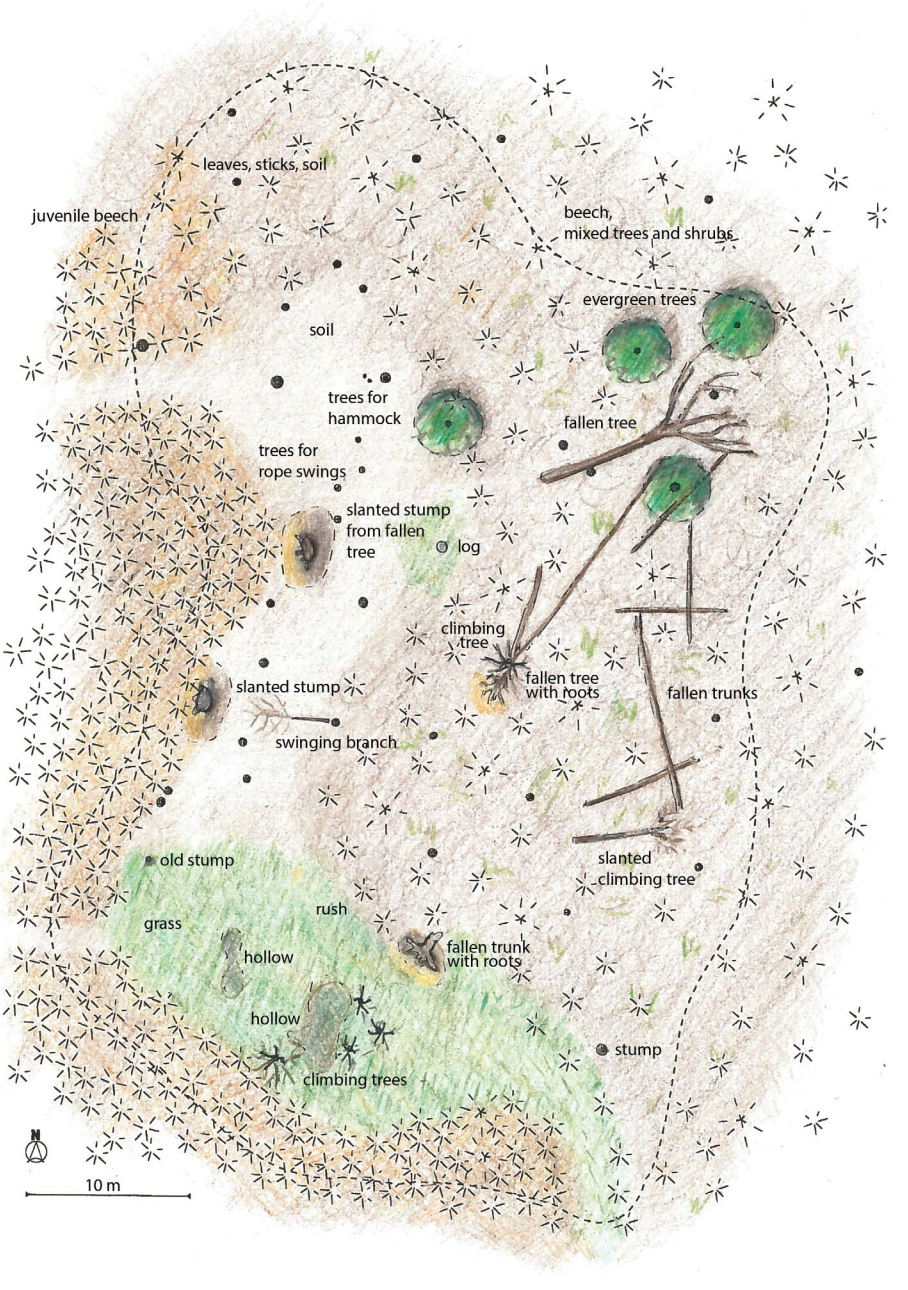
Appendix 1. Sketch of playground. The conifers are transparent to show the play equipment underneath.

Appendix 2. Sketch of forest site. The section is approximately at children's eye level (average 95 cm) except for the named features and the conifers.



Appendix 3. Classes of outdoor features for children in preschool.

	Classes	Key activities[a]	Links to examples for each class
1	Open ground	Run, drive, walk	http://youtu.be/ODJIUZRQSC4
2	Sloping terrain	Roll, slide, clamber	https://youtu.be/_JoWjAmUGrQ
3	Shielded places	Hide, as frame	https://youtu.be/TTuEfNWr4Hw
4	Rigid fixtures	Climb, balance, jump	https://youtu.be/dfNjMKgFym8
5	Moving fixtures	Swing, sway, seesaw, spin	https://youtu.be/TNA-gy50e2k
6	Loose objects	Arrange, modify, as tools, props, treasures	http://youtu.be/x1Zg1h6dl_s
7	Loose material	Dig, move, mould, smear	http://youtu.be/jaQS3nPjb1A
8	Water	Pour, mix, splash, float	http://youtu.be/VCaYyzfAcfI
9	Creatures	Look for, handle, care	http://youtu.be/1QhVCn7C7Ak
10	Fire	Feed, look after, sit by	https://youtu.be/-WBaVsxjxY4

[a]Key activities = distinctive and attractive activities for each class.