

## CHILDREN IN OUTDOOR CONTEXTS

Affordances and Independent Mobility in the Assessment  
of Environmental Child Friendliness

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of Environmental Child Friendliness

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*When the child was a child,  
Berries filled its hand as only berries do,  
and do even now,  
Fresh walnuts made its tongue raw,  
and do even now,  
it had, on every mountaintop,  
the longing for a higher mountain yet,  
and in every city,  
the longing for an even greater city,  
and that is still so,  
It reached for cherries in topmost branches of trees  
with an elation it still has today,  
has a shyness in front of strangers,  
and has that even now.  
It awaited the first snow,*

(From the "Song of Childhood" by Peter Handke  
in the movie "Wings of Desire" directed by Wim Wenders, 1987).

# Abstract

According to James J. Gibson, the concept of the affordance refers to the functionally significant properties of the environment, and provides a psychologically relevant means to analyze evolving child-environment relationships. Affordances operationalize the transactional approach. Thus the concept allows researchers to bring the material environment back into the realm of environmental psychology.

In this thesis and the supporting research articles, the framework of ecological perceptual psychology, and in particular the concept of the affordance, was utilized in the determination of criteria for child-friendly environments. An assessment model for child-friendly environments was constructed which was comprised of two central criteria for environmental child friendliness: children's possibilities for independent mobility and their opportunities to actualize affordances. By combining various degrees of these two criteria, four hypothetical types of environment were distinguished: Bullerby, Wasteland, Cell, and Glasshouse. The Bullerby type represents environments that are the most child-friendly. Such environments allow a positive interactive cycle to develop between a child and the environment. In the Bullerby-type environment a sufficient number of mobility licenses enables to a child to discover environmental affordances. Actualized affordances for their part motivate the child to move around more in the environment, which creates more possibilities for new affordances to become actualized.

The empirical results from the study of eight- and nine-year-old children indicated that the developed model was sensitive enough to assess the child friendliness of different communities in Finland and Belarus (Belorussia). All hypothesized environmental types appeared in the data. Each neighborhood had a unique combination of affordances and independent mobility in terms of the model. The Bullerby type

of setting abounded in the Finnish communities. The Cell, Wasteland, and Glasshouse types of environment were the most common in the Belorussian data. In general, the proportion of Bullerby-type settings decreased and that of Glasshouse-type settings increased as the degree of urbanization rose.

The two-dimensional assessment model presented here could be further developed so that it includes a third dimension such as, for example, the emotional value of affordances for children. At the same time an essential future challenge for ecological perceptual psychology, that of studying the motivational basis of affordances, could be met.

As the transactional approach of environmental psychology allows for the integration of children's experiences with the material world, it provides information that can be used in the design and planning of child-friendly environments.

**Keywords**

affordances, ecological psychology, children, child-friendly environment, Bullerby model

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I still remember the warm stony steps of the campus building where I was sitting, when I came to understand what affordances really are. A participant in a conference on ecological psychology at Miami University explained to me in detail the central idea of ecological perceptual psychology that was to become the core concept of my dissertation. So, my first expression of thanks goes to Professor Timothy Johnston.

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Espoo

November 17, 2003

Marketta Kyttä



# Contents

<b>1 INTRODUCTION</b>	<b>11</b>
<b>2 RESEARCH STRUCTURE AND RESEARCH QUESTIONS</b>	<b>15</b>
<b>3 TRANSACTIONAL PERSON-ENVIRONMENT</b>	<b>19</b>
Bronfenbrenner's Ecological Developmental Psychology	22
Transactional Environmental Preference Research	26
James J. Gibson's Ecological Perceptual Psychology	28
The Basic Concepts of Ecological Perceptual Psychology	28
Comparing Ecological Perceptual Psychology With the Information-Processing Framework	32
Combining Ecological Perceptual Psychology With the Information-Processing Framework	34
Neisser's Perceptual Multichannel Model	35
Ecological Cognition: Does It Exist?	39
Summary	42
<b>4 THE AFFORDANCE AS A THEORETICAL CONCEPT</b>	<b>43</b>
What Is Meant by Affordance?	43
The Ontology of Affordances	46
The Transactionality of Affordances	47
The Intentionality of Affordances	51
Affordances as Part of the Whole of Activity	53
The Various Levels of Affordances	54
The Various Degrees of Usability of Affordances	59
Affordance Categories for Children's Environments	62
Summary	64

<b>5 AFFORDANCES AND THE DEFINITION OF THE CRITERIA FOR CHILD-FRIENDLY ENVIRONMENTS</b>	<b>67</b>
The Individual Dimensions of Affordances	67
Affordances As Part of the Perceptual Cycle	68
The Emotional Dimensions of Affordances	71
Affordances in a Sociocultural Context	75
The Social and Cultural Dimensions of Affordances	76
The Social and Cultural Dimensions of Children’s Environmental Affordances	78
Negative Affordances As Part of the Social and Cultural Dimensions of Affordances	85
Affordances as Criteria for the Child Friendliness of Environments	87
The Person-Environment Fit Operationalized Using Affordances	87
An Assessment Model for Child-Friendly Environments	90
Summary	94
<b>6 CONCLUSIONS</b>	<b>97</b>
Theoretical Conclusions	97
Conclusions for Practical Applications	104
References	109



# 1. Introduction

As children play outdoors, they gradually form their own personal relationships with the environment. The yard becomes “my” backyard, the street that a child lives on becomes his home street, and the village becomes her home town. Children’s relationships with the environment are formed through active interaction with it. A temporally and spatially unique physical, social, and cultural environment shapes this development.

The research I present here deals with the central factors that children encounter as they develop personal relationships with their environments. The research places special emphasis on the interaction between children and the material world. One central factor that is currently changing in children’s relationships with their environments are the varying possibilities to become independently acquainted with the environment. In recent decades, children’s independent mobility regarding their own environments have become increasingly declined, especially in Western countries, Finland being one exception (Article II; Hillman et al., 1990; O’Brien et al., 2000; Tranter, 1993; Prezza et al., 2001; Gaster, 1992). Children’s mobility is becoming increasingly restricted for various reasons. In the worst-case scenario, children in modern society are becoming a generation of “safety-seat” children, who get to know the outside world mainly by observing the changing scenery through the car window.

Concurrently, children’s time has become more structured and concentrated leaving less time for unprogrammed activities. There are also fewer social support networks.

The sociocultural environment, which plays such an important part in children's development, has become more unstable<sup>1</sup>. This has been shown to cause problems in children's social and emotional development (Pulkkinen, 1983; Pulkkinen & Saastamoinen, 1986). There have, however, been few studies on the ways in which changes that take place in children's lives affect the formation of their relationships with the material environment. This research aims at shedding some light on the issue.

As children's actions and mobility in the environment become problematic or even impossible, children can no longer get acquainted with their environments through the use of their own bodies. That being the case, they will also be unable to find affordances in the environment. As children find affordances in an environment, they perceive that environment as an interesting and challenging place of adventure and exploration that inspires them to move around and find even more affordances. A cycle of formation of positive relationship of this type with the environment is possible in ideal circumstances that I refer to as "Bullerby"<sup>2</sup> in my research. The opposite, i.e., a negative cycle, can also take place. In that case children are living in circumstances that I term "Cell", without opportunities to form a personal relationship with the environment.

The actual role of the physical environment has not been thoroughly explored in studies on child-environment relationships. A child's environment is usually defined as a social and cultural context that remains in the background and that stays largely unrelated to his or her activities and experiences. In the work at hand I try to theoretically specify and clarify the interactive relationship between children and

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<sup>1</sup> Instability implies that, e.g., families often move house, changes take place in day care or at school, there is a lack of familial support, there are divorces and extended family situations, and there are changes with regards to mothers' work situations.

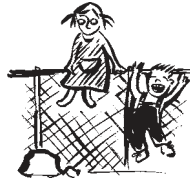
<sup>2</sup> "Bullerby" can be literally translated as meaning a noisy village. The term is used by the famous Swedish writer Astrid Lindgren (<http://www.astridlindgren.se/>) in a number of her children's novels where she describes the life of a group of children living in a Swedish village with this name. English editions of these books include *The Children of Bullerby*, *Christmas in Noisy Village*, and *Springtime in Noisy Village*, where "Bullerby" is sometimes not translated into English. I chose this label for the ideal situation for children because a Bullerby offers children possibilities to take part in all of the everyday activities of the village, and it provides children with meaningful tasks and roles in the community. I don't want to claim that a rural village setting can be the only candidate for a child friendly environment. Any "normal" everyday environment, that does not exclude children can in principle be child-friendly. There is no need to design special places or activities for children if children have access to everyday settings and activities. Other candidates for the label for the ideal situation were, for example, "Meadow", "Pasture", and "Oasis", but they all hinted that the ideal environment could only be a natural setting.

their material environments. To be concise, I refer to the material environment as “environment”. “Context” refers to the environment as a whole, including the material, social, and cultural environments.

My research consisted of a transactional child-environment study in which the environment was “put back in” environmental psychology, i.e., the material environment was given a significant role. Ecological perceptual psychology and the related concept of affordances formed the theoretical basis for this. In ecological perceptual psychology, perception is viewed as an active process in time, in which action and mobility in the environment play an essential part. For this reason, in my research I paid significant attention to children’s various possibilities to act and move around independently in their environments.

In my work I applied the concept of affordances to children’s environments, and I concentrated on research on the various degrees of actualized affordances and the related social and cultural factors. I created an assessment model for a child-friendly environment, which comprises two central criteria for environmental child friendliness: children’s possibilities for independent mobility and their opportunities to actualize affordances. In my view, the greatest downfall in ecological perceptual psychology is that the emotional dimensions of affordances and the motivational basis of activity have not been sufficiently explored. I propose in this research that the framework of ecological perceptual psychology needs reassessment in this respect.





## 2. Research Structure and Research Questions

This thesis consists of five articles and a synthesis that complements them theoretically. In the synthesis my objective is to further develop the theoretical framework of this research. Writing a doctoral thesis is, in fact, an ecological perceptual process of a kind. As I have studied the empirical data and acquainted myself with the relevant theories, I have discovered new affordances provided by research activity. My views on the formation of child-environment relationships have changed, and they continue to do so. For this reason, I chose to include in the synthesis ideas that emerged as the research progressed.

The research questions addressed in the individual articles and the proposal for the development of a theoretical framework are described below.

### Article I

**Kyttä, M. (2002). The affordances of children's environments. *Journal of Environmental Psychology*, 22 (1), 109–123.**

In Article I, I explored the actualization of affordances in various environments and regions in Finland and Belarus. The research questions dealt with the number and quality of actualized affordances in various environments, including the various levels of actualized affordances (the perceived, utilized, and shaped ones) and the location of affordances. Lastly, potential gender differences were addressed.

In the article I discuss the location of affordances as being between the person and the environment and illustrate the various levels in the actualization of affordances. The theoretical synthesis in this thesis furthers the illustration. In it I provide a clearer definition of the transactional nature of child-environment relationships, including negative affordances.

## Article II

**Kyttä, M. (2003). The extent of children's independent mobility and the number of actualized affordances as criteria of a child-friendly environment. Accepted to be published in the *Journal of Environmental Psychology*.**

The main research question in Article II focused on the connections between the actualized affordances of the environment and the degree of independent mobility of children, both theoretically and empirically. First, I discuss the sociocultural conditions of actualized affordances and define the fields of promoted, free, and constrained action that regulate the actualization of affordances. The theoretical synthesis of the thesis addresses negative affordances as well.

I proposed in this article a hypothetical model of the covariation between the actualization of affordances and children's independent mobility. This model provides the basis for four hypothetical types of environment. These environments in turn provide a framework for the assessment of the child friendliness of environments. I used this framework in assessing the child friendliness of Finnish and Belorussian towns and villages.

## Article III

**Korpela, K., Kyttä, M., & Hartig, T. (2002). Restorative experience, self-regulation, and children's place preferences. *Journal of Environmental Psychology*, 22 (4), 38–398.**

In this article I and my colleagues discuss children's place preferences and their psychological value for children. The research questions were as follows: Which places do children prefer? To what extent do children of two different age-groups utilize their favorite places for mental self-regulation and/or restoration? Are children's independent mobility licenses linked with their place preferences?

This article presents an example of transactional environmental preference research. Even though the work isn't based on a Gibsonian framework, it illustrates the emotional dimensions of affordances. Functional activity in the environment is seen as being a part of the formation of environmental preferences.



#### Article IV

Kyttä, M. (1997). Children's independent mobility in urban, small town, and rural environments. In R. Camstra (Ed.), *Growing up in a changing urban landscape* (pp. 41–52). Assen: Van Gorcum.

Together with Article III, this article deals with the individual dimensions of children's relationships with their environments in the context of the independent mobility of Finnish children (both mobility licenses and actual mobility). The research question centered on how possibilities for independent mobility vary depending on the degree of urbanization of the environment, as well as depending on the age and sex of children.

The article illustrates the formation of a child's relationship with his or her environment as a functionally active process based on Neisser's cycle of perception. In the synthesis section of this doctoral thesis I present a critical analysis of the cycle using the Gibsonian framework.

#### Article V

Kyttä, M., Kaaja, M., & Horelli, L. (2003). An Internet-based design game as a mediator of children's environmental visions. Accepted to be published in the *Environment & Behavior*.

In Article V, I discuss the possibilities of a children's Internet design game and its "affordance icons" to act as a mediator of children's environmental visions. The article is based on Stokols' theory of person-environment fit as an essential criterion for perceived well-being. I examine the possibility of operationalizing fit by using the concept of affordances.

There were two basic research questions: Do the suggestions for a better environment that are presented by children in participatory planning represent an attempt to enhance the fit between themselves and their environment? In which ways do the affordances of an ideal environment differ from the affordances of the present environment?

Together with Article II, this article presents a discussion of the child-environment relationship from the perspective of the material environment and aims at providing criteria for a child-friendly environment. The article emphasizes the role of urban planning in enhancing the compatibility between children and their environments.





### 3. Transactional Person-Environment Research As the Basis for a Theoretical Framework

Psychology's world view, as well as psychological research, is influenced by profound assumptions about the studied phenomena and the person-environment relationship. Altman and Rogoff (1987) categorize psychological theories and approaches into four classes according to their world views: trait, interactional, organismic, and transactional<sup>3</sup>. Psychological research that concentrates on the study of individuals or psychological processes as self-contained phenomena is trait research, and does not really take into account environmental influences. The interactive relationship between a person and the environment is taken into account in interactional and organismic research. Both hold the view that the person and the environment are separate units, which like billiard balls can interact, but which however remain fairly independently intact. Interactional research emphasizes individual psychological processes and the behavioral predictions based on them. Organismic research is slightly different in the sense that it studies entities such as personality, which is thought to be more than just the sum total of the various components. The organismic approach also emphasizes the equilibrium of a system as a major objective of agency.

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<sup>3</sup> The classification is based on views presented by Dewey and Bentley (1949) and by Pepper (1942, 1967) about the various philosophical frameworks.

In transactional<sup>4</sup> research the person-environment relationship is seen as a dynamic, interactive system, the components of which should not be taken out of context. In environmental psychology the transactional approach stresses the active role of both parties in this interactive relationship. People are active agents and are perceptive in their environments: They can influence their environments and change them. In the same way, the environment plays an active role with regards to human beings on all different levels. The material, social, and cultural environments all influence people by providing prerequisites for certain functions or by facilitating social encounters in the environment. In this system neither of the components, environment or humankind, hold a deterministic role, but rather a probabilistic one.

Altman and Rogoff (1987) emphasize that these theoretical approaches should not be placed in order of absolute preference, and that the organismic approach, and in particular the transactional approach, are very appropriate for application in environmental psychology, even though they haven't received enough attention. Transactional psychological research examines mental phenomena which are strictly tied in with social and cultural context in the time and place in which they occur. According to Khalil (2002), in addition to being applied to psychology, the transactional approach can be applied to economic and political science, sociology, and anthropology. In sociology, an analogous approach is called relational sociology, in which social reality is studied as a dynamic and continuous process (Emirbauer, 1997). In studies of journalism this approach is called perspective realism (Karvonen, 1999).

According to Altman and Rogoff (1987), good examples of psychological transactional theories are, for example, Gibson's ecological psychology, Lewin's field theory, and some theories found within Soviet psychology, particularly those of Vygotsky and Leontjev<sup>5</sup>. Altman and Rogoff hold that transactional research is represented in environmental psychology by, for instance, Barker's ecological psychology<sup>6</sup>. Not all environmental psychological approaches can be characterized as transactional or organismic. Paradoxically, environmental psychology has been

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<sup>4</sup> A certain approach within perceptual psychology in the 1940s and '50s was called the transactional framework, represented by, e.g., Kilpatrick (see Epstein, 1995).

<sup>5</sup> Other examples from the field of psychology include Riegel's dialectic approach, the ethogenic approach (Harre & Secord), ethnomethodology, and Gergen's social psychology.

<sup>6</sup> Other examples given by Altman and Rogoff from the field of environmental psychology include studies by Wapner, by Rapoport, by Altman, and by Stokols, and also the phenomenological approaches in environmental psychology.

criticized for ignoring the environment itself. Some have wondered what kind of role the environment plays in environmental psychological research (Sime, 1999). Wohlwill (1973) concluded that the environment does not exist in people's minds. His intention behind this remark was to criticize the prevalent way of studying people's internal processes (traits) without depicting the environment in a psychologically relevant way.

As far as the child-environment studies are concerned, sufficient attention has not always been paid to the material environment. Attention has focused mainly on children's abilities to perceive spaces, to construct mental representations of them, to function in a place, and to learn social rules connected with places. This research has brought the material environment within the sphere of developmental psychological research, and widened the concept of environment in developmental psychology to encompass more than just the social environment<sup>7</sup>. While children have been seen as active agents in the environment, the material environment has played the passive role of a mere setting. This type of research is represented by some studies on the development of child-environment relationships based on Piaget's developmental psychology (Hart & Moore, 1979; Acrecolo, 1976; Carning & Byrne, 1984). As the environment has been allotted a passive role, the research is more organismic or interactional rather than transactional (Altman & Rogoff, 1987).

The theories proposed by Barker (1968) and Bronfenbrenner (1989, 1993) have inspired various transactional child-environment studies. For example, Björklid (1982) studied two residential areas in Sweden as arenas of outside activity, utilizing both Barker's and Bronfenbrenner's theories. A well-known study of English residential areas by Moore (1986) was based on Bronfenbrenner's theory. In Finland, Barker's theory has been applied to child-environment studies (Setälä, 1984/1985; Syvänen & Setälä, 1972).

My research concentrates on the interaction between children and their material environments. Although my main interest lies primarily in the relationship between the child and the material world, I cannot and wouldn't even like to exclude sociocultural reality. When referring to the child-environment relationship, it is preferable to discuss the interaction between the child and the *context*. Context includes both the material world and the sociocultural reality (Ingold, 1996).

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<sup>7</sup> This is still valid, as shown by Pulkkinen and Caspi (2002) in their work *Paths to Successful Development*, in the chapter "Environmental Contributions to Personality Development". It deals with the sociocultural factors involved in the formation of ethnic identity, and also psychosocial transitions.

Ecological perceptual psychology and the concept of affordances in particular present, in my opinion, the opportunity to deal with context in a psychologically relevant way, in both child-environment studies and also in a more general sense in environmental psychology. This makes the transactional approach concrete, as with the use of affordances we can operationalize a transactional person-environment relationship. Transactionalism, in fact, already exists in the concept of affordance.

The underpinnings of my theoretical framework are based on James J. Gibson's ecological perceptual psychology, with the addition of Urie Bronfenbrenner's ecological developmental psychology<sup>8</sup> and transactional environmental preference studies. For this reason, I will briefly introduce not only ecological perceptual psychology, but also ecological developmental psychology and the environmental preference studies that were first conducted by Roger Ulrich and by Stephen Kaplan and Rachel Kaplan.

#### **BRONFENBRENNER'S ECOLOGICAL DEVELOPMENTAL PSYCHOLOGY<sup>9</sup>**

Bronfenbrenner discusses children's development in a socioecological context, described with successive levels. It is Bronfenbrenner's view that most developmental psychological studies focus on "children's strange behavior in strange situations with strange adults in the shortest possible time" (Bronfenbrenner, 1979, p. 19)<sup>10</sup>. According to Bronfenbrenner (1993), a person's development cannot be studied

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<sup>8</sup> Surprisingly, the links between various ecological approaches are not very clear. Heft (2001) points out that Gibson's ecological perceptual psychology and Barker's ecological social psychology share common philosophical roots. Although both Barker's and Gibson's studies were done in the 1950s and '70s, they make few references to each other's studies, and other signs of interaction between these ecological psychologies are similarly missing. The theoretical roots of Bronfenbrenner's ecological developmental psychology are different from those of the other two ecological psychological approaches.

<sup>9</sup> Bronfenbrenner's ecological psychology will from here on be called ecological *developmental* psychology to distinguish it from Gibson's ecological *perceptual* psychology. Barker's, Bronfenbrenner's, and Gibson's theories are referred to as ecological psychologies in the literature. This is misleading. I again propose that Barker's theory be referred to as ecological *social* psychology. This would bring out the distinctive qualities of various ecological approaches.

<sup>10</sup> To justify his point, Bronfenbrenner used data, which was collected by Larson (1975, unpublished reference), to publish three major studies in developmental psychology journals during the 1972–1974 period. The main part of the studies (76 %) consisted of laboratory experiments, 17 % consisted of paper and pencil tests, and a mere 8 % were observational studies that can be seen to have ecological validity, i.e., validity outside the research context in an everyday environment.

out of the multileveled social, material, and cultural context in which the development takes place. There is also no reason to disagree over whether genetic disposition or environmental factors<sup>11</sup> play a more significant role in an individual's development, as both are important. Developmental psychological studies should simultaneously focus on both the individual and the context, and concentrate on developmental processes.

According to Bronfenbrenner (1989, 1993), the famous equation by Kurt Lewin, which states that behavior is the joint function of person and the environment ( $B = f(PE)$ ), should be rewritten to replace behavior with development and to include the temporal dimension<sup>12</sup>. The developmental outcome at a given moment ( $D_t$ ) is the joint function of the forces emanating from the person and the environment. The interest of developmental psychologists should be aimed at the right side of the equation; research should not focus on the results of development, but rather on the processes that have led up to the current situation.

Bronfenbrenner (1993) defines four types of individual, developmentally instigative characteristics: the first encompasses those personal instigative characteristics that promote or restrict the reactions of the environment, and in this way have positive or negative influence on psychological developmental processes (e.g., easy vs. difficult babies, hyperactivity vs. passivity). The factors in this first group control the way *other people* react to an individual. The other remaining three groups deal with the ways in which individuals themselves interpret the environment and their roles in various contexts. The factors in the second group deal with an individual's selective sensitivity to the physical and social characteristics of the environment. Thirdly, Bronfenbrenner mentions the tendency to structuralize, which refers to the individual's tendency to shape, change, and even re-create (the social, physical, and symbolic) characteristics of an environment<sup>13</sup>. The factors in the last group are the

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<sup>11</sup> Traditionally in developmental psychology, the word "environment" has referred to the social environment, not to the physical environment. The discussion over whether genetic disposition or the environment plays a bigger role in the development of an individual has turned into a discussion over nature versus nurture. The role of the social environment has been both played up and played down. Piaget treated it as a factor contributing to an individual's development, whereas Dewey and Vygotsky assigned an essential role to the social environment (Rogoff, 1993).

<sup>12</sup>  $D_t = f_{(t-p)}(PE)_{(t-p)}$ , where  $D_t$  = individual development at a given time  $t$ ,  $(PE)_{(t-p)}$  = the joint development of the person and the environment at a time period prior to  $t$ , and  $f_{(t-p)}$  = a function defining the joint interaction between person and environment.

<sup>13</sup> The connection of this tendency to the extent that an individual wants to participate in environmental planning or development projects has so far been studied less.

person's guiding beliefs concerning the dynamic relationship between himself or herself and the environment. Bronfenbrenner (1989) included to the list those kinds of clearly physical characteristics that themselves carry no psychological meaning, but which often lead to psychological consequences (e.g., physical injuries, physical attractiveness, and race). As later becomes clear, this addition is particularly important for the theory of affordances, which stresses the importance of corporal perceptions.

According to Bronfenbrenner (1989, 1993), the characteristics of an environment should be studied on various levels, the first being the level of *microsystems*: home, school, day-care center, and other multidimensional conditions of the environmental context. The physical, social, or symbolic characteristics of the environment that determine the conditions either promote or inhibit development. Examples of development-promoting characteristics of a physical and social environment are items and places that allow for the manipulation of the environment: quiet places, interactive toys, decorations in a child's room, a nanny's sensitivity to a baby's cries, or participation in a child's activities. Examples of characteristics of a physical and social environment that inhibit development are instability or unpredictability, a lack of clearly defined systems, noise, a lack of space, conflict, and the use of force.

*Mesosystems* are collections of more than one microsystem, such as a child's daily environmental dyad consisting of the day-care center and home, or the system consisting of a first-grader's home, school, and after-school activities. It is important to study the synergetic effects of the various components of systems. To focus on one component at a time and on its effects on a certain phenomenon is to simplify a reality in which various components in fact enhance or minimize each other's influence. In studying, for example, the relative influence that parents and peers have on a child's school performance, it is not valid to concentrate only on one component. One should rather examine the ways in which supportive parents and nonsupportive friends mutually influence a child's school performance. All possible combinations of interaction should be taken into account.

*Exosystems* refer to systems of which the individual is not necessarily a part, but which affect his or her life regardless. For example, a child's life is affected by happenings at the parents' workplace, or even by decisions made at the social office. *Macrosystems* are, according to Bronfenbrenner, the prevalent models that in each culture affect the micro, meso, and exosystems. The prevalent beliefs, customs, etc. of a culture or subculture shape a child's life: the school or day-care center's physical and social characteristics, its daily rhythm, the kind of teaching and the way the teaching is provided there, the kind of development that is promoted and the kind that is not, etc.



When development is studied in a context, Bronfenbrenner (1989) thinks the so-called “models of social address” are not adequate. The most common “social addresses” are social class, place of residence, and family size. Also the “new demographic factors”, such as the number of providers in a family, the mother’s possible work, etc., all belong to the same group of class theoretical concepts. The developmental processes are not studied, only those environmental factors from which development is seen as rising. It is perhaps more valid to use individual-context models, which take into account both the characteristics of the individual as well as those of the context. The validity of these models is enhanced by their recognition of various ecological niches that are environmental areas particularly beneficial or not beneficial to certain types of individuals. The individual-context models have, according to Bronfenbrenner, at least one downfall. The temporal dimension of development is taken into account only in so-called process-person-context-time (PPCT) models, in which both the stability and instability of the individual and the context are taken into account. PPCT models represent a sophisticated transactional approach. As Bronfenbrenner points out, however, even these usually lack an analysis of developmental processes that are seen as universal. In my personal view, Bronfenbrenner’s way of modeling the environment leaves the analysis of the physical environment unaccounted for in detailed enough level. On micro, meso, exo, and macrolevels the environment is depicted mainly in sociocultural contexts.

Although the framework of my research is not strictly in accordance with ecological developmental psychology, I have taken into account thoughts generated within the field. For instance, I have chosen not to restrict the level of environment to individual microsystems, such as children’s backyards. My starting point is the everyday environment defined by the children themselves, regardless of whether it is restricted to a backyard or school, or whether it extends further to the whole city or the summer cottage. I have taken seriously Bronfenbrenner’s (1993) warning that developmental processes should not be taken out of the context in which they were born. The researcher is not supposed to mix data that has been acquired from children growing up in different environments; for this reason my data is locality-based.

The requirement to include the context in developmental psychological research has, according to Bronfenbrenner (1989), been too rigidly adhered to, which has led to research being taken to the other extreme, i.e., personal development and individual characteristics have been disregarded. For this reason, in Section The Individual Dimensions of Affordances I try to show how ecological perceptual psychology can be supplemented to better include individual characteristics in the study of children and their environments.

## **TRANSACTIONAL ENVIRONMENTAL PREFERENCE RESEARCH**

Research on environmental preferences is an essential part of environmental psychology. The pioneers in this field, Stephen and Rachel Kaplan and Roger Ulrich, began their work in the 1970s. They have ever since inspired others to study environmental preferences in a large scope, and to do research on the motives for spending time in preferred, often natural environments and on its effects on people's well-being. According to these researchers, the environmental preferences and reactions to the environment that have been found in empirical studies have mainly turned out to be shared by everyone (Ulrich, 1983, 1991; Kaplan 1987, 1988). This being the case, one can search for an evolutionary basis for these preferences. On the other hand, some preferences can be learned or they are sociocultural. Hartig (1993) would like to see a synthesis of these various theories, as transactional environmental research cannot exclude any of these matters.

Both Ulrich and the Kaplans have striven to come up with concepts and dimensions that would describe environmental preferences that refer both to the environment and to the perceiver. These theories can thus be considered transactional.

Kaplan (1987, 1988) thinks that the basis for environmental preferences is lying on the perceptual information one gathers from an environment and that controls a person's activities and mobility. In the course of evolution, beings have come to prefer environments that support their activities and their survival. Environments that offer ample opportunities for action, i.e., affordances, instinctively attract people and animals generation after generation. Preferences are direct and immediate. Kaplan and Kaplan (1987, 1998) list the coherence of information and its complexity, legibility, and mysteriousness as being the factors that explain most of the variation in environmental preferences. Of all these factors, mystery has been noticed to be the strongest indicator of environmental preference. Mystery refers to a promise on inferred environmental information that is not present yet. To give an example, partly obscured scenery seems mysterious. All the above-mentioned factors are both characteristics of the physical environment, and they refer to the perceiver's capacity to process the available information.

Ulrich (1983, 1991) also stresses the immediate nature of environmental preferences. He refers to a concept used by Zajonc and Ittelson called "preferendas". Preferendas are characteristics of the environment (attractive, interesting, scary) that spark an immediate emotional reaction towards the environment and motivate either attraction or aversion. According to Ulrich (1983), emotional reactions to the environment are first instinctual, based on preferendas. Only at a later stage does

cognitive processing step in. In a recent study Korpela et al. (2002) garnered empirical evidence to support the hypothesis on immediate, emotional evaluation of environments.

In their later studies, Kaplan and Kaplan have examined person-environment fit from the perspective of how different environments support an individual's activities and processing of information (see P-E fit, Section The Person-Environment Fit Operationalized Using Affordances). The motive for seeking out restorative environments is to revive one's ability to function and to recover after experiencing stressful situations. Times when a person's capacity to process information is being tested, such as stressful situations involving sensory overload and continuous alertness, make the person crave restoration. Restorative environments offer such relief (Kaplan, 1995, 1998)<sup>14</sup>.

Restorative experiences are characterized by (1) fascination, (2) extent, (3) being away, and (4) compatibility (Kaplan, 1995). Fascination refers to qualities of the environment that the person finds inherently interesting and engaging. Extent involves a pattern of stimulation that is extended in time and space, that is perceived as an environment that one can enter and spent time in. The experience of extent is facilitated if the immediately perceived environmental elements form a consistent totality that includes a sense of continuation beyond the immediately perceived, a sense that there is more to explore. The experience of being away means leaving behind distraction, putting work aside, and taking a rest from mental effort. Compatibility means that one's purposes fit the demands of the environment, creating a sense of oneness. Restoration through the physical environment can be considered a form of mental self-regulation. In this case a restorative environment can act by directly regulating the emotions or by indirectly supporting the cognitive processes that facilitate mental self-regulation (Korpela, 1995; Korpela & Hartig, 1996; Article III).

In Section The Emotional Dimensions of Affordances, I propose that the theory of affordances in ecological perceptual psychology be supplemented with emotional and motivational factors. The evolutionary models that emphasize the immediate nature of environmental preferences can be, in my view, particularly suitable to complement ecological perceptual psychology.

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<sup>14</sup> In my opinion, they have also at the same time stayed, more consistently than before, within the traditional framework of perceptual psychology, the so-called information-processing framework (see Section Comparing Ecological Perceptual Psychology With the Information-Processing Framework). In their early studies (e.g., Kaplan, 1988) they more clearly based their theory of preferences on the framework of Gibson's ecological perceptual psychology.

## JAMES J. GIBSON'S ECOLOGICAL PERCEPTUAL PSYCHOLOGY

### The Basic Concepts of Ecological Perceptual Psychology

James J. Gibson's ecological perceptual psychology is thought to be an example of a truly transactional framework (Altman & Rogoff, 1987). The framework of my research is based largely on ecological perceptual psychology, in which perception is studied as a functionally active process. In this research, I employ the Gibsonian framework with varying consistency<sup>15</sup>. In the sections below I first introduce the essential characteristics of Gibsonian perceptual psychology, after which I explore its relationship to a so-called information-processing framework that represents mainstream perceptual psychology. In particular, I look into the concept of affordances in ecological perceptual psychology, through which the transactional approach can be operationalized.

Gibson developed his own theory of perceptual psychology over many decades, beginning in the 1950s up until 1979. Gradually his views on the ways of perceiving (of both humans and other beings) deviated from the views held in mainstream perceptual psychology. Gibsonian perceptual psychology – which he himself began to call the ecological approach (Gibson, 1979) – has been described as being naturalistic, in contrast to rationalistic psychological theories. It is common for the naturalists, of whom there are many more in addition to Gibson<sup>16</sup>, to concentrate their efforts on studying the interaction between an organism and the environment. Rationalistic theories, on the other hand, place the main emphasis on mental processes rather than on the environment (Looren de Jong, 1991, 1995). Gibsonian perceptual psychology can be said to represent the third alternative between idealism and naïve realism. In this middle view, reality is seen as relational. It includes an expanded view of the subject, in which the body and its activities play a central role (Karvonen, 1999).

In the view of ecological perceptual psychology, the person-environment relationship is immediate and based on practical activity rather than on being analytical. This is why the Gibsonian framework is also called the framework of direct perception. Direct perception of meaning is, according to this view, primary<sup>17</sup>, not

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<sup>15</sup> Taking these liberties comes from the fact that I have been working on this doctoral thesis periodically and some of my articles are joint publications.

<sup>16</sup> In this context, Looren de Jong mentions Gestalt psychologist Heider and perceptual psychologists Brunswik and Marr. There is no consensus on the division of psychological theories into naturalistic and rationalistic. For example, van Hezewijk (1995) dislikes the division.

<sup>17</sup> The relationship between sensory perception and meaning is a classic dilemma in perceptual psychology. Gestalt psychologists call it the Höfdding step. It is a question of how something that we hear or see is suddenly given meaning (see Jones, 1999).

pasted over later. To give an example, a person does not perceive the shape, size, and color of an object, and combine that information to think that he saw a chair – instead he or she recognizes the object immediately. As we will later see, the perceiver actually perceives an object that allows him or her to sit down (and depending on the situation, do various other things).

Gibson was against dualism. He thought it was impossible to study a person and his perceptions separate from the environment.

*Perception cannot be studied by the so-called psychophysical experiment if that refers to physical stimuli and correspondent mental sensations. The theory of psychophysical parallelism that assumes that the dimensions of consciousness are in correspondence with dimensions of physics and that the equations of such correspondence can be established is an expression of Cartesian dualism. Perceivers are not aware of the dimensions of physics. They are aware of the dimensions of the information in the flowing array of stimulation that are relevant to their lives.*

(Gibson, 1979/1986, p. 306)

Gibson's (1979) perceptual psychology is based on a new description of stimulus information. Unlike the information-processing framework, ecological psychology emphasizes a thorough description and study of the environmental information. Gibson's description of stimuli is based on ecological information, the "ecological reality" accessible through human (and other organisms') senses, which for humans forms their human ecological reality. According to Gibson, perceptual reality forms an entity, the parts of which cannot be separately examined. Organisms and environments form their own ecological niches, the components of which define each other.

*...the words animal and environment make an inseparable pair. Each term implies the other. No animal could exist without an environment surrounding it. Equally, although not so obvious, an environment implies an animal (or at least an organism) to be surrounded.*

(Gibson, 1979/1986, p. 8)

Perceptual psychology has traditionally concentrated on visual perception and has considered the other senses to be inferior. Some have theorized that the information coming through the different senses is conveyed via separate channels (see Heft, 2001). Gibson (1966, 1979) emphasized the multisensory perception that constitutes a perceptual system. A functionally active person will see, hear, touch, and taste,

and all these perceptions will melt into one experience. This makes sensory information, collected through the various senses and sometimes contradictory, an interesting subject of study<sup>18</sup>.

Ecological perceptual psychology has, however, been mainly interested in visual perception. Visual information is studied as an optical net, as light, that hits the perceiver from all possible directions. Seeing is possible because the environmental structures shape this light. Structures such as medium, substances and surfaces are essential. For this reason the perception of an object should not be considered as separate from the perception of the surface structures of the background. For the perceiver the surrounding environment is just as important as the object itself. This is why Gibson has studied for example the structural elements of surfaces, surface gradients as indicators of the perception of depth, and as an indicator of size constancy (Gibson, 1979).

In the view of ecological perceptual psychology, perception is fundamentally goal oriented, which means that perception cannot be separated from the intentional activity with which it is connected. Mobility (motion) reveals a lot of significant information about the environment. Ecological perceptual psychology, unlike traditional perceptual psychology (or the information-processing framework) studies perception as an active experience, in which one finds information through mobility. “We must perceive to be able to move around, and we must move around to be able to perceive” (Gibson, 1979, p. 223). Perception and mobility are closely connected, thus the division between sensory and motoric activity disappears. What becomes interesting, instead of retinal images, is perception as an activity in an ecological reality. Gibson has written, “Perceiving is an achievement of the individual, not an appearance in the theatre of consciousness. It is a keeping-in-touch with the world, an experience of things rather than a having of experiences” (1979, p. 239). In this respect ecological perceptual psychology can be considered functional. The framework of ecological perceptual psychology thus approaches the framework of activity theory, in which activity is seen as the basis for all mental phenomena, and the study of activity is seen as an essential unit of psychological analysis (Leontjev, 1978).

Due to mobility, perceptions form an optical flow. Depending on the speed of the perceiver moving forward, the visual elements outflow at the same speed.

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<sup>18</sup> For example, Gibson and Walk (1960) studied infants' activities in a situation where the visual information hinted at the existence of a so-called visual cliff, but where the sense of touch provided contradictory cues because the cliff was in fact covered by a glass plate. The infants, however, trusted the visual information and did not dare to venture on top of the glass plate.

Simultaneously there are new elements flowing into the visual field. Together with the perception of the environment, optical flow makes it possible for the perceiver to perceive himself or herself simultaneously. Attention can be directed either at oneself or the environment. It becomes clear to the perceiver that she or he is the one who is moving<sup>19</sup>. Optical flow as a result of the individual's own mobility is essentially different from all other moving elements, as the individual can himself control the mobile, visual information. Optical flow can be stopped by coming to a standstill, by looking away, or by moving back in reverse<sup>20</sup> (Gibson, 1979).

Through the functionally active seeking of information the perceiver comes to see the essential characteristics of stimulus information. According to Gibson, they are invariant, i.e., their proportions don't change. When the perceiver moves, the optical net changes only partly, not totally. Even if angles or lighting change, or there are some other slight changes in the object of perception, such as changing facial expressions, some characteristics of the object remain the same, i.e., invariant. All objects have invariants that remain unchanged regardless of changing circumstances. Even if the retinal image of a box is different when looked at from different angles, the invariant proportions of the box stay the same, so the box is perceived as one and the same<sup>21</sup>. The size of the object is perceived as being the same regardless of the distance (constancy of size) because of having the same proportions with regard to the background. The object covers the same amount of surface gradient elements, even though the "right" size of the object as a retinal image varies (Gibson, 1979).

Perception is oriented towards finding the *affordances* of an environment, derived from invariants. Perception and action mix; action reveals new affordances, and the

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<sup>19</sup> Here ecological perceptual psychology offers a concrete definition for experiencing oneself, one that differs from the Cartesian "I think, therefore I am". The ecological self is closely connected with body and perception (Heft, 2001). Neisser (1988, 1993a) calls this self the "ecological self" and sees it as distinctive from the more abstract and conceptual parts of the self, such as, e.g., the expanded self, the private self, the conceptual self, and the interpersonal self.

<sup>20</sup> Heft (2001) points out that it is for this reason that we don't confuse the optical flow of a movie with the optical flow produced by our own mobility. Only the optical flow of our own movements can be reversed and stopped. Heft proposes that the difference can be overcome, with the help of modern technology, in a virtual environment.

<sup>21</sup> Here Gibson gives his answer to a classic dilemma in perceptual psychology called reverse projection. Any three-dimensional object can appear as a two-dimensional projection on the retina, based on basic mathematics. In case the situation is reversed, i.e., one tries to see which object has produced a certain projection, one is faced with various possibilities. In the field of perceptual psychology, there is still no consensus over how our system of perception deals with the dilemma. Gibson thinks the problem doesn't really exist, it is just a question of stimulus information not defined properly. In the flow of information produced by mobility the invariants are evident, so the problem of reverse projection does not exist (Epstein, 1995).

perception of new affordances creates new action. Different types and degrees of affordances, as well as the nature of affordances, will be dealt with in Section The Affordance As a Theoretical Concept.

As ecological perceptual psychology is interested in the description of the environment and its stimulus information, one might assume that the framework would be of interest to many environmental psychologists. References to Gibson are common in environmental psychology, but typically the connection remains superficial. It is also typical that one concept, and in ecological psychology it is usually that of affordances, is employed while the rest of the theory is disregarded. Interest in applying the approach and concepts of ecological perceptual psychology to environmental psychology has risen only in recent years<sup>22</sup>.

### **Comparing Ecological Perceptual Psychology with the Information-Processing Framework**

Ecological perceptual psychology was developed to challenge traditional perceptual psychology, i.e., the information-processing framework<sup>23</sup>. Gibson's views deviated gradually from the views held in mainstream perceptual psychology. Apparently Gibson wanted to revolutionize perceptual psychology. That never happened: the information-processing framework remains the prevalent theoretical framework in perceptual psychology. The principles of ecological perceptual psychology have, however, been given increasing consideration in traditional perceptual psychology, and recently more references have been made to perceptual two-channel and multichannel models. They are an effort to combine ecological perceptual psychology and the information-processing framework as parts of the same perceptual process, but as separate channels of perception (see Section Combining Ecological Perceptual Psychology with the Information-Processing Framework and Section Affordances As Part of the Perceptual Cycle).

Gibson criticizes the research based on the traditional information-processing framework for simplifying ecological reality. For instance, in research done on seeing, impoverished stimulus displays such as brief presentations of dot patterns, line fragments, or simple geometric forms have been used as input material, forcing

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<sup>22</sup> Increased interest in the framework of ecological perceptual psychology is suggested by a meeting on the theme of affordances, held by British environmental psychologists at the University of Surrey in 2002.

<sup>23</sup> The framework is also known as cognitivism, computationism, constructivism (as part of perceptual psychology, which is different from social constructivism), and indirect perception.



artificial limits on the perception of the individuals participating in the experiments. It is not unusual that experiments have been conducted so that seeing with just one eye instead of two has been studied, or that the perceiver has not been able to move around or engage in activity during the experiment. The research context has seldom been an authentic indoor or outdoor environment, or included other people. Thus the research lacks ecological validity (Neisser, 1980; Bronfenbrenner, 1977). Table 1 presents the essential differences between the information-processing framework and ecological perceptual psychology. It is based on articles written by Heft (1980, 1981), Hoffman (1998), Epstein (1995), and Laarni et al. (2001). One should notice that the comparison involves perceptual psychology as it stood in the 1980s, and as such does not include the recent development of the two frameworks moving towards convergence.

**Table 1.** A comparison of the information-processing framework with ecological perceptual psychology.

	Information-processing framework	Ecological perceptual psychology
Philosophical background	Indirect realism Person-environment dualism	Direct realism Person-environment monism
Perceptual process	Indirect construction Multileveled, successive stages of processing Modeling the environment	Direct perception Collection of essential information through moving and functioning Attunement to everyday environmental structures
Meanings	Perception is construction of meanings	Immediate perception of meanings
Description of the environment/ unit of analysis	Collection of inputs	The surrounding optical net Invariants Surface structures, the horizon Affordances
Studied phenomena	The perceptual process is divided (in a laboratory) into controllable units	Perception in "natural" situations Moving and functioning essential in the perceptual process. Illusory situations cannot be applied to normal ones.
Framework works best to describe	<ul style="list-style-type: none"> <li>– Complementation of perceptions</li> <li>– Impossible objects</li> <li>– Adaptation and afterimages</li> <li>– Visual illusions</li> <li>– Ambiguous images</li> </ul>	<ul style="list-style-type: none"> <li>– "Egomotion"</li> <li>– Depth perception through occluding edges</li> <li>– Explanation of constancy through invariants</li> <li>– Inverse projection problem viewed as a pseudoproblem</li> </ul>

In the information-processing framework, perception is treated as a form of cognition. Accordingly, perception is subconsciously constructed from sensory information, which in itself is insignificant stimulus material. Perception is a gradual process in which the perceiver interprets and compares the stimulus information with her or his previous database (Looren deJong, 1995). In ecological perceptual psychology, meaning is inherently linked with perception. Meaning in this context refers primarily to the *functional meaning* of the perceived in relationship to the perceiver's body, and also includes the intentions and emotions present in the perceptual process.

### **Combining Ecological Perceptual Psychology with the Information-Processing Framework**

A pioneer in cognitive psychology, Ulric Neisser was already over 20 years ago certain that ecological perceptual psychology and the information-processing framework would converge in the future<sup>24</sup>. The convergency, or a compromise, has not been easy, as even today there is no agreement on how it should be done or if it is indeed needed<sup>25</sup>.

It has been common to look for a compromise between direct perception and the information-processing framework by applying different theories to different perceptual processes, which in turn produces two-channel or multichannel models of perception. Among others, Neisser (1989, 1994) has preferred this solution. The idea is that context-related, socially shaped cognition cannot be explained through any particular framework.

Gibson, too, separated "literal" perception from "schematic" perception in his early works (Gibson, 1950). Literal perception is a direct reaction to the environment, whereas schematic perception has to do with perception colored by social and cultural habits and norms. Gibson later rejected the division.

Neisser (1989) divides perceptual processes into direct perception and object identification or recognition. The former he calls the "where" system, and the latter the "what" system. Direct perception supplies information for movement and

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<sup>24</sup> "... it seems certain that some way to integrate ecological optics with cognitive psychology will soon be found" (Neisser, 1978, p. 27).

<sup>25</sup> "As for my views, in the end I suspect some kind of synthesis may be necessary, but my intention is to see how far the ecological approach can be extended beyond perceiving into areas of cognition" (Heft 2000, personal e-mail notification).

orientation in space, and it requires dynamic interaction with the environment. The Gibsonian framework works well with perception of this kind. Object identification, on the other hand, which requires information for the identification and classification of objects and situations, is best understood using the information-processing framework. Goodale and Milner (1992) and Norman (2001) also present two parallel systems, the first of which is specialized in the control and navigation of activity, and the second in the identification of objects and situations. The existence of these parallel systems, as well as the parallel development that begins at birth, is validated by perceptual psychological research conducted on infants (Bertenthal, 1996). Similar views are shared by Ohno (2000), who sees environmental perception as being two parallel processes: ambient vision and focal vision. Focal vision can be equated with recognition, and ambient vision with direct perception. According to Ohno, ambient vision plays an important role in the way the environment is perceived<sup>26</sup>.

#### **Neisser's Perceptual Multichannel Model**

Next I will introduce in more detail Neisser's views on the perceptual multichannel model, which consists of direct perception, object recognition, and an additional, third channel of perception<sup>27</sup>, social perception. It deals with immediate interactive situations with other people (Neisser, 1994). According to Neisser, all three channels operate together so smoothly in adults that they are not conscious of them. Each system collects information from the environment although the information, or more precisely the quality of affordances, picked up by different systems varies. The systems develop in different ways, and their neurological bases vary.

Direct perception creates the platform for perception of all kinds. It has been shown that infants as young as three or four months old, and possibly even younger, can perceive the place where objects are placed, the shape of these objects, and their purpose. They can perceive depth and their own movements in relation to the

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<sup>26</sup> Ohno (2000) developed a computer program that measured the quality of visual information (visual radiation) in ambient vision, and that enabled the prediction of, e.g., the directions in which a person strolling in a Japanese garden would turn his head, as well as the appraisal of the scenery, and the feelings of loneliness and security in residential areas. A thorough analysis of the information produced by ambient vision could, in Ohno's opinion, provide researchers with more information on environmental perception.

<sup>27</sup> Neisser (1994) points out that even these three parallel systems are not enough. More systems are likely to be added to them. They will deal with memory, motor control systems, arousal/ emotional systems, and possibly linguistic functions.

environment<sup>28</sup> (Bertenthal, 1996). Direct perception reveals the various affordances available for the senses. Those affordances reflect both personal characteristics and those of the environment (Neisser, 1994).

Social perception, like direct perception, is based on information received through movement. The individual perceives other people's expressions and gestures as carrying certain social significance, and sends them interactive messages. Social perception develops in infants even earlier than does the direct perception involved in the actual control of activities. Infants as young as six to eight weeks "talk" to their nurses, maintaining eye contact and taking turns in producing sounds<sup>29</sup> (Neisser, 1994).

Only a part of social perception is, in Neisser's view (1994), direct in the above-mentioned way. Especially adult social perception includes recognition (object identification) based on representations. Social life is complex, encompassing widely varying situations and complicated cultural environments. All three levels of perception — direct, social, and recognition — must work together. The nature of the perceptual process determines which channel or channels are used. The information-processing channel suits the kinds of social situations in which phenomena require particularly profound processing, such as in totally new situations, or when one is asked to comment on the environment<sup>30</sup>. In here-and-now situations perception takes place directly. Direct perception gives one immediate impressions of other people, and so one reacts to them emotionally (Knowles & Smith, 1982).

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<sup>28</sup> Infants at least 4 months old perceive depth kinetically and with the help of an occluded object. They know how to keep out of the way of approaching objects to avoid collision and they change their bodily position in accordance with the perceived optical field (Neisser, 1994).

<sup>29</sup> Murray and Trevarthen (1985) watched the interaction between mothers and their babies "live" via a video screen. Babies and mothers made eye contact and took turns in producing sounds. When the situation was altered so that the babies could see the same happening in "playback" on video tape, i.e., they saw the same expressions and gestures but could not interactively respond to them, they reacted in a strongly negative way. It is apparent that the babies in the original situation enjoyed not only perceiving their mothers' behavior, but also their own active role in the interaction.

<sup>30</sup> One can ask which perceptual channel different research methods activate. For example, do interviews and questionnaires activate only the information processing channel? Can these methods be used to study the actual behaviour or activities in the environment? The well-known mismatch between research findings concerning environmentally friendly attitudes vs. actual behavior can perhaps be explained this way: possibly different research methods activate different perceptual channels and thus reveal different level of information. Baron and Boudreau (1987) used this explanation to interpret a mismatch between findings in actual behavior and stereotypical attitudes. I also face this dilemma in my research (see Section Neisser's Perceptual Multichannel Model).

Direct and social perception have distinctive differences in some respects. Information in direct perception is based on universal, optical laws that are common to all humans and to most animal species. Social perception, on the other hand, is based on specific, culturally varied interactive habits between people, such as eye contact or smiling. Another difference between direct and social perception lies, according to Neisser (1994), in the fact that social perception is emotional. The emotions vary dynamically from one situation to another<sup>31</sup>. A third difference arises from the fact that direct perception is largely independent of recognition, whereas social perception is usually not. At three months an infant interacts with both familiar and unfamiliar people, but a few months later this is no longer the case.

Recognition is not, as opposed to direct perception and some cases of social perception, directly connected to the immediate moment or to future predictions (see Bertenthal, 1996), but rather is determined by previous experiences. The only exception to this would be certain inherited stimulus responses. In identifying objects one compares the present information with memories of earlier perceptions. There is no agreement on the way these memories are stored (Bertenthal, 1996). Recognition is largely based on the external characteristics of objects, such as shape. Direct and social perception, however, are mostly independent of such factors. Identification is easiest if the object doesn't move. Again, identification differs from direct perception, where movement has an essential function. One difference between identification and direct perception lies in adaptation: direct perception adapts to new circumstances faster than does identification<sup>32</sup> (Neisser, 1994).

As the perceiver identifies objects, he or she perceives different types of affordances than in direct perception, in which the affordances are determined by characteristics of objects perceivable through the senses (how comfortable the chair is, the affordances of a spoon, etc.). In addition, recognition can reveal other than sensory information. For instance, a tree branch that looks suitable for swinging may turn out to be rotten, leading one to be careful in the next encounter with it. In the modern world an increasing number of affordances are of this type. Neisser's (1994) views differ from Gibson's (1979) in this respect. In Neisser's opinion, the affordances

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<sup>31</sup> In my view, direct perception is also emotional. Environmental affordances are perceived as either positive or negative. The emotional dimensions of affordances have been disregarded in ecological perceptual psychology to this day (see Section The Emotional Dimensions of Affordances).

<sup>32</sup> For example, in Kohler's (1964) famous experiment, in which the participants wore prism lenses that made the world appear reversed (right was left and vice versa), riding a bicycle – navigation of movements – was easy after 18 days, but text on street signs still appeared in mirror image; in other words, object identification had not adapted to the situation.

of, for example, a mail box or telephone are not perceived directly, but by identifying the objects (refer to Section Affordances in a Social Context ).

The three parallel systems of perception also have different neurological bases (Neisser, 1994). This is clear as regards social perception, in which the connection to the subcortical limbic system is well documented. Monkeys have also been found to have what/where areas in their cortices<sup>33</sup>. Even though human direct perception and recognition are most likely based on more extensive cortical activity and links between various areas, certain neuropsychological disorders hint at the possibility that humans have corresponding what/where areas. As Neisser (1993) points out, Gibson was not particularly interested in the neural basis of brain activity, making it reasonable to expect the latest findings in neurosciences to be inconsistent with the views held in ecological psychology. However, this does not necessarily have to be the case. For example, Iran-Nejad's (2000) biofunctional theory on knowing resembles the Gibsonian framework in its basic starting points, and it has been estimated to fill some neurological gaps in ecological perceptual psychology (Hruby, 2000; Rosch, 2000).

Applying the multichannel models of perception to empirical research can be difficult. At least, it is hard to draw the line where the framework of ecological perceptual psychology should be exchanged for the information-processing framework<sup>34</sup>. My assumption is that in cases in which perception is multichanneled, the various channels of perception are inseparably intertwined.

In Sanders' (1996) opinion, the analytical approach may be more appropriate for studying the structural elements of which phenomena consist and how these elements work internally, whereas the ecological approach (the framework of direct perception) is best suited for situations in which the aim is to understand the interaction of these elements in larger systems. This doctoral thesis focuses more on the latter than the former. For this reason, it is valid to remain for the most part within the framework of ecological perceptual psychology. Also, the fact that I study child-environment relationships suggests that the use of the framework of direct

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<sup>33</sup> Posterior parietal (dorsal) cortex is presumably responsible for the control of navigation of movements whereas inferotemporal (ventral) cortex attend to object recognition and identification (Undergleider & Mishkin, 1982; Norman, 2001).

<sup>34</sup> Norman (2001) reported on a patient suffering from brain damage to the ventral cortex. Norman called him "DF". DF could utilize environmental affordances, but he was incapable of talking about them. The ventral cortex is, according to the two-channel theory, in charge of object identification. In this case it was possible to draw a line between the functions of different channels. Usually it is much more difficult.

perception is more appropriate. I presume that the framework of direct perception is dominant in children (cf. Neisser, 1994).

In my research the activities of children was not directly observed. Instead, children were interviewed about their perceived affordances<sup>35</sup>. For this reason ecological perceptual psychology is perhaps not the most appropriate framework. This research was not about children's activities in the here-and-now, but rather about their memories of perception and activities afterwards. The affordance interview was mostly about *where* the affordances perceived by children were located, and to what extent they utilized them. They were asked, e.g., if there is a place where they can ride a bicycle, where that place is, and how actively they make use of the place. I didn't ask the children to name their affordances, but instead to pinpoint them in their own environments; in other words I was interested in the where-system that controls the navigation of activity. For this purpose, it is valid to apply the framework of direct perception to this research. The next section deals with the question of the extent to which it is possible to remember activities or actualized affordances without mental representations or internal structures.

### **Ecological Cognition: Does It Exist?**

In this section I briefly introduce the attempts made by ecological perceptual psychologists to solve the problems that have led to criticism of their approach. Those in favor of the framework of direct perception have tried to prove that perception can be explained without resorting to assumptions about inner representations, or at least be explained so that the existence of inner representations is not necessary or essential in every situation. The following is a short introduction to the discussion that researchers, following in Gibson's footsteps, have been having about the possibility of putting representations to a new use within an ecological paradigm.

According to critics of ecological perceptual psychology, namely Heil (1979, 1981) and Neisser (1977), Gibson wasn't interested enough in what happens in perceivers

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<sup>35</sup> In principle, observation would be a good research method for the ecological framework, but there are many problems involved in using it. It is difficult to arrange for adequate observation (time and space), which results in uncertainty over whether all the important environments of children have been included in the research. My starting point was not to limit the environments (see Section Bronfenbrenner's Ecological Developmental Psychology). Observation will also not reveal the role that affordances play in all of children's activities. Even though I haven't systematically reported these results, the data from the interviews enabled me to do preliminary research of this type. Future research could concentrate on the phenomena that can be studied with qualitative methods.

as they pick up information from the surrounding optical net<sup>36</sup>. Individual differences in perception and what they are based on is difficult, if not impossible, to explain without the assumption of inner representations. Heil (1981) gave the example of a meteorologist, who perceives in moving clouds totally different information than does the average person who is not a meteorologist. In Heil's view, the difference is caused by education that has crystallized into inner representations. Representations guide perception and lead one person to see more in the same stimulus selection than does the next person.

Those in favor of the ecological framework (e.g., Heft, 1980; Wilcox & Katz, 1981) feel that critics do not consider the radical nature of Gibson's theory that organisms and environments cannot be studied separately. This theory means that one cannot even discuss what happens in the perceiver, but rather is always required to ask what happens in the ecological totality of which the perceiver is a part. Supporters think that Gibson explains the individual differences in perception sufficiently well. Differences result from (1) variations in sensitivity to environmental information (in the example of the meteorologist, this sensitivity is influenced by the education he or she has received), (2) differences in exploratory activity, and (3) individual bodily facilities. Only the mechanistic model, or the explanation based on presumed inner representations, is missing. Talk about inner representations is inherently dualistic, and as such not something Gibson would do.

Gibson himself (1979) wrote about two different forms of awareness: direct perceptual cognition (knowledge *of* the environment) and indirect, symbolic, or transmitted cognition (knowledge *about* the environment). Gibson dealt mostly with the former, which is primary and tacit. Transmitted knowledge is based on displays, such as speech, images, writings, etc., that are common and public. Indirect, divided cognition can lay the ground for the Gibsonian concept of inner cognition,

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<sup>36</sup> Gibson's followers have come up with the concept of effectivity (translated into Finnish by Ihanainen as "*kohteellinen toiminta*", 1991) as a solution to the demand that perceiving subjects should be described more closely. Effectivity would then complement the concept of affordances such that affordances become material for perception and effectivity becomes material for action. Greeno (1994) in turn talks about individuals' abilities. This perspective has also received criticism that is in my view justified. For instance, according to Sanders (1997) this type of division threatens to throw the baby out with the bath water. Gibson's aim was to do away with dualistic categories, while the aforementioned division would bring them back. Costall and Leudar (1996) have also pointed out that the affordance-effectivity division freezes the relationship between a functioning individual and the environment, a relationship that Gibson saw as being a process. In my view effectivity or abilities do not have anything essential to add to the ecological framework, so therefore I choose not to employ these concepts.



i.e., representation. Gibson didn't like the word representation, but some of his followers have put it to "ecological" use (Reed, 1987).

Indirect cognition expands and confirms information perceived through direct perception. Indirect cognition cannot, however, reach all those meanings that are perceived in direct perception (Reed, 1987). Gibson (1966) emphasized that when adults structure their environments, there is always more than one type of cognition present. Looking at things from the ecological framework, most theories on cognition are "claustrophobic" in the sense that they define cognitions as individual, internal mental structures that operate with abstract concepts and rules. Ecological cognition, on the other hand, is both mental and shared (Reed, 1993).

It can be said that ecological perceptual psychology sees perception as a type of fundamental cognition. Ecological cognition, then, includes psychological processes through which a functioning organism receives information from the environment. This information can be received by perceiving the existing environment or by remembering earlier environments. The information can confirm the perceiver's views on the environment, or even give the perceiver hope for a more preferable future environment. The latter type of information connects environmental planning to information about the environment (Reed, 1993).

The representatives of ecological perceptual psychology do not deny the existence of internal (inner) cognitive phenomena (mental images, dreams, memories, fantasies, thoughts, etc.), although in their view they should not be called forms of cognition, but rather expanded perception (Reed, 1993). "The having of ideas is a fact, but not a prerequisite of perceiving. Perhaps it is a kind of extended perceiving" (Gibson, 1979, p. 250). Ecological perceptual psychologists are, however, opposed to the view that representations exist separately (as schemes, structures, hierarchies, etc.) in the subject's consciousness, and that they are disconnected from the perceptual process and the person-environment relationship. In Cisek's (1999) view the concept of representation is valid as long as the focus is on the practical, regulative value that representations have, not on how they describe the world. One must move from stressing representations to emphasizing behavior, from gradual processing to the analysis of simultaneous regulative currents.

Remembering, imagining, etc., are just as much natural ecological experiences as is perception, but it is very difficult to determine where perception ends and remembering and imagining begin. At the same time, the perceptual process extends in time to a kind of enlarged present, where the present moment is no longer razor sharp; instead its duration varies depending on the situation. Gibson explains that "there is no dividing line between the present and the past, between perceiving and remembering. A special sense impression clearly ceases when the sensory excitation

ends, but a perception does not" (1979, p. 253). Time that is spent in perceiving an object or the invariant structure of a phenomenon determines the duration of perception (Heft, 2001).

In recent discussion, the definition of ecological cognition has become more specified and it has expanded into embodied cognition and/or embodied mind (see, e.g., Varela, 1999). Cognition and all other mental activity are then taken to be closely linked with the body, which sit well within the Gibsonian framework. In addition to embodied or situational cognition there is also abstract cognition. Abstract cognition does not, however, necessarily belong to the sphere of perception (Iyer, 2002).

### **SUMMARY**

In the above sections I have introduced the basis for transactional person-environment research. In transactional research the person-environment relationship is seen as a dynamic, interactive system in which all components play an active role. The theoretical framework of my research is thus Gibson's ecological perceptual psychology, supplemented by Bronfenbrenner's ecological developmental psychology and by ideas from transactional environmental preference research. I have examined the basic concepts of ecological perceptual psychology and its role in the history of perceptual psychology. Ecological perceptual psychology is in many respects different from traditional perceptual psychology and the so-called information-processing framework that it emphasizes. Among other things, the functional activity involved in perception, the importance ascribed to direct perception of meaning, and a new description of perceptual information separate ecological perceptual psychology from traditional perceptual psychology.

Ecological perceptual psychology and the information-processing framework have converged in recent years. These days many researchers talk about two-channel or multichannel models of perception. I introduced in more detail Neisser's (1994) multichannel model of perception, which I return to again in *Affordances As Part of the Perceptual Cycle*. The ecological framework also creates pressure to define cognition in a more theoretically congruent way.

My approach in this research on child-environment relationships has been to study children, whose activities are normally somewhat regulated by the material environment, as functionally active perceivers in the environment. In the next section I will further examine the role of the material environment in transactional child-environment relationships. This brings up the question of environmental affordances to which I referred earlier.



## 4. The Affordance as a Theoretical Concept

In the following sections I introduce various interpretations of affordances that are based on research done by Gibson and his followers. The concept of the affordance is central to my research, which is why I aim here to give a fairly thorough presentation of the different understandings of it. My own interpretations are added to them, along with some theoretical elaborations. In Section The Individual Dimensions of Affordances examine the application of the concept of affordances in studies on children's environments.

### **WHAT IS MEANT BY AFFORDANCE?**

“Affordance” is perhaps the most fascinating concept in ecological perceptual psychology. It was coined by Gibson in 1966 in his book *The Senses Considered as Perceptual Systems*. Later Gibson developed the concept further in another book, *The Ecological Approach to Visual Perception* (1979/1986), in which he defined it in the following way:

The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. The verb to afford is found in the dictionary, but the noun affordance is not. I have made it up. 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, 1979/1986, p. 127) .

Gibson claims he came up with the concept of affordance upon being inspired by Gestalt psychology, referring to Koffka's concept of “demand character” and to

Lewin's valences (*aufforderungscharakter*) (Gibson, 1979, p. 138)<sup>37</sup>. Gestalt psychologists share Gibson's view that the perception of meaning is as immediate as, for example the perception of color. In Koffka's view, objects tell us what we should do with them, i.e., they "demand" to be used. Lewin's valences have also been given the name "invitation character". Valences can be described as vectors that pull or push the perceiver towards or away from objects. However, Gestalt psychologists interpret the demand or invitation character of objects as a phenomenal phenomenon; in other words, the character changes according to the perceiver's individual perceptual habits. Gestalt psychologists thus stick with a dualistic person-environment view. The Gibsonian view and his concept of affordances differ in this respect from those in Gestalt psychology.

According to Gibson (1979), the purpose of perception is to perceive affordances. Objects and other things are not perceived as such, but rather as functionally meaningful units, which makes the perception of functional meaning primary. Objects offer themselves up to be grabbed at, twisted, lifted, etc. Surfaces are to be run on, climbed on, slid on, etc. In Costall's (1995) view, Gibson's theory of affordances can be seen as one of the most significant theoretical contentions in modern psychology. Affordances reveal the reality of meaning that is independent of language or customs. Affordances call the material world, objects and environments, back to life.

As in ecological perceptual psychology in general, the perception of affordances also takes place through activity in the environment, and as such it is not based on occasional stimulus information, but on a temporally and spatially continuous process, on a flow of perceptions. Thus affordances can be seen to exist only in places where organisms live as active agents in the environment (Barentsen & Trettvik, 2002). For example, McArthur and Baron (1983) explain the skill of Eskimos in distinguishing between different varieties of snow by claiming that each variety of snow provide different affordances, i.e., each variety enables the Eskimos to engage in different activities. As I point out in Article II, the outdoor mobility licenses of children and the ability to perceive outdoor affordances are closely connected. For instance, the ability of Finnish children to perceive affordances in snow, to realize when they can make snowmen, ski, or walk on snow, is connected to their experiences of activity in winter environments.

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<sup>37</sup> Ihanainen (1991) has given the concept a good Finnish translation: "*tarjouma*". Other suggestions include, e.g., "*suominen*" (Jahnukainen's translation of Neisser's 1980 text).

Traditionally, affordance has referred to those functional possibilities in the environment which again refer to the agent's corporality. Examples of empirical studies and the various affordances included in them are steps one can climb, objects one can step over, objects one can grab, chairs one can sit on, etc. (Warren, 1995; Mark et al., 1990; Pufall & Dunbar, 1992). Gibson mentions a person's bodily proportions, hand size, and shoulder width, among other things, as examples of individual qualities that are related to the perception and actualization of affordances. To be able to perceive affordances one needs some other qualities, as well. Skills, practice, and strength are crucial for the perception of affordances, as are the goals and intentions of an agent (Costall, 1995). I will return (in Sections The Intentionality of Affordances and The Individual Dimensions of Affordances) to discuss the various individual factors affecting the perception of affordances.

Newborn children perceive environmental affordances immediately. They are selective towards affordances that are connected to their mothers, such as their mothers' voices. Children's abilities to perceive affordances develop as they grow; in fact, children develop these skills systematically. Children's perception improves as they develop more physical skills. For example, when a child learns to walk, a new field of affordances opens up in the environment (Gibson & Schmuckler, 1989). When the environment changes, so does the growing individual. When a baby who doesn't walk yet is given a walking chair, he or she quickly learns new ways of behaving, such as looking far away, or making more contact with adults (Gustafson, 1984). Children also learn to be selective and pick suitable affordances based on less and more subtle information (Gibson, 2000). Affordances in the environment are perceived mainly through direct action, but indirect learning also takes place (Gibson & Spelke, 1983).

*The simplest affordances, as food, for example, or a predatory enemy, may well be detected without learning by the young of some animals, but in general learning is all important for this kind of perception. The child learns what things are manipulable and how they can be manipulated, what things are hurtful, what things are edible, what things can be put together with other things or put inside other things – and so on without limit. He also learns what objects can be used as a means to obtain a goal, or to make other desirable objects, or to make people do what he wants them to do. In short, the human observer learns to detect what have been called the values or meanings of things, perceiving their distinctive features, putting them into categories and subcategories, noticing their similarities and difference, and even studying them for their own sakes, apart from learning what to do about them. (Gibson, 1966, p. 285).*

The perception of affordances is also taught to children. Children are made aware of the world and its possibilities through language, pictures, toys and learning through example. Parents often instruct them step by step how to actualize affordances. On the other hand, parents also actively restrict the actualization of affordances (see field of constrained action in Section Affordances in a Social Context). In this way parents, teachers, and other adults transmit experiential information from one generation to the next and help children organize their world. By observing the activities of other children, a child learns yet more about the actualization of affordances.

It is possible that hints of the affordances are more pressing for children than adults (Costall, 1995). Although Vygotsky (1978) was unfamiliar with the theory of affordances, he stressed that objects dictate to children what they should do. A door demands to be opened and closed, a staircase to be climbed, and a bell to be rung. Some patients with brain damage are incapable of closing their eyes to pressing stimuli, and they cannot function independent of them. Freedom to either actualize affordances or not is perhaps a feature that develops gradually as children grow.

According to Gibson, learning is perceptual. It takes place in the relationship or system between the learner and the environment, i.e., learning is a phenomenon in the ecosystem. In fact, for Gibson learning is evolution of short duration. Affordances and their structures provide learning with ecological support, with something from which one learns, which is just as important as what is learned (Ihanainen, 1991).

### **THE ONTOLOGY OF AFFORDANCES**

One reason why the concept of the affordance is so fascinating is that it is philosophically challenging. It breaks the ontological and epistemological rules held in Western psychology. I have already referred to this theme in the section that deals with criticism against ecological psychology.

Ecological psychology represents direct realism and it opposes the dualistic treatment of person-environment relationships. Monism, the idea that humans (and all other organisms) form an inseparable unit with the environment, crystallizes in the concept of affordances through its combination of reality with the knowledge of reality. The perception of affordances is both an ontological fact and an epistemic act. A glass is an ecological structure independent of humankind, but at the same time it is an object that we know we can drink from. In the case of affordances, the object-subject division loses its meaning or effect because the dichotomy between the mental (subjective, meaningful) and the physical (objective, meaningless) is overcome. The reality and its perceiver are inseparable, but they both exist (Ihanainen, 1991). Therefore the concept of affordances is a transactional concept.

There are, however, conflicting views on the ontology of ecological perceptual psychology. Turvey (1992) thinks that the ontology of ecological perceptual psychology is materialistic and dynamistic. Sanders (1997), on the other hand, thinks that it represents neither materialism nor idealism, but naturalism. Heft (2001) describes the Gibsonian framework as neutral monism.

Ecological psychology is thought to reach beyond the one-dimensional exploration of phenomena that takes place in structuralism and functionalism. The simultaneous study of structure and function (in particular with affordances), as well as the analysis of the interaction between meaning and contents, perception, and function, is what makes this possible (Shaw & Hazelett, 1986).

According to Kadar and Effken (1994; also Heft et al., 1989, 2001), the ontological weaknesses in the concept of the affordance have to do with the lack of research on intentionality in ecological psychology. These authors suggest that the terminology used in ecological psychology be complemented with phenomenological terms<sup>38</sup>.

### THE TRANSACTIONALITY OF AFFORDANCES

Affordances exist only in the person (organism)-environment system. Affordance refers to both the perceiver and the object of perception simultaneously, so affordance is a relational concept. The affordance is situated between the individual and the environment without being a characteristic of either of them alone. Thus the concept of affordance breaks the dichotomic subject-object division and represents the transactional idea of the inseparably intertwined nature of the person-environment relationship.<sup>39</sup>

Affordances are derived from invariants; in fact, they can be thought of as invariants of invariants<sup>40</sup>. The transactionality of affordances extends into the organism-

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<sup>38</sup> Although ecological psychology has consistently opposed mentalism, ecological psychology and phenomenology share various historical and philosophical points of convergence. Especially the phenomenology of Heidegger and Merleau-Ponty, which diverged from Husserlian phenomenology, is philosophically related to the Gibsonian framework (Heft, 2001).

<sup>39</sup> Heft (2001) shows that the roots for Gibson's concept of affordances and the surpassing of the subject-object dichotomy are found with a representative of radical empiricism, William James. James talked about the simultaneous study of the "subjective" and "objective" sides of experiences, and said that experiences are often in this sense double-barrelled. One of the connecting links was Edwin Holt, a student of James and Gibson's mentor, who himself said his thinking represents philosophical behaviorism.

<sup>40</sup> Affordances are "...a unique combination of invariants, a *compound* invariant, (is) just another invariant" (Gibson, 1979/86, p. 141).

environment relationship, into relationships between various environmental elements, and even into relationships between structures of an organism. Information about affordances is information about the environment (exteroception), but at the same time is information about the organism itself (proprioception). As Gibson (1979/1986) put it, “An affordance ... points both ways, to the environment, and to the observer. So does the information to specify an affordance ... exteroception is accompanied by proprioception ... to perceive the world is to coperceive oneself” (p. 141).

Because an affordance needs a perceiver to be actualized, one might think that the affordance is a unique relationship (between subjective and objective worlds). The subject’s aims would then define affordances. Gibson (1979) warns against such subjectivism. Affordances exist on the ecological level regardless of whether the individual perceives them or not. The existence of perception is dependent on affordances, whereas the opposite is not true. Affordances exist as environmental resources, whether they are actualized or not. Still, it is the nature of affordances that they are defined through their relationship with the perceiver. For instance, a drinking glass as an affordance is dependent on both its ecological structure (invariant elements) and a subject who can use it (thirsty individual) (Ihanainen, 1991). Affordances can also be other than the so-called “right” uses of objects; in fact, each object has countless affordances. A small child perceives the affordance of a glass for drinking and spilling. This is why there are upright-staying mugs for small children, specially designed in the hope that the affordance for drinking will surpass the affordance for spilling (Hodges & Baron, 1992).

Not only are affordances relational to an active individual, their relationality also extends into the context of which the affordance is a part (Heft, 2003). For example, whether a chair is suitable for sitting is determined by the sitting person’s individual characteristics (bodily proportions and facilities, preferences, intention, etc.) and by the context in which the chair is situated. If an otherwise comfortable chair happens to be in a showcase at the Museum of Design, the chair is no longer perceived as a chair to sit on. The same physical space can be a different context in different situations. Barker’s (1968) concept of behavior setting is very useful in this context (I further discuss behavior settings below). For instance, the affordance of a basketball hoop in a school gymnasium can vary from being a hoop in a basketball game to being an affordance for hanging a curtain when the school gymnasium is used for a spring exhibition.

The individual and contextual prerequisites for the perception of affordances vary dynamically depending on the situation and on the person’s level of development. Small children’s abilities to perceive affordances in various contexts become more



subtle as they develop. The contextual and sociocultural dimensions of affordances are dealt with in more detail in Section Affordances in a Social Context.

So-called “wrong messages” are interesting examples in determining whether affordances are qualities of the environment or of the active individual. Gibson (1979, p. 142) gives the example of a situation in which a person walks into a glass door, thinking it is open space, and hurts himself. Gibson thinks that the affordance for walking through the door never existed, even though for a moment it did exist for the person who tried to walk through it (see Norman’s view in Section The Various Degrees of Usability of Affordances). Gibson concludes that the existence of an affordance is a property of the environment, rejecting the alternative that the affordance exists only if it exists to the perceiver.

*An important fact about the affordances of the environment is that they are in a sense objective, real, and physical, unlike values and meanings, which are often supposed to be subjective, phenomenal, and mental. But, actually, an affordance is neither an objective property nor a subjective property; or it is both if you like. An affordance cuts across the dichotomy of subjective-objective and helps us to understand its inadequacy. It is equally a fact of the environment and a fact of behavior. It is both physical and psychological, yet neither. An affordance points both ways, to the environment and to the observer. (Gibson, 1979/86, p. 129)*

The existence of affordances that are independent of the perceiver seems illogical if one seriously considers their location between the person and the environment – otherwise they would be environmental qualities. How then to solve the conflict that, on the one hand, affordances exist independently of the perceiver in the ecological reality and, on the other hand, they exist only in the relationship between the perceiver and the environment?

Heft (1989) suggests that *potential* affordances should be distinguished from *actualized* affordances (Heft, 1989; see also Shotter, 1983). This way potential affordances become qualities of the environment, and actualized affordances become individual relationships with the environment (if one is allowed to use such un-Gibsonian terms that separate the individual from his environment). The actualization of affordances can take place in various degrees. This will be discussed further in Section The Various Levels of Affordances.

Greeno (1994) sees affordances as prerequisites for action. The existence of prerequisites does not guarantee the actualization of action, but only opens the possibility of this taking place. Situational factors connected with individual perception and motivation present further prerequisites for the actualization of

activity. Affordances can also be seen as headings that include both perception and activity (Shaw & Hazelett, 1986). Like two sides of a coin, perception and activity serve as complementary pairs in all interactive situations between organisms and the environment. When the interaction arises more from the side of the environment, it is called perception. When it arises more from the side of the organism, it is called activity.

To give an example, the affordances of a playground seem different for each individual, and they can again be different for the same individual in different situations. Their existence is potential, independent of users, and they are “waiting” to be actualized. Each individual perceives the world through his own “affordance spectacles”. Children of different ages perceive affordances that correspond to their bodily qualities, to the functional demands of ongoing activity, and to their current intentions. A child can have his or her own affordance preferences. A common affordance preference with children appears to be that they are fascinated by affordances that push their limits and capacities. They want to stand on the highest point of the climbing apparatus, and to test the strength of the ice on a puddle that has just recently frozen over. As we will see in Section Affordances in a Social Context, social and cultural factors also control children’s perception and their actualization of affordances. Parents at a playground sometimes guide their children to perceive various affordances, or show them the limits of promoted action.

Even though affordances look different to each individual through his or her affordance spectacles, affordances can be more or less shared. In fact, a significant number of affordances are common to everyone. Perception of shared affordances is an essential part of socialization (Gibson, 1979).

In this context the connection of affordances to Barker’s (1968) behavior settings is very interesting. Heft (2001) suggests that the two be intertwined. The suggestion is based on the analysis of the shared theoretical roots between these two ecological traditions and on the study of their common features. Barker’s behavior setting refers to units of functional rules connected with various physical spaces, kinds of social codes of behavior in a given context. The place forms a physical and social system in which action at a given time takes place according to norms, rules, and practices. For example, the football field as a behavior setting is a complex collection of rules developed in the course of the history of the game. Football is played in specific places at certain times when two teams get together. The behavior setting has to do with the processes of functioning in a team. We are dealing with a socio-psychological, collective concept. Heft (2001) thinks that the behavior setting can be seen as a cluster of affordances. For example, children’s environments consist of behavior settings, which in turn consist of clusters of affordances. Different objects

can simultaneously have many affordances – clusters of affordances – for *the individual* to perceive. In my opinion, clusters of affordances are not sufficient to define behavior settings, because the clusters can just as well be perceived by one individual or by a whole group of people. My own interpretation of the relationship between behavior settings and affordances is that behavior settings represent *shared* affordances. Behavior settings are thus a group of those affordances that a group of agents shares in a certain place at a certain time.

Children and their parents share many affordances. Parents have learned to see the environment not only their usual way, but also the way their children see it through their affordance spectacles. This becomes evident when parents, e.g., forbid their children to engage in some dangerous activity before the children even do anything. The affordances of a playground are, however, different for the parents themselves than they are for the children. The parents may be interested in a bench where they can sit and eat, or they may be interested in a sunny bank from which they can observe the children. Social affordances are also essential: few mothers or fathers feel like spending long periods of time on a playground without the company of other adults. Like adults, children are able to perceive the environment through others' affordance spectacles. A small child who loves to play hide-and-seek is practicing this skill. He learns to hide out in a place that is not immediately perceivable by others.

A central feature of the transactional concept of affordance is that affordances are thought to be potentially existing, even though there is nobody to utilize them. On an individual level, potential affordances are part of the ecological reality that exists outside of the individual and independent of him, but as systemic facts between the individual and the environment, they represent reciprocity between subject and object. This way the outside world and the material environment become shared reality. This is, in my opinion, an essential view in environmental psychology. Research bent on idealism cannot find this shared reality. In an extreme case “anything goes”, relativism can take over (Karvonen, 1999). In that case it is difficult to discuss the quality of the environment as “one person likes this, and another that”. This makes environmental planning very difficult.

### **THE INTENTIONALITY OF AFFORDANCES**

The intentionality of affordances refers to the connection that affordances have to the motives and intentions of an agent. The actualization and nonactualization of affordances are connected to the intentional activity of an agent<sup>41</sup>. Connecting intentionality to affordances could be seen as mentalistic and contrary to Gibson's

theory, in which little attention is paid to the internal processes (motives, intentions) of an agent. To Gibson's followers the question of the intentionality of affordances has, however, been important, as criticism against the ecological approach has called for a closer look at the subjective side of affordances.

Heft (1989) was one of the first to discuss the intentional nature of affordances. Heft extended the body scaling of affordances to be part of intentional activity. Affordances are linked with the physical qualities of an agent, such as bodily proportions, but also with what the agent is able to do. Corporality becomes a way of actualizing individual intentions. This can also be expressed the other way around: environmental affordances and the physical qualities of an agent create the framework in which intentions can be actualized. Corporality in this context does not mean a mere collection of physical qualities but, like Merleau-Ponty put it, rather signifies "a vehicle for being in the world" (1963, 82).

The varied intentions that are involved in various situations lead perceivers to find more and more new affordances. For example, a book's affordance may be to act as a paperweight when a heavy wind hits papers that have been left on a table by an open window. A book has various potential affordances, the revelation of which depends on the various intentions of the agent. Intentions do not, however, by themselves determine the affordances of a book. A book must have certain physical qualities, such as sufficient weight, to have an affordance as a paperweight (Heft, 2001).

Gibson's critics have found it hard to accept the idea of intentionality without mental structures (Chow, 1989). According to the Gibsonian framework, the assumption about representation is not necessary. Intentionality can be connected to direct perception through activity that is always intentional. In other words, action and events are consecutive by nature; in the flow of events it is often possible to predict outcomes. Mentalism is avoided by using the argument that in a series of activities, the prediction of outcomes forms the basis for intentionality (Ginsburg, 1990).

Reed (1993), too, sees that the development of intentionality is the same as the ability to group activities into units through which one tries to achieve the desired outcome. However, Reed represents a compromise between the Gibsonian and the traditional approach. Ecological intentionality is not merely internal or mental,

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<sup>41</sup> In psychology the concept of intentionality is used in a more narrow sense than in philosophy. For psychologists the concept means goal-oriented, intentional activity. Philosophers use the concept in a wider sense to discuss the direction of internal (mental) states outwards and towards objects, events, and other things.

but expands into a dynamic, socially shared series of events in certain contexts. The internal, cognitive component of intentionality, such as the ability to plan one's activities, is just a part of intentionality. The process itself is more extensive and complex.

Intentional activity appears in situations where there is the possibility of choice between various affordances. Choice may also involve the question of whether an affordance will be actualized at all. Even a small child can react to affordances in immediate situations, but the persistent carrying out of intentional acts, which involves the combination of various contexts, develops gradually as a child grows (Reed, 1993).

One possibility to go around the Gibsonian ban on references to mental structures – something Gibson didn't actually do but which some of his followers did – is to supplement the terminology used in ecological psychology with Vygotsky's (1978) views. As he was studying children's development, Vygotsky noticed that toys can represent almost anything to a small child, depending on the situation. Playing is an interesting example of a transitional form between the appeal of affordances and abstract thinking unaffected by the environment. To Vygotsky (1986), intentionality is a phenomenon with social and historical components, not merely an internal, mental phenomenon. In connection with this, Looren de Jong (1991) has proposed that intentionality in relationship to the "inner" and the "outer" should preferably be examined as a continuum rather than as an either/or phenomenon.

#### **AFFORDANCES AS PART OF THE WHOLE OF ACTIVITY**

In Gibson's view (1979), affordances are perceived through action, and the perception of individual affordances is part of the whole of activity. For this reason it is valid to examine affordances as sequential and nested units, and to study the affordances that are connected with different levels of activity (Bærentse & Trettvik, 2002; Gaver, 1991). The following is a brief discussion on possibilities to extend the study of individual affordances into the study of meaningful units from the point of view of the agent, although I have yet to apply this approach in my own empirical research.

Mobility and action reveal affordances, the perception of which leads to the perception of sequential affordances. This way sequential affordances follow one another, and sometimes an affordance cannot even be perceived before the preceding affordance has been perceived and utilized. As was pointed out in the

previous section, with the help of sequential affordances it is possible to explain the connection that affordances have with intentions.

For example, the ladder of a playground slide enables one to climb up, after which the slide is an affordance ready to be slid on. One can also get carried away in sequential activity: a child playing in an enchanted forest finds more and more new affordances through his adventures. Climbing a tree reveals a strong branch on which one can build a tree house. The idea of building a tree house makes the child look for suitable building materials, which means that the twigs he passed by earlier become valuable. The accelerated finding of sequential affordances through fascinating activities can carry a child away so that time and place are forgotten about and action just flows (see Section The Emotional Dimensions of Affordances).

Affordances can also be nested affordances. Environments are full of nested affordances, such as the switches on electrical appliances, which naturally enable one to use the switch, but at the same time enable one to initiate some other activity as well (Gaver, 1991). The computer I use for writing contains nested affordances. The keys allow me to press them and in that way they enable me to produce letters and other functions, which in turn enable me to write articles, and eventually, to write a doctoral thesis. A dining table at a day-care center makes it possible for one to enjoy a snack (naturally the table has various other affordances, too), to eat an apple that has been left on the table, to bite it, to swallow the bits, etc.

Bærentsen and Trettvik (2002) hold the opinion that ecological perceptual psychology has convincingly analyzed perception as a functionally active process, but it has given the analysis of activity itself little attention. Therefore they suggest that ecological perceptual psychology be complemented with concepts of activity theory, and that the analysis of affordances be complemented with various levels of activity. The various aspects of activity, i.e., activity, action, and operation, can all be connected with affordances of various types. This approach seems promising, but it requires further theoretical and empirical research.

### **THE VARIOUS LEVELS OF AFFORDANCES**

It is preferable to discuss the various levels of affordances rather than to treat affordances as either/or phenomena (Greeno, 1994). First I will distinguish potential

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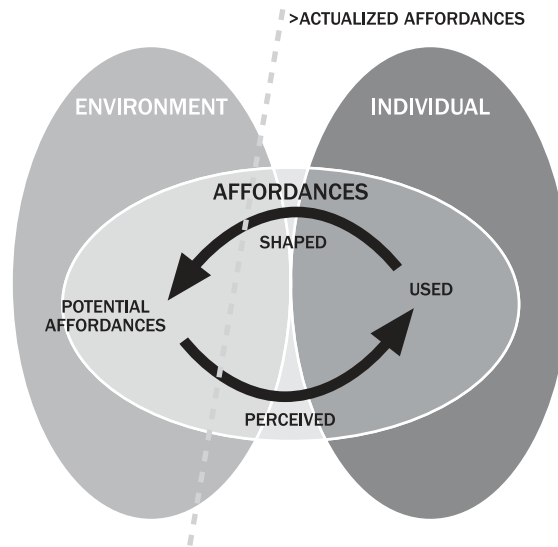
<sup>42</sup> In the Finnish empirical data presented in Article I, the relative number of *shaped* affordances was significantly higher in the rural village than in other localities, while the relative number of *perceived* affordances was significantly higher in the suburb than it was in other areas.

affordances from actualized ones (see Section The Transactionality of Affordances; Heft, 1989), after which I will take a closer look at the various levels of actualization of affordances. This division was used also in Article I<sup>2</sup>. In Section The Various Degrees of Usability of Affordances I briefly discuss the degree of the usability of affordances, although in my empirical research I have yet to study children's environmental affordances from this perspective.

All environments have countless numbers of potential affordances that no agent has yet perceived. Potential affordances can be looked at in relation to the individual, and described as a subset of potential affordances which exists for a certain individual and which is defined by the individual's qualities, such as children's physical skills or bodily proportions. On the other hand, one can also talk about units of potential affordances that are available to various agents. There is an infinite number of both individual and shared potential affordances. It is impossible to list all possible affordances for different individuals, groups, and situations.

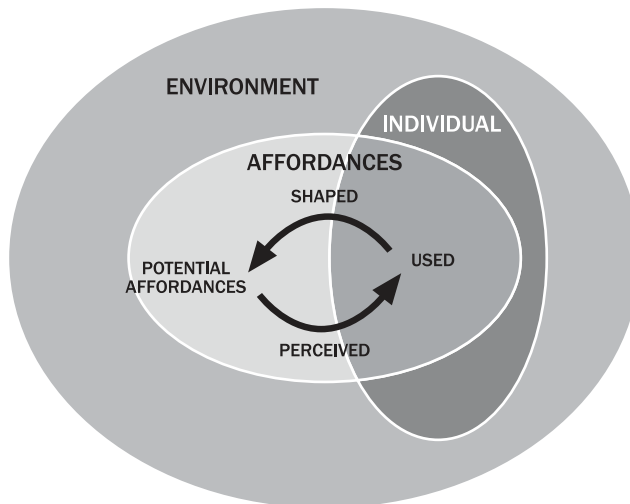
Actualized affordances include (a) affordances that have been perceived, (b) affordances that have been utilized, and (c) affordances that have been shaped. The qualities of an individual, as well as his or her current intentions, and other social and cultural factors determine which affordances out of all potential affordances the individual perceives in different situations (see Section Affordances in a Social Context). Individual and sociocultural factors also determine which of the perceived affordances are utilized and when they are utilized. Finally, it is also possible to actively shape the environment, to create new affordances, or to change existing ones. One can have an influence on the selection of potential environmental affordances, and thus have influence on the affordances available for other people (see Heft, 1989; Shotter, 1983). In this way potential, perceived, utilized, and shaped affordances form a cycle.

In Article I, affordances were identified as existing somewhere between the person and the environment, and the various degrees of affordances were presented as shown in Figure 1a. In the figure, potential affordances are depicted as environmental qualities, and the actualized affordances of various degrees are depicted as being part of the individual domain. This is based on Heft's (1989) solution to the dilemma concerning the placement of affordances (see Section The Transactionality of Affordances), in which the division between potential and actualized affordances was used to clarify whether affordances are part of the material environment or part of the inner world of individuals.



**Figure 1a.** Affordances are identified as existing between the environment and the active individual. The actualization of affordances for an individual can take place to various levels (see Article I).

Figure 1b is different in that it is more true to the Gibsonian framework: it doesn't present a dualistic view of the person-environment relationship and separate the individual from the environment.

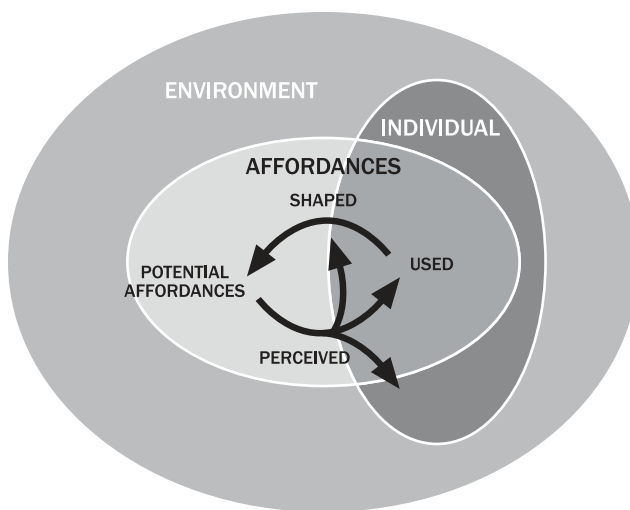


**Figure 1b.** Affordances of various levels, based on the nondualistic view of the person-environment relationship.



Finally, in Figure 1c I complete the schematic with a representation of negative affordances. Gibson defined affordances as positive and negative environmental opportunities and dangers: "... all these benefits and injuries, these safeties and dangers, these positive and negative affordances are properties of things taken with reference to an observer ..." (1979/1986, p. 137).

As Miller et al. (1998) pointed out, this two-sided nature of affordances is usually neglected in research that applies the theory of affordances – I know this from personal experience, having made the same mistake. Attention almost always centers on the positive environmental opportunities only, while negative affordances such as environmental dangers are treated dismissively<sup>43</sup>. In Section Affordances in a Social Context and Article II, I discuss the social or cultural factors that restrict the utilization or shaping of affordances. I also introduce a new field, the field of constrained action. Negative affordances haven't been dealt with systematically here, but in Section The Emotional Dimensions of Affordances my aim is to create a basis for the discussion on the emotional dimensions of affordances.



**Figure 1c.** Affordances of various levels, including negative affordances.

Red arrows indicate situations where the perception of a negative affordance results in avoidance, escape, or the shaping of an affordance.

<sup>43</sup> Perceived environmental dangers and frightening places of children have been studied in environmental psychology, but the negative feelings towards the environment have received much less attention than the positive ones (cf. literature related to favourite places, article III). An exception to the rule is the research on traffic environments. Research based on ecological perceptual psychology seems to contain a mismatch between research on positive vs. negative affordances

Gibson (1979) doesn't think of positive and negative affordances simply in terms of pulling and pushing forces as is the case with valences in Lewin's field theory. In Gibson's view, such pulling and pushing forces are not each other's opposites. For example, the affordances of a precipice and of an approaching lion are both negative; they are potential dangers or threats. However, only the lion requires that the perceiver retreat or escape, whereas the precipice simply requires the perceiver to keep a safe distance. One must also remember that danger can be appealing, and that people want to take conscious risks and test their skills.

Miller et al. (1998) saw that it is characteristic of both positive and negative affordances that they include choice. A positive affordance can be actualized or not, and a perceived danger can be avoided or faced head on. On the other hand, an environmental demand that doesn't include choice is, according to them, not an affordance. An example of such a situation would be when a person drops a burning hot vessel from his bare hands. Miller et al. (1998) pointed out that the majority of changes in our activity have to do with demanding situations. Even a persistently ringing phone can be interpreted as such. The necessity for the division between affordances and environmental demands should be studied as part of the theoretically significant project of emotionalizing affordances.

An individual's earlier experiences, as well as social and cultural factors, play a part in the perception of the meaning of affordances. The same affordance in different situations, or the same affordance perceived by different persons, can transform into either a positive affordance, a negative affordance, or an environmental demand. To give an example, a playground slide can be perceived by a child's mother as a positive affordance when her child is seated and about to slide down, or as a negative affordance if the child is standing at the top of the slide. Another mother may perceive the slide as dangerous or demanding right from the start, in which case she will hurry to intervene (Miller et al., 1998).

Those who are acquainted with children's behavior know that children – just like many adults – do not try to consistently avoid environmental dangers, i.e., negative affordances. Danger holds a fascination for children, and they like to take risks when they are active in their environments (Jambor, 1986; Hart, 1979). Negative affordances can sometimes be actualized. Thus the schematic in Figure 1b does not necessarily look different when applied to negative affordances. On the other hand, one might think that a negative affordance would be more likely to boost the perceiver's desire to shape the environment. He or she may want to change a dangerous place, in which case a perceived danger can be directly followed by the shaping of an affordance. In such cases the schematic would look slightly

different<sup>44</sup>. A dangerous affordance can result in either escape or avoidance (as was shown by Gibson's example involving the lion and the precipice). In this situation the perception of an affordance is followed by its rejection. In Figure 1c I aim at pre-presenting a preliminary formulation of various situations involving the perception, utilization, and shaping of negative affordances.

The nature of shaped affordances requires further research. The intention to shape affordances usually includes a vision of an environment that is different from the existing one (see Article V). It is a theoretically interesting question whether in that case one can still use the framework of direct perception or whether one needs to apply the multichannel model of perception.

### **THE VARIOUS DEGREES OF USABILITY OF AFFORDANCES**

In addition to affordances of various levels – potential, perceived, utilized, and shaped ones, on the one hand, and negative and positive ones, on the other hand – one can also discuss affordances from the perspective of their various degrees of usability. Although my own research lacks this perspective, I consider it crucial for the planning of child-friendly environments, which is exactly why I bring it up here.

The concept of affordances has been applied widely, particularly in industrial design and information technology<sup>45</sup>. Donald Norman introduced the concept to industrial design in his book, *The Psychology of Everyday Things*, in 1988. These industries use the concept slightly differently from its original definition put forth by Gibson.

Even though Gibson did not express his views specifically, for him affordances were clearly binary, i.e., they either existed or didn't exist. For example, stairs either make climbing possible or they don't. Gibson did not consider the option that there could be various degrees in the usability of affordances. Stairs may be possible for an 18-month-old to climb, but it requires great effort. Warren (1995) was able to

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<sup>44</sup> Also in the case of positive affordances, the perception of an affordance can be directly followed by its shaping. This alternative can be, however, more likely in the case of negative affordances.

<sup>45</sup> For example, with the search word "affordance" the Internet-based search engines find applications of the concept produced almost solely in these fields.

find the ideal height for steps, one that enables the maximum number of people of various heights to climb stairs with minimum effort<sup>46</sup>.

It is quite natural that user-friendly designers would emphasize the various degrees of the actualization of affordances. A chair can be more or less good for sitting, just as a building, or a whole residential area, can have various degrees of user friendliness. Everybody who loves top design knows that sometimes even top designer products fail in their main purpose, and that a designer chair can be extremely uncomfortable, or that a building that has been praised for its architecture can be impractical for its users (Niemenmaa & Jauhiainen, 2001).

According to Gibson (1979), affordances are usually determined directly through perceptual information. The exception would be misleading information about affordances. “When Koffka assured us that each object will tell you what it is, he forgot to mention that objects can lie” (Gibson, 1977, pp. 81–82). Affordances can be “false”, i.e., an affordance is perceived even though it doesn’t really exist. This happens when we walk into a glass door. In the same way, an existing affordance may go unperceived. In Gibson’s (1977) view, false perceptions can be explained in two ways: either the information available is insufficient, or the reception of information is insufficient. It is for these reasons that quicksand is sometimes mistaken for hard soil, and acid for drinkable liquid.

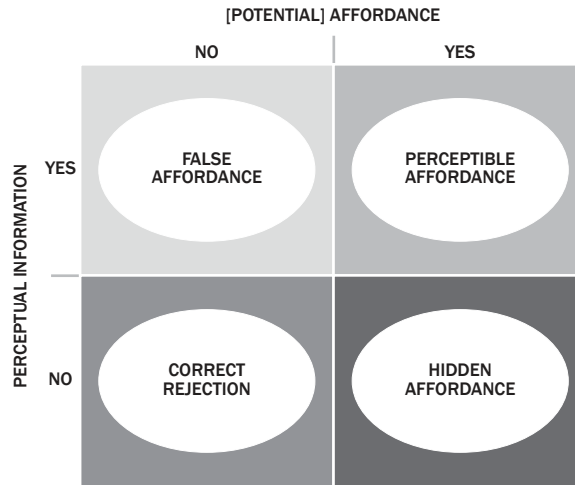
Designers seem to be particularly interested in situations where perceptual information is misleading. A potential affordance exists, even if no one perceives it, when a door blends into a paneled wall. Designers analyze false perceptions by separating affordances from the perceptual information that defines them (McGrenere & Ho, 2000). Norman (1998, p.123) asserts, “It’s very important to distinguish real from perceived affordances. Design is about both, but the perceived affordances are what determine usability.” In my opinion, instead of talking about “real” affordances, one should in this context talk about potential affordances, whose opportunities for actualization are influenced by hints coming from perceptual information.

Figure 2 shows how Gaver (1991) distinguishes between perceived, hidden, and false affordances through a simultaneous analysis of the perceptual information that determines the affordances and of the existence of an (potential) affordance. McGrenere and Ho (2000) in turn suggest that both defining factors of the usability

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<sup>46</sup> Pufall and Dunbar (1992) tested the ability of children of various ages to perceive the usability of stairs. Even though children grow physically, their ability to perceive these affordances remains the same.

of affordances, i.e., the quality of perceptual information and the degree of facility of actualization, should be studied as continua. Good design aims at simultaneously including both factors.



Note: Figure taken from “Technology Affordances” by W.Gaver, 1991, Proceedings of CHI’91. New Orleans, Louisiana, April 28 – May 2. pp. 79–84.

**Figure 2.** Distinguishing between the existence of potential affordances and the perceptual information that determines them facilitates the differentiation of hidden and false affordances from other perceived affordances.

The distinction of the existence of potential affordances from the perceptual information that determines them gives rise to the idea that designers manipulate perceptual information. One central task for designers is to make affordances perceptible. A well-designed object will tell you directly how it should be used. In my opinion, environmental psychologists and architects should also be interested in the various degrees of usability of affordances. A playground as a whole can have appeal of various degrees for children, and its swings may offer possibilities for various degrees of swinging. A swing may be such that even a heavier child can properly swing on it, or it may be too unstable for almost anyone. In the future in the study of affordances there should be analysis of the differences in the usability of affordances, as well as analysis of the connection that the degree of usability has with the appeal of an affordance.

## **AFFORDANCE CATEGORIES FOR CHILDREN'S ENVIRONMENTS**

In the previous section I distinguished positive affordances from negative ones. In this section I will discuss the existing categories of positive affordances. The affordance categories developed for children's environments are also introduced. I have used these categories in Articles I and V.

Even though Gibson (1986/1979) was not particularly interested in categorizing affordances, he lists some affordances for humans. They include, e.g., medium, substances, surfaces and their layouts, objects (both "attached" and "detached"), places, events, other people, and animals.

Table 2 presents the affordance categories that I use for children's environments. They are an application of Heft's (1988) categories, which were based on various observational studies on children's behavior in an outdoor environment<sup>47</sup>. Heft listed and categorized all those situations of reciprocity (= affordances) where children were involved with the material environment. The result was ten different environmental features or categories which facilitate the discovery of certain affordances. Each category includes at least two different affordances. For my own categorization I deleted one category<sup>48</sup> because it was difficult to operationalize as a question in an interview. Instead of that category I added a new category, affordances for sociality (Gaver, 1996; see Section Affordances in a Social Context), by which I mean elements of the material environment that facilitate social activity. This category was also inspired by van Andel's (1984/1985) research on functional categories of children's outdoor games.

The added affordance category of affordances for sociality is a preliminary attempt to map those elements in the material environment that are connected to children's social activity. Affordances for socialization deserve further research. This is particularly the case when research is carried out on the environmental affordances of adolescents and adults. Clark and Uzzell (2002) have studied affordances for socialization and places for retreat and being alone in the home environment, neighborhood, school, and city center. As I studied the affordances of densely built residential areas and courtyards, I found mostly affordances for socialization, affordances for retreating from social relationships, and emotional affordances such as affordances for restoration (Kytta, 1996; Kytta et al., 2000).

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<sup>47</sup> The studies were published in the books *One Boy's Day* (Barker & Wright, 1951), *Children's Experience of Place* (Hart, 1979) and *Childhood's Domain* (Moore, 1986).

<sup>48</sup> I excluded the category of "aperture" (affords locomotion from one place to another, affords looking at and listening to an adjacent place).

Table 2.

Affordance categories for children's environments as described by Kyttä (2002).

Environmental qualities that support certain affordances	Affordances	Environmental qualities that support certain affordances	Affordances
Flat, relatively smooth surfaces	<ul style="list-style-type: none"> <li>· affords cycling</li> <li>· affords running</li> <li>· affords skipping</li> <li>· affords skating</li> <li>· affords playing hopscotch</li> <li>· affords skiing</li> <li>· affords playing (football, ice hockey, tennis, or badminton)</li> </ul>	Attached objects	<ul style="list-style-type: none"> <li>· affords jumping over</li> <li>· affords jumping down from</li> </ul>
Relatively smooth slopes	<ul style="list-style-type: none"> <li>· affords coasting down</li> <li>· affords skateboarding</li> </ul>	Nonrigid attached object	<ul style="list-style-type: none"> <li>· affords swinging on</li> <li>· affords hanging</li> </ul>
Graspable/detached objects	<ul style="list-style-type: none"> <li>· affords throwing</li> <li>· affords digging</li> <li>· affords building of structures</li> <li>· affords playing with animals</li> <li>· affords using plants in play</li> </ul>	Climbable feature	<ul style="list-style-type: none"> <li>· affords climbing</li> <li>· affords looking out from</li> </ul>
		Shelter	<ul style="list-style-type: none"> <li>· affords hiding</li> <li>· affords being in peace and quiet</li> </ul>
		Moldable material (dirt, sand, snow)	<ul style="list-style-type: none"> <li>· affords molding something</li> <li>· affords building of snow structures</li> </ul>
		Water	<ul style="list-style-type: none"> <li>· affords swimming</li> <li>· affords fishing</li> <li>· affords playing with water</li> </ul>
		Environmental opportunities for sociality	<ul style="list-style-type: none"> <li>· affords role-playing</li> <li>· affords playing rule games</li> <li>· affords playing house</li> <li>· affords playing war</li> <li>· affords being noisy</li> <li>· affords following/sharing adult's business</li> </ul>

The affordance taxonomy that I have used is applicable not only to studies of eight-year-olds as in my research, but also to studies of outdoor affordances of about five- to twelve-year-old children. The affordance categories of smaller children should be supplemented by, for example, affordances for crawling and rolling, pushing

carts, etc. The affordance categories of the environments of children older than twelve years should have in particular more multidimensional affordances for socialization.

I Gibson's categories the affordance types are nested and intertwined; for example, places and objects are included in events. Affordances could also be categorized on the basis of whether they belong to the animate or inanimate environment (Miller et al., 1998). Gibson (1979) stresses that for a human being the most significant affordances are other people and animals. This makes affordances reciprocal: a woman's affordances for a man are reciprocal to what the man offers the woman. A human being is also, at least to a certain extent, capable of perceiving affordances that are available for another human being (i.e., is capable of seeing the world through the eyes of his fellow human), as well as of perceiving which of his or her own affordances are available for the other. In the future, the research on the environmental affordances of children should concentrate on the various degrees of usability of affordances (see the corresponding Section), on affordances as part of the whole of activity (see the corresponding Section), on affordances for socialization or shared affordances (see Section Affordances in a Social Context.) as well as on negative affordances (see Sections The Various Levels of Affordances, The Emotional Dimensions of Affordances and Negative Affordances As Part of the Social and Cultural Dimensions of Affordances).

## **SUMMARY**

In this section I have looked at the affordance as a theoretical concept. I have introduced Gibson's views on the special nature of affordances and their location between the human being and the environment. In Gibson's view, objects and other things are not perceived as such but are rather perceived as opportunities for action, as functional values, which means that the perception of functional value (meaning) is primary. Objects offer themselves to be grabbed at, twisted, lifted, etc. Surfaces exist to be run on, climbed, slid on, etc. An affordance is not solely an environmental quality any more than it is a quality of an active organism. The concept of affordances thus breaks the dichotomic subject-object division and represents the transactional view of the inseparably intertwined nature of the person-environment relationship.

Gibson's followers have expanded and specified the various dimensions of the concept of the affordance. There are various degrees of potential and actualized affordances. Perceived, utilized, and shaped affordances represent the various levels of actualized affordances. Potential affordances exist in the ecological environment



even if no one uses them. Potential affordances can be defined either individually or collectively. The actualization of a potential affordance shows clearly how affordances are positioned between the person and the environment. Each individual perceives, utilizes, and/or shapes the affordances that fit with his or her personal qualities. Traditionally the actualization of affordances has been seen as connected to the bodily qualities and facilities of an active individual, but also the intentionality of an agent is an essential factor in the actualization of affordances.

Affordances are basically either positive, meaning that they are environmental opportunities, or negative, meaning that they are environmental dangers. However, not much research has been carried out on negative affordances. Affordances can be seen as shared affordances and as part of the whole of activity. Designers are particularly interested in the various degrees of usability of affordances. Finally, I introduced affordance categories that I have made use of in evaluating children's environments.

The concept of affordances facilitates transactional and multidimensional research on children's environments. In the following section I will further discuss the uses of the concept of the affordance in defining the conditions and criteria for child-friendly environments.





## 5. Affordances in the Definition of Criteria for Child-Friendly Environments

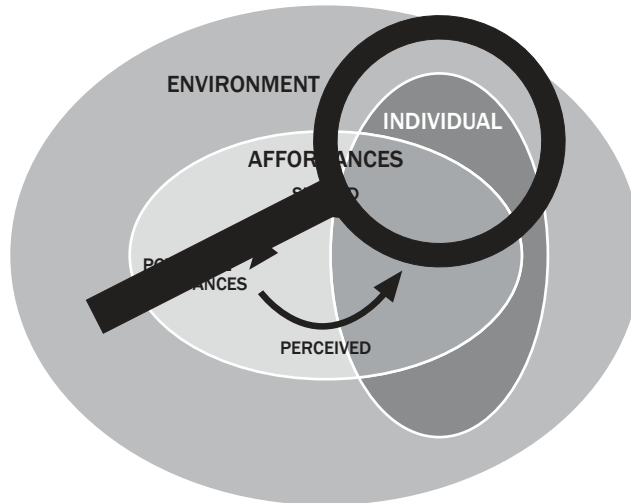
Here I will further examine child-environment interactions from the transactional perspective. I also aim to define the criteria for child-friendly environments. In this section I combine the theoretical perspectives that I introduced in the five articles by examining the child-environment interaction from three different perspectives.

As became evident in the previous section, affordances are situated in the interaction between the person and the environment (see Figure 1b). I will discuss the interaction from three perspectives looking at the various parts of Figure 1b. Although it is customary in the transactional approach that no components of any unit are studied separately from the unit, I will approach the various parts of the system from three different angles without overlooking the other components of the system. Firstly, I will look at the role of active children when they interact with their environments. Secondly, I will discuss the social and cultural factors that control the actualization of potential affordances. And thirdly, I will take a closer look at the prerequisites set by various hypothetical environments for the actualization of affordances, while defining the criteria for a child-friendly environment.

### **THE INDIVIDUAL DIMENSIONS OF AFFORDANCES**

My research, rather than emphasizing the individual differences involved in the perception of affordances, has been concentrated on mapping out the environmental conditions that are connected to the number, quality, and actualization of affor-

dances in children's environments. However, two of my articles include discussion on the individual dimensions of affordances (Articles III and IV). For this reason, I will briefly discuss affordances as part of the perceptual cycle, and I will also discuss the emotional dimensions of affordances (see Figure 3). Finally, I suggest that the theory of affordances be complemented with an emotional dimension.

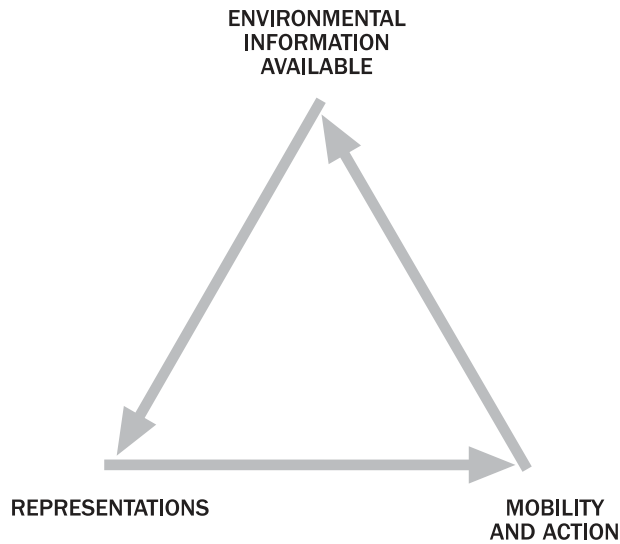


**Figure 3.**  
Focusing on the individual dimensions of affordances

#### **Affordances as Part of the Perceptual Cycle**

Article IV was based on Neisser's (1980) perceptual cycle. Here I will look at the perceptual cycle in connection with Neisser's later work (Neisser, 1989, 1991, 1994), as well as in connection with the framework of ecological perceptual psychology.

Neisser's perceptual cycle (1980) substantially complements the traditional information-processing framework by introducing action and mobility as parts of the perceptual cycle (see Figure 4). Neisser's perceptual cycle is an information-processing model in which perception is constructed into meaningful inner representations based on potential, earlier representations. Representations direct both action and the search for new information in the environment, activities which eventually validate the representations or result in changing the representation so that it corresponds to reality. The perceptual cycle, however, gives no further clues as to how mobility and action in fact promote perception. Perception is only thought to be enriched as the moving perceiver sees more things (Heft, 2001). It also remains unclear what exactly is perceived of the environment.



**Figure 4.** Neisser's perceptual cycle.

From the perspective of the framework of ecological perceptual psychology, Neisser's model should be developed so that the role played by the perceiver's mobility and action becomes concretized in the perceptual process, and so that the nature of the information available in the environment becomes more specified. Neisser (1991, 1994) has himself also come up with such elaborations. According to Gibson (1979), the environment is primarily perceived as affordances that are determined by unchanging pieces of perceptual information called invariants. The information available in the environment is not just bits of stimulus that have to be constructed into meaningful perceptions via cognition; instead, perception is loaded with meaning. A unique collection of affordances is actualized for each perceiver in each situation. Through mobility and action the invariant environmental structures are revealed. The moving perceiver can see both changing and unchanging structures in the optical flow<sup>49</sup>. The perception of invariant structures is promoted also by the fact that perceiver-controlled mobility facilitates the perceiver's simultaneous perception of himself or herself and the environment. The additions of ecological perceptual psychology to the perceptual cycle are thus, on one hand, related to the upper part of the triangle. The information available in the environment is specified into affordances and invariants. On the other hand, the nature and function of the

<sup>49</sup> Invariant structures can also be detected by using sense faculties other than vision. Gibson (1979) emphasizes systemic, multisensory perception, but most of his research is on visual perception.

individual's mobility and actions can be defined as the analysis of optical flow and as the active search for invariant structures.

In ecological perceptual psychology, references to mental representations are not necessarily made at all, and even when they are made, the emphasis lies on the ecological interpretation of representations or cognition. This being the case, cognition is not something abstract, but rather is closely connected to corporality as well as to the situation in which perceptions occur.

As became evident in Section Combining Ecological Perceptual Psychology With the Information-Processing Framework, Neisser (1994) defends the two-channel or multichannel model of perception. Based on this, Neisser's perceptual cycle splits into various parts (see Figure 5). The inner circle of the supplemented perceptual cycle – referring to the earliest perception channel in the individual's development – includes social perception. Social perception has, in Neisser's view, features from both direct perception and recognition, and it reveals social affordances. The perception channel that develops next is direct perception, which is responsible for the navigation of action and which reacts to functional affordances<sup>50</sup>. Ontogenetically the last perception channel to develop is recognition, through which one identifies objects and which also reveals invisible affordances, those affordances that cannot be perceived through the senses.

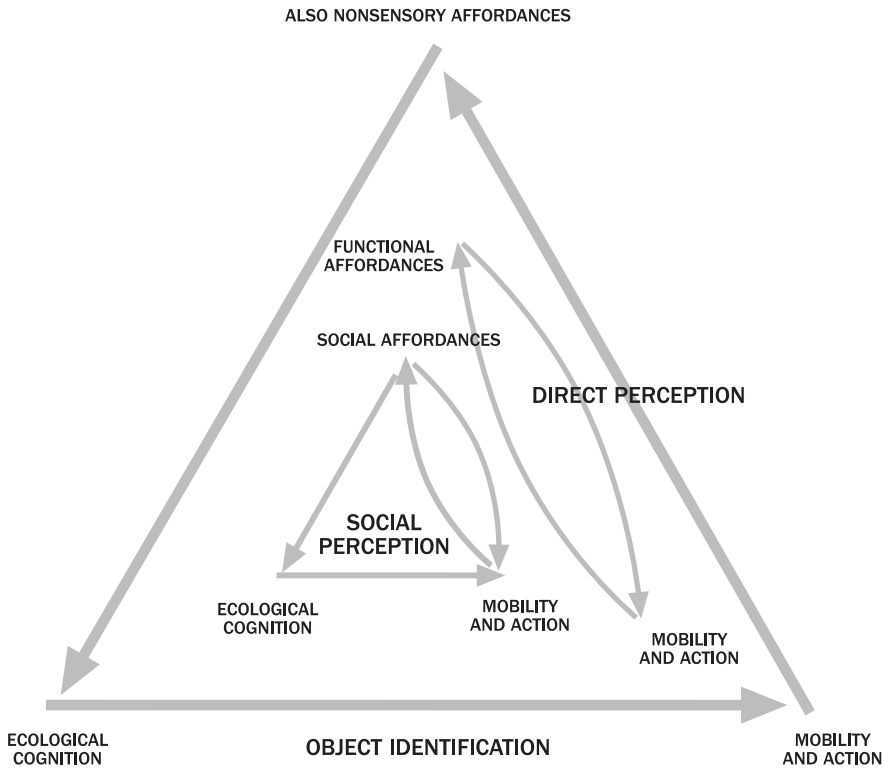
In a multidivisional perceptual cycle, the cycle of direct perception does not include representations. Representations can, however, be connected to social perception and recognition. The nature of representations can be described as ecological at least when it is a question of perception, not of thinking or deduction (see Section Ecological Cognition: Does It Exist?).

In Neisser's view, the inner perceptual channels of the perceptual cycle are dominant in children<sup>51</sup>. As this doctoral thesis consists of studies of eight-year-old children, and in particular focuses on the action that takes place in their outdoor environments, I feel it is valid to emphasize the framework of direct perception, even though I do not claim that other channels of perception are nonexistent.

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<sup>50</sup> Ecological perceptual psychologists also talk about the perceptual cycle or the perception action cycle (PAC; Reed, 1993). In the PAC the exploratory activity of the perceiver reveals affordances that are directly included in performatory activity. Thus the ecological perceptual cycle does not demand the inclusion of representations as a construct.

<sup>51</sup> No researcher has, to my knowledge, presented age limits for when the outermost channel enters the picture.



**Figure 5.** The three-channel model of perception. The model is based on Neisser’s multichannel model of perception, complemented by definitions drawn from ecological perceptual psychology.

### The Emotional Dimensions of Affordances

As I already mentioned in Section The Various Levels of Affordances, affordances can be defined either as positive or negative. Gibson (1979/1986) pointed out that meaning and value are inherent features in affordances. Thus meaning and value are not secondary experiences to be pasted over value-neutral affordances, but rather they are perceived as immediately as is the object itself.

*The perceiving of an affordance is not a process of perceiving a value-free physical object to which meaning is somehow added in a way that no one has been able to agree upon; it is a process of perceiving a value-rich ecological object. Any substance, any surface, any layout has some affordance for benefit or injury to someone. (Gibson, 1979/1986, p. 140)*

In the previous section I discussed the “socialization” of all affordances. In a similar fashion I could talk about the “emotionalization” of all affordances. With this one

is looking for the motivational basis for the utilization of affordances. According to Gibson (1966), the motivational basis for a person's actions is connected either to performatory or exploratory action. Performatory action is directed at existing environmental resources, objects, or people according to the current aims of the individual. While exploratory action is taken to reveal new qualities in the environment, the end result of such action is not necessarily predictable.

Affordances carry their own emotional contents that include not only positive or negative meanings, but also more subtle emotional meanings. For example, an affordance for climbing can be an exciting, fascinating affordance to an individual such as my colleague, who loves rock climbing, but can be an insignificant or negative, even terrifying affordance to some other individual. Every affordance can have its own emotional coloring that is uniquely apparent to each individual. It is possible for a place to be emotionally appealing even if its functional affordances are not rich and, vice versa, functional versatility does not necessarily guarantee the emotional appeal of places.

The intensity of the emotional value of affordances is apparently flexible. In extreme cases the value of affordances can be primarily emotional. In line with Gaver's (1996) discussion of affordances for sociality, one could talk about affordances for emotionality. These kinds of affordances are sometime found in physical places that provide one with experiences of beauty, restoration, or other emotions. For example, von Bonsdorff (2000) discusses affordances as one of the defining factors in a person's aesthetical experience of a residential area<sup>52</sup>. The contents of affordances can, in her words, extend quite naturally from basic, functional affordances to aesthetical, social, and cultural areas of life.

For example, the affordance of a fire in a fireplace on a dark autumn night is more emotional than functional. Watching the fire is a restorative experience. The flicker of the flames may help the person sitting in front of them to forget about a stressful day (Kaplan et al., 1998). In some other situation, such as on an outdoor trek, the functional affordance of a fire is primary. The hikers need to build a fire fast, so that they can cook a meal and keep warm by the fire. The emotional and functional contents of negative affordances can also vary. One must stay sufficiently far from a fire in order not to get burned. A pyromaniac finds the devastation caused by fire irresistibly enticing. To other people, however, a fire that is out of control is a demand, an emergency that no longer represents an affordance.

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<sup>52</sup> In addition to affordances, Bonsdorff mentions in this context enticement, which can be seen as another dimension of affordances (and in fact resembles a concept of mystery by R. and S. Kaplan), and generosity and recognizability.



As I reported in Section Transactional Environmental Preference Research, transactional environmental preference research can offer a basis for the emotionalization of affordances. Preference studies have revealed many of the qualities of the physical environment that are connected to environmental preferences as well as the restorative qualities of environments. Like Gibson, Kaplan in his theory of preferences defines the motivational basis for action either as a desire to understand the environment (cf. performatory action) or as a desire to investigate the environment. The former includes order and legibility of the environment, the latter the complexity and mysteriousness of the environment (Kaplan, 1987; Kaplan et al., 1989).

As we pointed out in Article III, the two most common reasons for children's place preferences were functional affordances and friends. At the same time, approximately half of the children said they used their preferred place for restoration. Children's place preferences were typically sports and residential settings. Contrary to what one might expect, natural environments were not the most commonly preferred settings. Natural environments were also not significantly linked to the restorative use of settings. This seems to suggest that for children, functional and restorative affordances may be closely connected. Functional activity may be restorative for children in rather the same way as retreating into a natural environment is for adults (Korpela & Hartig, 1996; Korpela et al., 2001). Future research should concentrate on a further theoretical and empirical study of the connection between restoration and affordances.

The functionalism of children's place preferences may also have to do with the fact that action in itself feels rewarding, even captivating. The emotional contents of affordances are then linked with the functional whole of which the affordance is a part (see Section Affordances As Part of the Whole of Activity). In this context Csikszentmihalyi's (1996) flow theory might be useful. According to the theory, so-called autotelic, i.e., inner motivated, action produces emotionally positive experiences for a person, and a high level of activity is maintained for the action itself without any external stimuli or rewards. Flow takes place in situations where one becomes so absorbed in activity that the rest of the world seems to disappear. One loses oneself in the activity<sup>53</sup> (Tynjälä, 1999). Flow seems to call for a balance between the requirements of the activity and the skills and facilities of the person (see P-E fit, Section The Person-Environment Fit Operationalized Using Affordances). Naturally, flow should be seen as a continuum in which the degree of flow may vary. Further research should also be done on the conceptual and empirical connections between feelings of fascination and experiences of flow and restoration (see Williams & Harvey, 2001).

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<sup>53</sup> Horelli-Kukkonen (1993) noticed the same phenomenon in rooms that were reserved for recreation, such as rooms for woodwork.

Flow can take place in the actualization of an affordance, or in the functional whole of which the affordance is a part, in cases in which the actualization of the affordance is suitably challenging and interesting. For instance, a child who is learning to ride a bicycle can be totally engrossed in the activity. It is also possible that a single affordance triggers flow while a child is playing.

One way of looking at the emotional contents of affordances is to look at the amount and the quality of feedback coming from the environment. “Children seem to be especially excited about and continue utilizing such affordances, which give them clear feedback on their activities” (Chawla & Heft, 2002, p. 210). The amount of feedback information that is related to the utilization of affordances would thus be something upon which affordance preferences could be based. Feedback can be received directly from the material environment as well as from the social environment. This could explain, for example, why children are always fascinated by water and sand, as well as by other affordances in the natural environment. Feedback concerning a functional success can produce experiences of mastery or self-efficacy, which may in turn be linked with the ability to utilize affordances, or to manipulate them, or to create new affordances.

For this reason one might have expected to find that in the place preference study presented in Article III, natural environments would have been dominant. The research, however, was conducted exclusively among urban children. Although the studied urban environments had been selected in a way that guaranteed versatile affordances, the affordances normally seen in natural environments are limited in an urban environment. The mobility restrictions of urban children (see Articles II and IV) may also restrict the actualization of affordances in natural environments. Natural environments can also be situated too far away, out of reach for children, as was probably the case with the suburb presented in Article I. The research in Article III also did not indicate a connection between children’s mobility licenses and the quality of place preferences, which may have been due to the only slight variations in mobility licenses in our data. The existence of a possible connection cannot, however, be dismissed, and the matter requires more research in the future.

Multisensory, at times conflicting information about affordances can also evoke strong feelings. When visual and auditory information support each other it is usually experienced as pleasant. The emotional dimensions connected to the multisensory perception of affordances present an interesting challenge to future research (Carles et al., 1999).

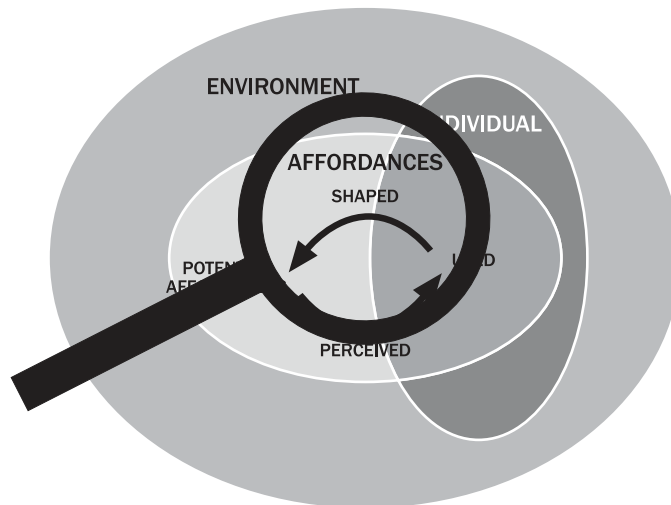
The challenge my research presents to future studies on affordances is for them to clarify the emotional dimensions of affordances, as well as the motivational basis for the actualization of affordances. Negative affordances in particular need

clarification. Such clarification will change our conception of the environment. Instead of seeing it as a field of positive affordances, one sees it as a more realistic setting with restrictions on the actualization of affordances, negative affordances, and other environmental demands. The research at hand is mainly concerned with the various dimensions of positive affordances, and with the social and cultural restrictions related to their actualization. These will be dealt with in the next section.

There are probably many other ways of taking up the challenge of the emotionalization of affordances, apart from the ones already mentioned. Baron and Boudreau (1987) have already made references to this challenge, but for some reason researchers have not taken it up yet. This could be due to difficulties encountered in crossing the borders between various fields of psychology. The concept of affordances has a potential for use in personality, social, perceptual, and environmental psychology. Any attempts to do further research on the concept require familiarity with research done in all these fields.

#### AFFORDANCES IN A SOCIOCULTURAL CONTEXT

Affordances are easily thought of as belonging to the private reality of the individual perceiver without any reference to sociocultural contexts (Costall, 1995). This is why Costall proposes that (almost) all affordances be recognized as having their social dimensions (see Figure 6). In this section I will briefly explain the on-going discussion on the social and cultural dimensions of affordances, and then present my synthesis and interpretation of the discussion.



**Figure 6.**

Focusing on the sociocultural dimensions of affordances.

### **The Social and Cultural Dimensions of Affordances**

Gibson (1979/1986) emphasized the material and functional natures of affordances. Because of this his followers have disagreed on matters such as to what extent immaterial phenomena can be considered affordances, or in what ways social and cultural factors are related to the perception of affordances. Gibson hardly wanted to divide the world up into material, social, or cultural worlds, as he was against all division of environmental experience. Gibson's aim was to dismantle the artificial dichotomy between the person and the environment. In a similar fashion he also saw no reason to emphasize the difference between material and social environments. To him material and social environments are strongly intertwined, and inseparably so.

This becomes evident in Gibson's description of the affordances of a mailbox. In a Finnish context an orange-yellow mailbox invites one to mail the letters one is carrying. Everybody who is over 6 years old and a product of this culture identifies the affordance of a mailbox and knows where to find one. In Gibson's view (1979, p. 139), we don't perceive only the bright-colored mailbox; instead the mailbox represents the whole of the complex social system of which the postal services are a part. "Mailbox" is a part of this system, and it is perceived as a sociocultural object. Sociocultural meanings are not, however, inherent in *potential* affordances. A person who is a product of a culture in which mailboxes are different, or in which postal services do not exist, is not able to identify the affordances of a mailbox. Sociocultural factors are related to the *actualization* of affordances, i.e., their perception, utilization, and shaping (Reed, 1993).

According to Gibson (1979), also other people offer versatile affordances. "When you touch them, they touch you back, when you hit them, they hit you back; in short, they are interacting with the perceiver and with each other. Behavior affords behavior ..." (Gibson, 1979, p. 135). Gibson was referring to "social" affordances, even though he didn't call them by that name. Other people provide us with a rich and complex interactive network with sexual, exploitative, nurturing, argumentative, playful, cooperative, and communicative affordances. These affordances are reciprocal: a woman's affordances to a man, and a man's to a woman; a mother's affordances to her child, and the child's to her mother (Gibson, 1977).

The majority of Gibson's own affordance-related examples have to do with functional affordances. Gibson never categorized the social dimensions of affordances. Many social psychologists, like Knowles and Smith (1982), regard the perspectives of ecological psychology as promising for the study of social situations. For example, Hodges and Baron (1992) point out that material objects and the activities related

to them speak more than do words about social laws, values, and rules. The nonverbal messages of the material world have long been studied in environmental psychology (Rapoport, 1982; Horelli-Kukkonen, 1993). According to Baron and Boudreau (1987), affordances explain social behavior better than do the so-called trait theories. People's reactions may vary in different situations, in which case those theories that are based on permanent, unchanging patterns of behavior simply do not work. The theory based on affordances is particularly applicable to social situations in which people are face to face with each other.

In Gibson's view, both the material and cultural environments have been shaped by humans. Only a fraction of our world remains in an intact, virgin state; most of it has been shaped by generations of people. Objects, surfaces, roads, even plants and animals, have been shaped by human activity. Anthropologist Tim Ingold (1992) defines the environment as a sculpture that thousands of hands have molded, but which will never be completed. According to Gibson, there is no reason to separate the cultural environment from the natural environment:

*It is a mistake to separate the natural from the artificial as if there were two environments; artifacts have to be manufactured from natural substances. It is also a mistake to separate the cultural environment from the natural environment, as if there were a world of mental products distinct from the world of material products. There is only one world, however diverse, and all animals live in it, although we human animals have altered it to suit ourselves. We have done so wastefully, thoughtlessly, and, if we do not mend our ways, fatally. (Gibson, 1979, p. 130)*

Other opinions have also been expressed about the existence of a connection between affordances and social and cultural factors. Schmitt (1987) was doubtful with regards to social affordances: social phenomena, such as norms or social meanings are in his opinion immaterial by nature. They are not determined by physical stimuli, and this is why they cannot be considered to be affordances. Berry (1988), on the other hand, wanted more specific guidelines on which (social) phenomena the ecological approach can be applied to. Again, Smith and Ginsburg (1989) stressed that evaluation, deduction, and impressions are different from perception, in which case they cannot be included in ecological studies.

Pickering (2000) thinks that the human perceptual process is clearly loaded both socially and culturally. People are particularly flexible in their perception of affordances. They find infinite numbers of new affordances for the same object, and they combine physical, symbolic, social, and cultural elements into an inseparable unit. Like Costall (1995), Reed (1993) stresses the social nature of the perceptual process of all those affordances that open up to people. As we perceive environmental

affordances, we often also perceive the actions of other people and animals, their search for and discovery of affordances. As we perceive other human beings or animals, we notice that they perceive us. The environmental affordances are at least in part common to both – we may even compete for the same affordances. Thus affordances are shared, at least partly (see Section The Transactionality of Affordances).

Socialization, however, includes significantly more than just a shared awareness of affordances. There are many social dimensions connected with the perception, utilization, and shaping of affordances. People in different cultures perceive affordances in different ways. It is even possible that intercultural variation in the perception of affordances is greater than the variation between different animal species (Reed, 1996). A good example of a culture-related affordance is the way people use their hands when eating. In our Western culture, food can be eaten with either hand, which is not the case in Asian cultures, where food can only be touched with the right hand.

Loveland (1991) has made an interesting classification of the various layers of social affordances and their links to norms. Table 3 shows affordances in three different, nonexclusive categories. First of all, there are affordances that are related to physical contact with the outside world. These are the functional affordances to which the concept of affordances has traditionally referred. Secondly, culturally determined and socially accepted affordances are the subset of all potential (functional) affordances. The actualization of these affordances is socially acceptable. Thirdly, social and communication-related affordances reflect the importance of human activities directed towards other people. These could be considered the “actual” social affordances.

My own research is not about social affordances as such (Loveland’s Category 3). My interest is directed at the social and cultural contents of all affordances, as well as at the practices and rules that are related to the actualization or nonactualization of children’s affordances.

### **The Social and Cultural Dimensions of Children’s Environmental Affordances**

There are multilayered social dimensions related to children’s abilities to discover and utilize affordances. Children do not discover all affordances independently, but receive help from adults and other children. For instance, the affordances of cups and spoons are taught to children. They learn first how to use them correctly, how to hold the spoon, etc. Later they learn that there are other, more subtle social rules connected to cutlery, such as what kinds of spoons are used with different foods (Costall, 1995).

**Table 3.** The three layers of affordances of human environment (based on Loveland's nonexclusive categories).

The different layers of affordances	Description	Examples
<b>1. Affordances for physical transactions with the environment (functional affordances)</b>	<ul style="list-style-type: none"> <li>– Allows us to manage getting around in the immediate environment</li> <li>– Failure to discover this category of affordances in the human environment would lead to a catastrophic inability to get around in the environment, to explore, to survive</li> </ul>	<ul style="list-style-type: none"> <li>– Affordances as the offering of support by appropriate surfaces</li> <li>– Obstacles and pathways</li> <li>– The visual/ tactual affordances of various substances</li> <li>– Affordances of things that can be picked up, manipulated, squashed, etc.</li> <li>– The container function of cups, etc.</li> <li>– The reflective properties of mirrored surfaces</li> </ul>
<b>2. Socioculturally preferred affordances</b>	<ul style="list-style-type: none"> <li>– Afferred but not necessary interactions</li> <li>– Selected among the very rich set of potential affordances</li> <li>– Reflect participation with other people in a shared cultural milieu that predisposes the individual use of objects, interpret events, etc. in particular ways</li> <li>– Failure to discover this category of affordances would lead to subtler yet potentially devastating and socially disabling problems<sup>54</sup></li> </ul>	<ul style="list-style-type: none"> <li>– A person whose conception of preferred affordances is limited or inflexible will seem rigid or ignorant (e.g., a person who believes that certain food is edible only when cooked exactly a certain way)</li> <li>– A person, who lacks awareness of preferred affordances seems alien, incongruous, or unacculturated (e.g., a person who drinks from the fingerbowl)</li> </ul>
<b>3. Social and communicative affordances</b>	<ul style="list-style-type: none"> <li>– Reflect the meaning of human activity for other humans</li> <li>– Complete failure to grasp this category of affordances would lead to an absence of communication and to complete disruption of interpersonal behaviors</li> <li>– An imperfect grasp of what human language, gesture, postural behavior, etc. afford would result in a less severe but still serious handicap</li> </ul>	<ul style="list-style-type: none"> <li>– Affordances of symbolic behavior (conversation, writing)</li> <li>– Affordances of nonsymbolic activity (facial expressions, gesture, body postures and movements, tone of voice, direction of gaze)</li> </ul>

<sup>54</sup> Reed (1993) reported the perception and use of affordances of traumatically brain damaged individuals. Patients suffering from closed head injuries manifest severe but relatively diffuse brain damage that prevents them from understanding and acting in the environment in a “proper” way. For example, one patient made hundreds of “affordance mistakes” during breakfast over the course of 28 days. He tried to put one shoe on on top of another and to mix peculiar food items (he used tomato juice as “syrup” for waffles). He made nearly 100 errors in the act of making and drinking coffee alone, like putting incorrect items (e.g., oatmeal) into the coffee. Despite such apparent chaos, not once did he pour liquid onto his plate, or attempt to transport a liquid via a knife or fork. So, he managed quite well with Loveland's first layer of affordances, but not with the second layer of socioculturally signified affordances.

The perceived affordances of children and their parents form an inseparable unit, at least while the children are small. The perception of affordances through the eyes of a child is an essential challenge for parents with small children. It is impossible to protect a child from environmental dangers such as falling, getting cut with sharp objects, or getting burned, if parents cannot predict a child's actions – or rather predict the appeal and dangers posed by environmental elements seen from a child's perspective. Parents actively guide children's perception and actualization of affordances through their own perception of affordances. A child may perceive an affordance as a positive one, whereas the parents may perceive the same affordance as being dangerous (Miller, 1998).

A significant amount of communication between animals and between humans has to do with the sharing of affordances. A turning point in children's development takes place when they learn to understand when something is being pointed out to them. They learn to pay attention to what is being pointed at rather than to the person pointing the finger. This is also a question of being able to perceive affordances through the eyes of others (Reed, 1993). According to Vygotsky (1978), children point at something because the object is out of reach and cannot be grabbed. When a child notices how others react to her attempts to reach the object – when the gesture is interpreted as being something else than just an attempt to grab the object – the child can give the gesture a new meaning. The gesture is abstracted into pointing. The ability to use language and symbols facilitates the perception of the above-mentioned things and of the action related to them. It enables one to perceive and share new layers of affordances.

In addition to the sociocultural rules that are related to the actualization of affordances, I have in my research examined also those structures of the material environment which promote or restrict social activity. Gaver (1996) calls them affordances for sociality. I have, among other things, discussed the environmental affordances that facilitate social activities and social games, and I have in this way complemented Heft's (1988) affordance categories for children's environments (see Section Affordance Categories for Children's Environments).

Figure 7 presents my interpretation of the connection the actualization of affordances has to social and cultural factors. Figure 5 is based on Loveland's second layer of affordances; in other words, it is based on socioculturally preferred affordances. This category closely resembles Reed's (1991, 1993) *field of promoted action* (FPA). The FPA controls the what, when, and where of affordances, as well as how the affordances can be perceived, utilized, or shaped.

My interpretation of the FPA differs slightly from Reed's (1993) original definition. As I see it, the FPA controls the perception, utilization, and shaping of affordances.



Reed included the social regulation of the utilization of affordances in the FPA alone. In my opinion, the utilization of affordances can be promoted or restricted, or the individual may utilize affordances regardless of social rules. Different individuals may compete over the same affordances of which there are a limited number (not enough for everybody). The “can be utilized” of promoted action refers also to the fact that others will not keep the individual from utilizing the affordance (see the fields of free and constrained action that will be introduced later).

The FPA is closely connected to verbal communication. Yet children are taught the cultural ways of behavior already before they begin their language studies. In this way children are integrated into the shared, common, collective environment (Vygotsky, 1986).

It is possible not only to actively promote the actualization of affordances, but also to actively restrict the process (see Ihanainen, 1991). I refer to this subset of potential affordances as the *field of constrained action* (FCA). The FCA, just like the FPA, controls the perception, utilization, and shaping of affordances. Parents can restrict their children’s actualization of affordances, for example, by directly restricting their behavior, by diverting their attention to other targets, or by verbally explaining to them the reasons why they cannot actualize a specific affordance. If an individual has to compete over a limited number of affordances in the FCA, he or she loses out because many people cannot always utilize the same affordance simultaneously. This is a common situation on playgrounds, where parents have to remind their children over and over again to wait for their turn in the actualization of affordances.

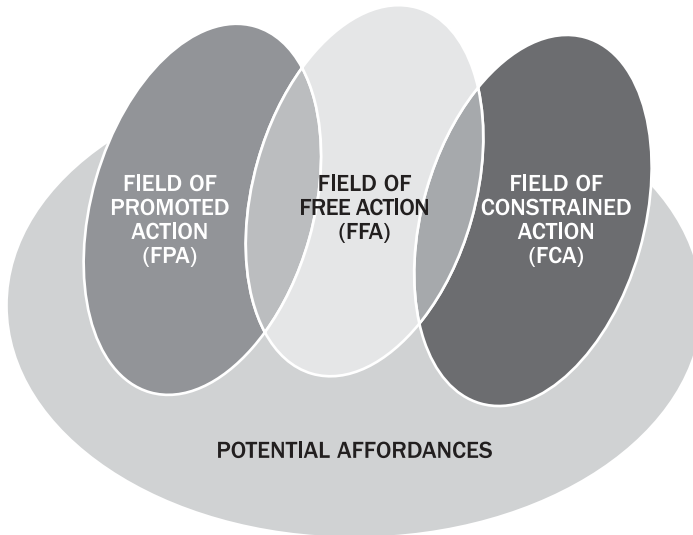
Costall (1995) has remarked that limited possibilities for the actualization of affordances can be an inherent feature in planning. Building solutions may be such that they exclude certain user groups (e.g., handicapped individuals), or the overall environment can be unfriendly to its users. Correspondingly, building solutions may promote certain types of action (the FPA). This can be more or less obvious.

In accordance with Reed (1993), the third subset will be referred to as the *field of free action* (FFA), which according to my interpretation consists of affordances that the individual has independently perceived, utilized, or shaped. Even if children primarily learn to perceive things that they have been actively encouraged to perceive, i.e., to explore the FPA, there always exist affordances that children discover independently, often to the surprise of their parents<sup>55</sup>. Children frequently do not

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<sup>55</sup> Looking after a toddler can be exhausting for an adult because a small child perceives affordances very differently from the adult, who is constantly worried about what the child will come up with next. The perceptions of an older child are more socialized. Still, children discover new and unexpected affordances all the time.

know how their parents will react to the actualization of their discoveries. The quality and quantity of the individual's independently actualized affordances vary according to their bodily qualities such as size, and according to the development of his or her perceptual, motoric, and social skills. In addition, the personality traits and personal preferences of the individual may have an effect on the independent discovery of affordances.



**Figure 7.** A schematic of the environment as potential affordances, the actualization of which is regulated by the fields of promoted, free, and constrained action.

Gibson (1950) talked about expedient and proper ways of behavior. The former satisfy the needs of the individual (e.g., a child who touches all the foods on the table) and the latter correspond to socially acceptable norms (e.g., which foods one is allowed to eat with one's fingers). In my model, expedient ways of behavior correspond to the FFA, and proper ways of behavior to the FPA. The sociocultural rules that are related to affordances send out veiled cultural messages. For example, the building solutions of schoolyards have been called "hidden curricula" (Adams, 1993). The affordances of the material environment convey messages about "right" and "wrong" ways to behave.

The number and quality of independently perceived affordances change as an individual's perceptual skills develop. Individual skills and the development of, for example motoric skills determine the perceived, utilized, and shaped affordances.

During the development the FFA typically grows and the sociocultural rules pertaining to the fields of promoted and constrained action become differentiated and more complex (Reed, 1993). However, it is the individual who determines what degree of independence he or she retains after socialization, i.e., how extensive his or her FFA is. An independent relationship with affordances can manifest as a desire to shape the existing selection of potential affordances.

In my model the fields of promoted and constrained action overlap the FFA. The actualization of some affordances in the FFA is socially promoted and that of others socially constrained. In the latter case, the affordances can still become actualized in “unsociable” ways, either deliberately or not. Correspondingly, some of the independently discovered and utilized affordances of children are at the same time socially promoted. Children are not even cognizant of all the sociocultural factors that are connected to their independently discovered affordances. Those affordances are situated in a section of the FFA that doesn’t overlap the fields of promoted and constrained action.

The fields of promoted, free, and constrained action also extend into the set of potential affordances. This relates to the fact that as affordances are being shaped (either in a socially approved way or otherwise) the shaping of the set of potential affordances makes it available to other operators as well. When the environment changes as a result of the shaping of the affordances or as a result of urban planning, the set of potential affordances of the environment expands.

The fields of promoted, constrained, and free action are closely related to the activities of children. At different stages of their development, children variably remain inside, in between, or outside of these fields – in fact, they often engage in playful activities that move from one field to another. Children may also strive to enlarge the scope of the FFA. For example, Moore (1986) noticed that children often prefer places outside the control of their parents. Article III also showed that less than half of the parents were able to identify their children’s place preferences.

I presume that the degree of independent mobility of children can be related to the extent of all three fields of action (see Article II). Naturally there are a number of other sociocultural factors that define the fields and their extent. Various indicators of independent mobility emphasize these fields in slightly different ways. Territorial range applies to all three of the fields, the degree of a mobility license mainly pertains to the extensiveness of the FPA and FCA, and actual mobility primarily applies to the FFA.

The fields of promoted, free, and constrained action together determine the zone of proximal development, where learning and development take place. The concept

of the zone of proximal development comes from Vygotsky (1978). Vygotsky uses it to show the difference between the individual level of development and the potential level of development. The individual level of development refers to those mental functions of children, which are the result of earlier developmental processes. The individual level of development can be assessed by examining the independent problem-solving skills of a child. The potential level of development refers to the level the child can reach if assisted by adults or more skillful peers. With the concept of the zone of proximal development Vygotsky criticized the assessment of children's levels of development and their potential for development based solely on independent performance. The zone of proximal development defines actions that are developing; it shows potential and future development rather than development that has already taken place, and it also indicates the support needed for development.

The fields of promoted, free, and constrained action can be seen as applications of Vygotsky's ideas within a Gibsonian framework (Ihanainen, 1991)<sup>56</sup>. Reed (1993) placed the zone of proximal development in the systemic person-environment fit, in which all situational ecological, social, cultural, and individual factors play their important roles. According to Reed, learning and development change the fields of promoted and free action. The FPA becomes more detailed and specified, whereas the FFA expands. Both fields are inseparable and connected to one another through social interaction. In my model, the FCA is also a part of the zone of proximal development. The three fields together determine the conditions for development in each context.

The idea of the zone of proximal development should be applied to initiatives in participatory planning. This way whenever children and young adults participate in environmental planning one could differentiate between the fields of promoted, free, and constrained action, which determine the zone of proximal development in initiatives in participatory planning. The beginning of the initiative should be conducted in the FFA to define those impressions and ideas that children voluntarily produce. After this there could be a shift to "realism" and a definition of the fields of promoted and constrained action (Horelli et al., 1998; Horelli, 1994).

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<sup>56</sup> In his licentiate's dissertation, Ihanainen (1991) examined in an interesting way the zone of proximal development in learning situations. In his view the FFA should be defined in each and every learning situation, and then only on the basis of that should the FPA be created together with the students. This would bring arranged learning situations (such as the ones in school) closer to "natural" learning experiences, which are utilized, e.g., by children who learn to read before they start school.

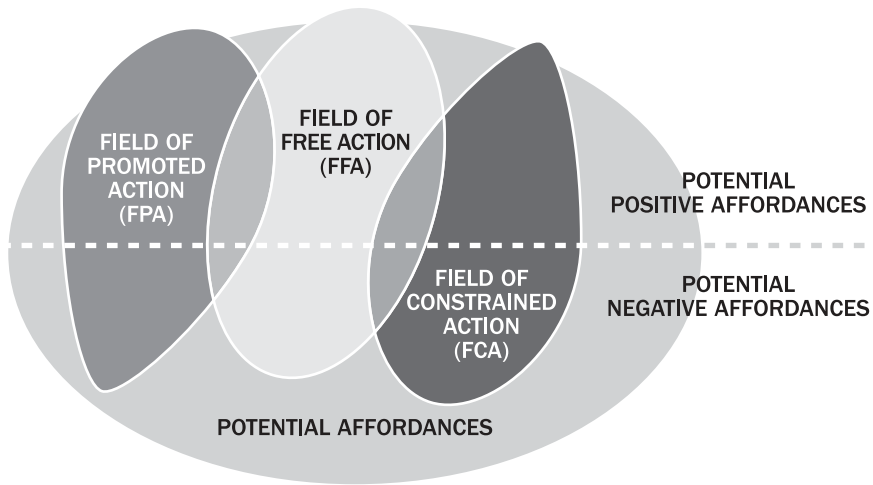
### **Negative Affordances as Part of the Social and Cultural Dimensions of Affordances**

In examining the social and cultural dimensions of affordances I haven't taken into account negative environmental affordances and dangers (see Figure 7). However, one can assume that negative affordances are included in the fields represented in Figure 7, as (almost) all environments have an infinite number of both positive and negative potential affordances. I also make the assumption that negative affordances are not just a feature of the FCA, and that they are not simply excluded from the FPA and FFA, but instead that they can sometimes feature in either.

Some of the affordances in the FFA can be negative ones, environmental dangers that children still want to utilize. Taking risks and testing one's skills are an integral part of children's activities (Hart, 1979). Apparently parents and the sociocultural environment can sometimes promote the perception or utilization of negative affordances. For instance, in countries like Finland, where children's independence and the acquisition of basic environmental skills are highly appreciated, learning to perceive environmental dangers may be regarded as an essential skill for every child. In order for the children to become "streetwise", they cannot be overly protected.

Miller et al. (1998) studied the behavior of parents and children, as well as their perception and utilization of affordances, in various environments; at home, under laboratory conditions, and on playgrounds. The researchers came to notice that the context was a decisive factor in the extent to which parents tried to have an influence on the actualization of their children's affordances, i.e., the extent to which they forbade their children or encouraged them to actualize affordances. Parents tried to influence their children's activities to a larger extent on the playground, and less at home. In addition, the parents' controlling behavior was affected by whether they had other simultaneous tasks to perform while they were looking after the children. More responsibilities for the parents meant more punishing parental behavior and more affordances that were seen as negative.

The research encourages investigators to ponder which factors determine whether children and their parents perceive affordances as positive or negative, or to what extent the actualization of negative affordances can be tolerated in each context. The perception of affordances by both children and parents forms a unit. It seems that the perception of affordances as positive or negative is learned to a certain extent.



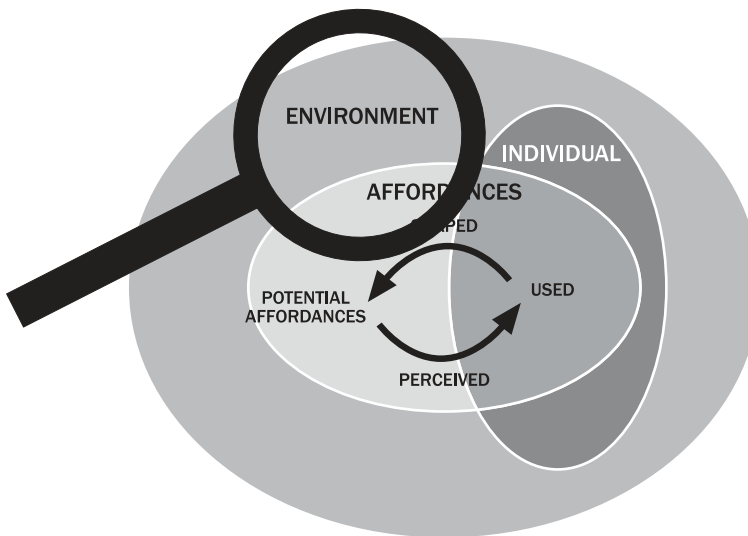
**Figure 8.** A supplement to Figure 7, which depicts the role that social and cultural factors play in the actualization of affordances. In this version the field of potential affordances has been divided into positive and negative affordances.

With Figure 8 I attempt to present a preliminary version of what Figure 7 would look like if negative affordances were taken into account. Figure 7 shows the role of social and cultural factors in the actualization of affordances. The new version of the figure is based on the idea that potential affordances can be both positive and negative; however, in reality it is very difficult to draw a line between them<sup>57</sup>. Social and cultural factors regulate the actualization of both positive and negative affordances via social promotion or discouragement, or affordances are actualized in the FFA. However, it is likely that the number of negative affordances is smaller in the FPA than in the FCA. For this reason I have reshaped these fields from being elliptical to being egg-shaped. The FFA remains elliptical.

<sup>57</sup> In my view, affordances are mainly positive or negative, not neutral. Gibson (1977), however, mentions neutral affordances. The essential insight of ecological perceptual psychology was that the environment is perceived as inherently meaningful. Neutral affordances are apparently purely functional.

## AFFORDANCES AS CRITERIA FOR THE CHILD FRIENDLINESS OF ENVIRONMENTS

Finally, I put under a magnifying glass the role of the material environment as a source of actualized affordances for children (see Figure 9). I look at affordances as parts of the process through which the child friendliness of environments can be determined. I examine the role that the material world has in child-environment interactions, and I specify the essential qualities of child-friendly environments. I approach this theme by applying the concept of the P-E fit, central in environmental psychology. In Article V, I operationalized P-E fit through the concept of the affordance and I examined to what extent children's ideas about environmental planning reflect an attempt to increase fit. The section ends with my four-fold model, which I have developed to assess the degree of child friendliness of various environments. The model was tested empirically in Article II.



**Figure 9.**  
Focusing on the role of material world in child-environment interaction.

### **The Person-Environment Fit Operationalized Using Affordances**

In environmental psychology P-E fit or congruence has been put forward as the basis of human well-being (see Stokols, 1979; Bonnes & Secciaroli, 1995). Human beings tend to maximize the perceived congruence between their personal strivings

or preferences and their social and material environment, for instance, when they choose their habitat or work place. If the fit is poor, the result can be felt as stressful<sup>58</sup>. In the opposite case, the experience of well-being is enhanced by adequate congruence. Environmental stress can be alleviated if the individual enjoys even a slight possibility to influence the situation or to control the stressful causes of the environmental discrepancy.

In environmental psychology a human-friendly environment is usually defined as one with a maximal P-E fit. Also in this research, the P-E fit is a starting point for the definition of a child-friendly environment. However, here, from the perspective of ecological perceptual psychology, fit is described as being a process in which the individual and the environment adjust to each other to form a unique system, a kind of an ecological niche<sup>59</sup>. The child-environment relationship is the equivalent of a key that is looking for a lock in the environment, while the environment is expecting to be opened up, it is waiting for its affordances to be discovered and actualized.

Several ways exist to operationalize P-E fit. Nevertheless, it is important to deal with it with commensurate constructs or dimensions which link the environment and the person together (Edwards et al., 1998). In Article V, I examined the possibility to operationalize fit through the concept of the affordance. Participation in environmental planning was seen as an effort to improve the child-environment fit. The shaping of existing affordances or the creation of totally new ones give opportunities to actively improve the P-E fit. The assumption was that children make their plans in order to try to reinforce the perceived fit between themselves and the environment. According to the hypothesis, children try to plan the kinds of environmental affordances which are “weak” in the existing environment, i.e., the actualization of which is poorly promoted by the environment, but which children like (see Figure 10).

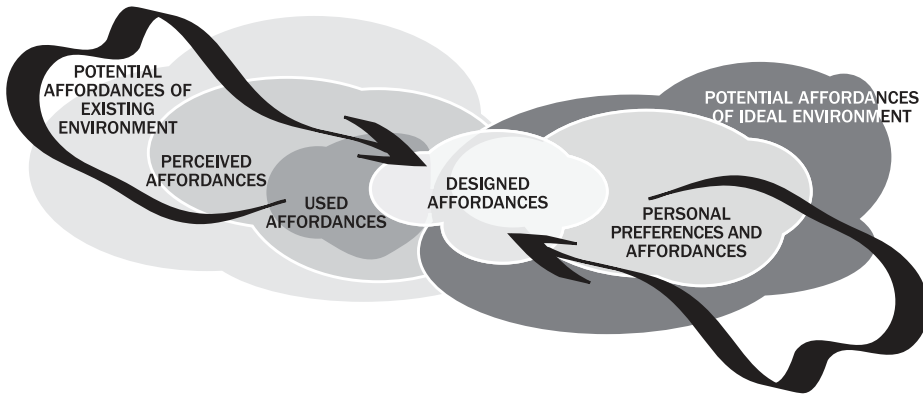
The concept of affordance and its ontological nature include the idea of P-E fit. The actualization of affordances requires fit, as affordances are not even perceived, let alone utilized, if the individual’s qualities, skills, and intentions do not fit the

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<sup>58</sup> This could be the way to develop a theory of environmental stress based on ecological perceptual psychology (see also Heft, 1981). Those theories of environmental stress that are based on the information-processing framework regard stimulus overload and the inability to interpret stimulus in a meaningful way as causes of stress. An ecological theory of stress could look into restrictions in the actualization of positive affordances and stressful experiences related to the actualization of negative affordances, as well as that related to demands.

<sup>59</sup> “We all fit to the substructures of the environment in our various ways, for we all are, in fact, formed by them. We were created by the world we live in” (Gibson, 1979, p. 130).





**Figure 10.**

Designed affordances as a way to improve the perceived person-environment fit.

potential environmental possibilities. Correspondingly, any negative affordances are also seen in relation to oneself. People (usually) try to avoid those negative affordances that threaten the fit between themselves and the environment. The assessment of the fit between oneself and the environment can include also normative dimension, as well. Environmentally responsible actualization of affordances includes the intention of not producing any negative affordances for other agents today or in the future (see Horelli et al., 1998).

The person-environment fit determined through affordances emphasizes an individual and unique type of fit<sup>60</sup>. Thus each individual can experience various degrees of fit even in the same environment. The child-environment fit can be assessed through the number and quality of actualized affordances, as I have done in Article I. I presumed that the more affordances there are in the environment that children find interesting, the better the fit and the more child-friendly the environment.

While the degree of the child-environment fit might be considered to be a criterion for a child-friendly environment, one must consider whether it is enough as a sole criterion. In Vygotsky's zone of proximal development (see Section The Social and

<sup>60</sup> The collective fit can be assessed in the same way as Heft (2001) did with Roger Barker's concepts of ecological psychology, through behaviour settings and the synomorphy between behavior and milieu. In that case the unit of analysis changes from being the individual and his perceived environment, to sociocultural units in which the individual adjusts his or her behavior to fit in groups. The adjustment is made based on spatial and sociocultural hints. In synomorphy one moves from the examination of the individual to the examination of physiosocial units.

Cultural Dimensions of Children's Environmental Affordances), the difference between the individual and the potential levels of development create a tension that, according to Vygotsky, is to be utilized in learning. In the same way, one can say that a child-friendly environment should include some challenges for children; there shouldn't be just a fit between children's skills and environmental possibilities and demands, but there should also be challenging situations that suit children's level of development. These are included in affordances that challenge children to surpass themselves. These types of affordances are likely to be the most fascinating ones for children. For this reason the role of a safe environment should not in my opinion be overestimated. An environment that is too safe and without challenges may even provoke children to take big risks, in which case an environment that was supposed to be safe becomes dangerous. Suitably challenging but at the same time safe activities have been called "safe adventures" (Allas et al., 1992).

The model for child-friendly environments that I introduce in the following section includes the idea of a challenging environment. A child-friendly environment must challenge children to explore, to discover new affordances, and to find new dimensions in existing affordances.

### **An Assessment Model for Child-Friendly Environments**

I present in this section an assessment model for child-environment fit and for child-friendly environments. The model is based on the simultaneous assessment of actualized affordances and of the degree of children's independent mobility.

I have studied the degree of children's independent mobility and the actualization of affordances in various places in Finland and Belarus. I have paid particular attention to actualized affordances and children's possibilities for independent mobility in multidimensional child-environment relationships because I consider these two factors to be the central criteria for children's relationships with the environment. Also according to Moore (1986, p. 234), "Access to and diversity [of resources] emerge as the most important themes in child-environment policy". Opportunities to move freely and a variety of activity settings appear also as criteria of environmental quality as defined by children themselves (Chawla 2002; Horelli, et al., 1998).

I have chosen to concentrate on these two factors also because in my opinion they epitomize the current environmental changes taking place which influence both the quality of children's relationships with the environment, and the central prerequisites needed for the development of relationship with the environment. Article

II presents a summary of recent studies done on children's independent mobility. It seems that children's independent mobility are being restricted around the globe, but in the Nordic countries they are still more extensive than almost anywhere else in the world.

The degree of independent mobility can be presumed to be closely connected to the extent that children can perceive their environments as ample collections of affordances. According to both the Gibsonian framework of direct perception and Neisser's perceptual cycle, action in the environment and perceptions of the environment are inseparably linked. Without possibilities for independent mobility, perceptions of the environment are inevitably limited<sup>61</sup>. I therefore presume that independent mobility and the actualization of affordances correlate positively, without excluding the possibility that this would not be the case.

To examine the connection between the actualization of affordances and the possibilities for independent mobility, and their significance for the quality of the child-friendliness of the environment, I developed the model depicted in Figure 11. The model is built on the idea that the covariation of independent mobility and the actualization of affordances define four qualitatively different types of children's environments. The names of the hypothetical environmental types are *Bullerby* (the ideal environment), *Wasteland*, *Cell*, and *Glasshouse*. The varying environmental situations in the model are interpreted on the basis of the fields of promoted, free, and constrained action (see Figure 7).

Gibson's ecological approach to perception emphasizes the significance of action and exploration for perception. Therefore, the types of environments in the model that represent a linear connection between mobility and affordances, i.e., the Bullerby and Cell types, will probably be the most widely spread types in the four-fold model. Extensive possibilities for independent mobility licenses will probably correlate with an ample supply of affordances, whereas restricted possibilities for independent mobility will result in a small number of perceived affordances. However, also the two other environment-types, Wasteland and Glasshouse, have to be taken into account. In Article II, one of the objectives was to do an empirical study on which of the hypothetical types of environment in question appear in the research data.

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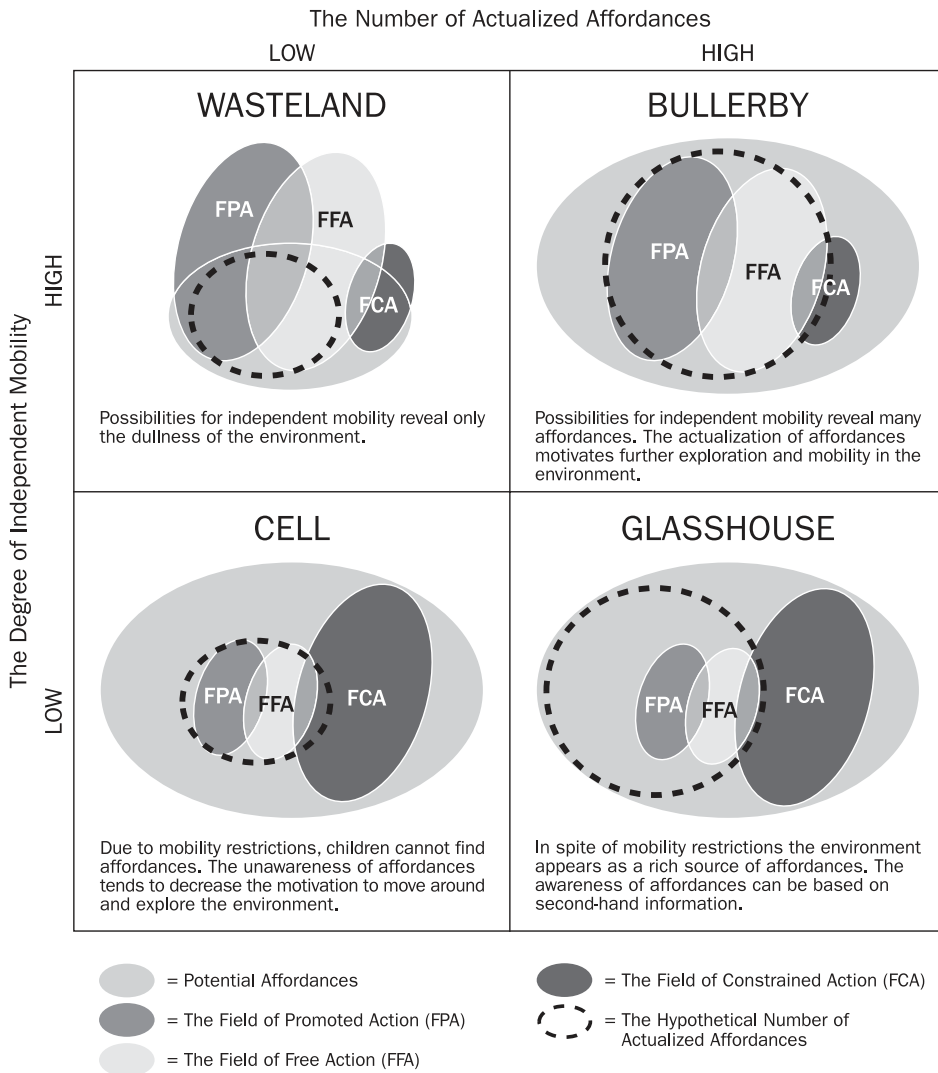
<sup>61</sup> Held and Hein (1963) conducted a classical study on this subject. They examined the ability of kittens to perceive depth and distance. Kittens that had had the opportunity to move around independently and had received visual stimulus had no problems with the so-called visual cliff test, in which an artificial cliff had been created by using an unreflective glass sheet and a checkered pattern. These kittens stopped at the edge of the cliff, unlike other kittens that had received the same visual stimulus, but which hadn't had the chance to move around independently.

The opportunities for the actualization of affordances vary in these four environments. Theoretically, they should be most extensive in the Bullerby and Glasshouse types and least extensive in Wasteland and Cell environments. The Bullerby type, which is the ideal representation of a child-friendly setting, should have more extensive fields of promoted and free action than does the Glasshouse type, but the number of possible actualized affordances should be the same. The situation is, however, different in the number of *actively* actualized affordances. In a Bullerby environment the affordances are not only perceived but are also utilized and possibly shaped.

An example of a Bullerby-type environment could be a rural village or an urban area or any diverse environment that children can explore. It is only essential that Bullerby represents an environment that does not exclude children from everyday life. In the Glasshouse type a large number of affordances remain passively perceived as the limited size of the fields of promoted and free action make the actualization of affordances difficult. A present day example of such an environment for children could be an old European urban milieu full of things that are fascinating but impossible for children to independently utilize. The environment is diverse and attractive, but it cannot be accessed freely. An extreme example of this kind of an environment is a place riddled with landmines where children are forced to play in a very restricted area. Not as extreme, but still a Glasshouse type of situation, is when a child familiarizes himself extensively with the environment, but only through his parents' assistance. Without licenses to independently explore the environment, children fail to learn many essential things about the environment. This has been proven to be the case in various studies done on the development of children's environmental cognition (Hüttenmoser & Degen-Zimmermann, 1995; Biel & Torell, 1977; Biel, 1982; Blades, 1989; Rissotto & Tonucci, 2002; see also footnote 61).

There are essential differences also between the Wasteland and the Cell environment types. In the Wasteland type, the extensive fields of promoted and free action do not result in a large number of actualized affordances because the environment is empty of things to discover; its affordances are few and/or nondiverse. Living environments that are too dull, such as sleepy suburbs, can be of this type, especially in cases where the territorial range of children does not extend to the greenery surrounding the suburb (see Article I). In the Cell environment the restricted fields of free and promoted action make it impossible for children to explore the affordances of the environment. Thus the potential affordances are not even perceived, let alone used or shaped. This kind of an environment can be any setting where children are locked inside and they cannot receive, for instance, second-hand information about the enticing affordances of the outdoor environment.

The various parts of my four-fold model represent qualitatively different types of environment. In this model the Bullerby type represents a child-friendly environment. The child friendliness of the other types of environment can be improved in various ways. The child friendliness of the Wasteland type is enhanced by raising the number of potential affordances. A Glasshouse environment becomes more child-friendly



**Figure 11.** A model for describing four hypothetical types of environments that emerge from the covariation of children's independent mobility and the number of actualized affordances.

if children's possibilities for independent mobility are increased. A Cell-type environment is child-friendly only after the numbers of both licenses for independent mobility and potential affordances are increased.

The assessment model for child-friendly environments could be supplemented in many ways. The first step would be to include negative affordances in the model. In situations where children's possibilities for independent mobility are good, i.e., in Bullerby and Wasteland environments, children most likely perceive both positive and negative environmental affordances quite realistically. On the other hand, in the Cell and Glasshouse types children do not learn a great deal about environmental affordances. In Cell-type environments children are unaware of affordances. A child growing up in Glasshouse is perhaps to some extent aware of environmental affordances, but this information may be superficial and/or unrealistic. In that case negative or positive affordances may be dominant, and the child may have either an idealized view of the positive environmental affordances, or negative affordances dominate and the environment is seen solely as a nest of dangers. In the Conclusions section I make a few more suggestions as to how to extend and specify the model.

## **SUMMARY**

In this section I have utilized the framework of ecological perceptual psychology, and in particular the concept of the affordance, in determining the criteria for child-friendly environments. First I looked at the individual dimensions of affordances, even though the emphasis of this study is on mapping out those environmental conditions that are related to the number, quality, and actualization of affordances in children's environments. Of the individual dimensions, I first critically discussed Neisser's perceptual cycle, which I utilized in Article IV, from the view of the framework of ecological perceptual psychology. Next I looked at the possible emotional contents of affordances, which determine the motivational basis for action. Finally I suggested that the theory of affordances be supplemented in this respect.

As I was trying to determine the social and cultural dimensions of affordances, I examined the fields of promoted, free, and constrained action, which regulate the actualization of affordances. I later complemented these fields by adding negative affordances, although those were not included in my empirical data.

Finally I presented an assessment model for a child-friendly environment, in which there are two central criteria for child friendliness: children's possibilities for independent mobility and their possibilities to actualize affordances. In the model

I have presented, these two criteria are covaried in order to classify environments into four hypothetical types of environment: Bullerby, Cell, Wasteland, and Glasshouse. Each type of environment represents a different combination of the fields of promoted, free, and constrained action. A child-friendly environment is primarily represented by the Bullerby type, where the abundance of mobility licenses and actualized affordances creates a positive cycle, and where the fields of promoted and free action are at their most extensive. The more that children can move around in the environment, the richer the FPA and the more motivated the children to roam in the environment. I utilized this model in Article II to assess the child friendliness of environments using the empirical data I collected from Finland and Belarus. In the future the model should be tested in other environments and with different groups of children.







## 6. Conclusions

### **THEORETICAL CONCLUSIONS**

The research problems in this study were how the material environment could be reintroduced into studies on children and environments, and how interactions between children and the material environment could be specified theoretically and made more understandable.

In my view, transactional environmental research forms a good theoretical basis for this. Within it the child-environment relationship is studied as an inseparable unit, the parts of which cannot be studied separately. Gibson's ecological perceptual psychology provides tools for the operationalization of the transactional framework, as well as tools for the theoretical understanding of person-environment interactions. Through ecological perceptual psychology it is possible to specify what exactly one perceives in the physical environment and why the mobility and activity of the perceiver are essential in the perceptual situation.

Through the concept of affordance as it is used in ecological perceptual psychology, the material world, objects, and the environment come alive. From the infinite reservoir of potential environmental affordances certain affordances are actualized in a unique way for each individual, so meaning is inherently linked with the perceptual process. The concept of affordance connects the perceiving individual to the material, social, and cultural contexts in an inseparable way. The embodied individual with his or her own, unique life experiences perceives the world through his or her affordance spectacles. At the same time the material world, however,

exists in consensual reality, and some of the actualized affordances are shared with other agents. The environment for its part actively regulates, creates possibilities for, and restricts the individual's actions. In this sense, the framework of ecological perceptual psychology represents perspective realism (Karvonen, 1999).

The framework of ecological perceptual psychology, i.e., direct perception, is in my opinion particularly suitable for the study of child-environment relationships. When perception is studied based on the two-channel or multichannel models of perception, it becomes clear that the channel of direct perception is responsible for the overall perception of the environment and for navigation in the environment. The framework of direct perception is thought to be dominant in children, too (Neisser, 1994). In my research the focus is on children's actions in the environment and on their overall perception of the environment.

If the framework of ecological perceptual psychology is applied to the study of child-environment relationships, the essential factors regulating development can be said to be children's possibilities for both independent mobility and the actualization of environmental affordances. By combining various degrees of these two criteria, I produced an assessment model for child-friendly environments. The four hypothetical types of environment in the model are Bullerby, Wasteland, Cell, and Glasshouse. The Bullerby type represents a child-friendly environment, as it allows a positive interactive cycle to develop between a child and the environment. In the Bullerby type a sufficient possibilities for independent mobility in the child's immediate surroundings enable to him or her to discover environmental affordances. Actualized affordances for their part motivate the child to move around more in the environment, which creates more possibilities for new affordances to become actualized. At the other extreme, children can live in a Cell-type environment without possibilities to familiarize themselves with the environment by moving around independently and looking for affordances. In this type of negative cycle the motivation to explore the outdoors is negligible, as restrictions on mobility make it impossible for a child to discover environmental affordances and to perceive the environment as an ample field of interesting affordances.

In a study coordinated by Chawla (2002) it was found that possibilities for independent mobility and versatile opportunities for action were factors that children themselves indicated to be primary indicators for a child-friendly environment. This study replicated Kevin Lynch's (1977) well-known work from *Growing Up In Cities*, in which children from six continents and eight different countries participated. The main conclusion was that children's opinions about the indicators of the child friendliness of environments were surprisingly similar among children despite their diverse backgrounds, and that those indicators had stayed almost the

same for 25 years. In addition to independent mobility and the versatility of the environment, the other indicators of child friendliness were social uniformity, strong communal identity and a tradition of self-help, the existence of meeting places for age peers and the existence of safe green areas, the availability of basic services, and the safety and continuity of living. Some of these factors are included in the extended concept of affordance, particularly in its sociocultural dimensions. My model for child-friendly environments extends into that part of the child-environment relationship that is related to perceived space and mundane spatial routines<sup>62</sup>. The definition of a child-friendly environment can, however, be extended outside the immediately perceived material environment (see Chawla, 2002; Horelli, 2003).

In my research (in Articles I, II, and V) I have used Heft's (1988) affordance taxonomy, supplemented by affordances to socialization. The affordance categories were based on rather old observational studies on children's actions in various environments. It is a valid question whether the categories are suitable for studies on children at the turn of the century. According to Chawla's (2002) follow-up research, children's environmental preferences have remained surprisingly consistent from the 1970s to the end of the 1990s. The concept of affordance gives a theoretical explanation for this continuity. Although the perception of affordances varies individually and socioculturally, perception is linked with corporality and physical action. Children's corporality and physical actions have not changed even in the postmodern world.

The biggest change that has taken place in child-environment relationships is, however, that outdoor mobility has become more restricted and/or less appealing. The virtual world is more enticing for many children than are outdoor affordances. In Articles II and IV, I present the view that Finnish children enjoy more extensive possibilities for independent mobility than do Belarusian, English, or German children. I point out in Article II that the actualization of environmental affordances and children's mobility licenses are closely connected. The Bullerby- and Cell-type environments, which represent positive correlations between these factors, were featured strongly in the empirical data. Without actualized affordances, there can be no discussion of any personal relationship with the environment. There are also other justifications for securing possibilities for independent mobility: the

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<sup>62</sup> Lefebvre (1974) called this space the perceived space (*perçu*). Perceived space consists of the visually perceivable, audible, and tangible environment where people are situated and in which they move. Lefebvre's two other levels of creating space are conceptualized space (*l'espace conçu*) and lived space (*l'espace vécu*). Conceptualized space refers to conscious representations of space, such as professional people's conceptualizations of the various dimensions of a city. Lived space refers to space that opens up through beliefs, myths, hopes, and fears, and which is kept alive by art and literature, among other things (Lehtovuori, 2002).

improvement of children's motoric development and physical fitness, the protection of their social and emotional development, and their creation of a responsible relationship with the environment<sup>63</sup>. Restrictions on children's possibilities for independent mobility also have societal consequences, such as an increase in traffic and an increase in the time parents spend taking their children to various free-time activities.

In Article II, I operationalized children's possibilities for independent mobility through the use of mobility licenses, meaning parental rules regarding children's mobility. A more reliable and more justified operationalization would combine the studies on mobility licenses with studies on children's actual mobility and their territorial range. Instead of concentrating on mobility licenses alone, the model could try to depict more generally children's independent mobility and the accessibility of affordances. In that case, time schedules set for children's outdoor activities should be taken into account. Also, any sociocultural restrictions on children's outdoor mobility, actions, and use of various spaces should be assessed. This type of extended study on independent mobility would describe, in a more versatile manner than the operationalization used in this study, the fields of promoted, free, and constrained action which regulate the actualization of affordances.

In studying child-environment relationships, I have chosen not to restrict the pool of environments for examination. For example, I have not examined only places that are designed for children, such as playgrounds or schoolyards, but have examined those environments that children have said are meaningful for them. In Article III, we claimed that not all parents were aware of their children's place preferences, and that in particular they were not aware of the emotional value those places had for children. Article I shows that in addition to the immediate surroundings, summer cottages and grandparents' houses are important environments for children. Affordances outside the immediate surroundings were of importance only in special cases. Some families with children in one affluent Finnish urban environment had opportunities to offer their children other kinds of environmental experiences. In the radioactively contaminated area of Belarus, the authorities organize summer camps for children, both in Belarus and abroad.

The affordances of the immediate surroundings, the home, the backyard, the school, the day-care center, and others, are priceless for children. Even though it is known that adults are less attached to the neighbourhood than they are to their home or to the whole city (Hidalgo & Hernandez, 2001), the neighbourhoods are not without

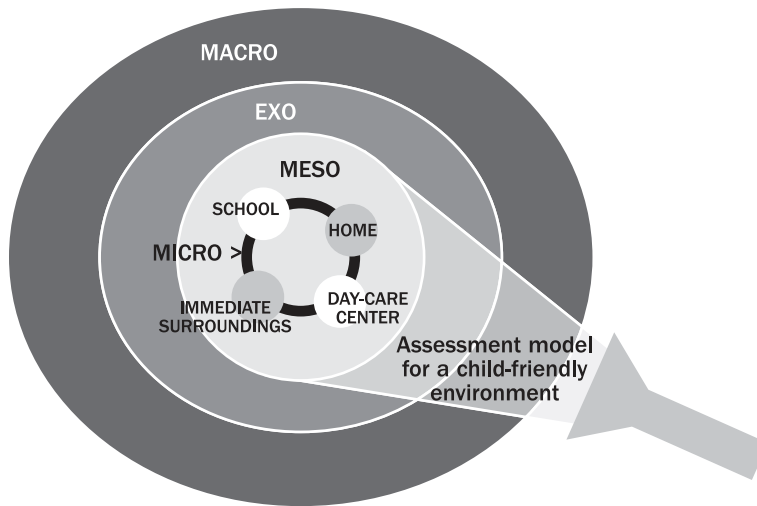
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<sup>63</sup> Corresponding reasons have been presented in connection with securing the independent mobility of elderly people, that of women in particular (Siren & Hakamies-Blomqvist, 2001).

value for them either (Mesch & Manor, 1998). In Article I, I found that Finnish children discovered in the yards and elsewhere in the immediate surroundings most of the affordances that they were asked about in the interview. Children in Belarus, however, relied on affordances they found at home or in courtyards. This I interpreted as being due to restrictions on mobility and/or due to the shortcomings in the infrastructure of the immediate surroundings. Chawla (2002) also emphasized the importance of the immediate surroundings as a source of possibilities for action. My model for the assessment of child-friendly environments makes use of the microenvironments and mesoenvironments defined by Bronfenbrenner (1979, 1989, 1993). However, also the exoenvironments and macroenvironments for their part create prerequisites for a child-friendly environment. Figure 12 presents this in such a way that the spotlight of the assessment model for child-friendly environments mainly highlights the micro and mesoenvironments, but it can also reflect on the levels of exo and macroenvironments.

To give an example, the distance that children's parents have to travel to get to work and the flexibility of their working hours, which are all connected to the exo-environment, influence children's possibilities to create relationships with the environment. Also macroenvironmental factors, such as currently held ideas about childhood and about the prerequisites for favorable development, can greatly affect children's lives. A worrying example of this is the idea of social dangers in the environment. Currently, it is a commonly held view that in many countries the environment has become clearly more dangerous for children. Crime and accident rates do not support this view, however (Blakely, 1994; Valentine, 1995, 1997; Holloway & Valentine, 2000). Discourse about possible dangers has unforeseen consequences. The more that users of public spaces avoid the outdoor environment because of fears, the less there exists social control produced by the users of the outdoor environment, and the more dangerous the environment grows in reality. It is a question of self-fulfilling prophesy. (Katz, 1995).

My model for the assessment of child-friendly environments should not be interpreted in a deterministic way suggesting that all children in a given environment occupy the same place in this four-fold model. With the help of this model it is possible to identify variation related to children's individual qualities as well as to sociocultural factors. In principle at least, the same material environment can be of the Bullerby type for one child and of the Cell type for another. As children grow, their relationships with the environment may vary. For example, a residential area with inadequate public transportation can be a Bullerby environment for a child, but a Glasshouse environment for a teenager who would like to access affordances that are situated further away. As the environmental affordances of children of various ages are studied, one must choose carefully the affordance categories used.



**Figure 12.** The assessment model for child-friendly environments mainly concentrates on Bronfenbrenner’s micro and mesoenvironments, but targets the exo and macroenvironments at least partly.

The categories used here are suitable for the study of child-environment relationships of under-12-year-olds. The affordance categories for older children should be supplemented in particular with affordances for socialization (see Clark & Uzzell, 2002).

The assessment model for child-friendly environments could be extended for use with other age-groups, even for adults. In that case it would be important to be able to identify the affordances pertaining to various age-groups. The interesting affordances for each group and the availability of those affordances could thus form a basis for the development of a model for human-friendly environments (Kytä, 2003).

Children’s individual qualities determine the extent to which they are able to or want to have licenses to explore the environment and discover affordances. In my research it wasn’t possible to sufficiently delve into individual differences. Although individual perception is included in the concept of the affordance, and my research in this respect resembles more person-context research than that based on the model of “social addresses” (Bronfenbrenner, 1989), any future research should look into the individual dimensions of affordances, perhaps in ways that I outlined in Section The Individual Dimensions of Affordances The individual “incentives” (see Section

Bronfenbrenner's Ecological Developmental Psychology) presented by Bronfenbrenner (1993) should also be included.

The temporal dimension should also be included in studies on child-environment relationships; in other words, there should be follow-up studies. It would be important to know the extent to which the actualization of affordances is linked with critical periods in children's development. If sensitization to affordances in the outdoor environment has not taken place in childhood, is it too late after a person has grown up? To what extent do preferences for various types of affordances vary at different ages? Instead of conducting just the traditional organismic studies on the development of children's environmental cognition, the transactional process-person-context-time (PPCT) models see both time and contexts as playing an active role. As was stressed by Bronfenbrenner (1989, 1993), the physical, social, and cultural environments form a multileveled, inseparable system to which the individual actively adapts in various ways at different times.

The sociocultural factors that determine the child friendliness of environments need to be examined in more depth. For instance, it would be interesting to study two subcultures in the same geographical area and to find out to what extent the realities of different groups of children vary in the same material environment. The study of shared affordances would also be interesting. The actualization of shared affordances, behavior settings, and their role in the development of a collective environmental fit can be studied the same way that individual affordances, their actualization processes, and their connections with person-environment fit have been analyzed in this research (see Horelli, 2003).

Of the types of environment I presented in my assessment model, the Glasshouse type may become more common in the future. The media and other sources of second-hand information give children the idea that the environment is a field of ample affordances, but because of mobility restrictions children don't have independent access to those affordances. Second-hand information alone can give a distorted view of affordances – either positive and idealized, or unrealistically negative. The assessment model could be utilized to examine virtual realities. To what extent are possibilities for mobility in virtual environments related to the actualization or nonactualization of environmental affordances? To what extent are they possibilities to discover more extensive or distantly located real or virtual environmental affordances?

The two-dimensional assessment model presented here could be further developed so that it includes a third dimension. The added dimension could be, for example, the emotional value of affordances for children. This would allow the model to be

used to shed light on the motivational basis for action in the environment. The first step to refine the model would be to include negative affordances, but in future research, studies on the emotional basis of the perception of affordances should be more specified. The study of the motivational basis of affordances is, in my opinion, an essential future challenge for ecological perceptual psychology.

My research only investigated the extreme cases of residential areas that vary according to their level of urbanization. It would be interesting in future research to examine the various urban environments in more detail. For example, my model could be used to assess the child friendliness of residential areas which have been designed in different ways, but which represent the same degree of urban density. The analysis of affordances could thus extend into societal levels. The various possibilities of people to actualize affordances would be interesting to explore (Costall, 1995). To what extent are the affordances of the urban environment accessible to people, including disabled people, elderly people, and children? For whom are new potential affordances being designed and created? Whose fields of affordances are expanded, and whose are not? What kinds of ideas about the nature of human activity do the design solutions reflect? It is also good to ask to what extent our system of design leaves room for individual and collective attempts to shape affordances (Horelli, 2001, 2002). These questions are dealt with in more detail in the next section.

### **CONCLUSIONS FOR PRACTICAL APPLICATIONS**

The assessment model I developed for child-friendly environments is based on children's possibilities for independent mobility and for the discovery of environmental affordances. In this research countryside environments proved to be the most child-friendly ones. However, in the Finnish data the urban environments were very close to being equally child-friendly. The findings should therefore not be interpreted to mean that only countryside environments can be child-friendly. It is interesting to note that the rural villages included in my study did not have many facilities specifically designed for children. In Astrid Lindgren's Bullerby there was no need for a playground, or for lots of toys. The child friendliness of the village lay in the fact that the children were an important part of the social community; they were not excluded from any mundane events in the village, and they had important roles and responsibilities. Roger Hart (1997) has said that Western children lack work i.e. meaningful roles and tasks, unlike the children in developing countries, who have too much work. Modern-day children lack agency in their own



communities (see Alanen, 1997). Two interesting questions are whether it would be possible to a certain extent to consciously design Bullerby-type environments, and what the prerequisites are for different environments to become Bullerby environments.

Of the two factors in the assessment model, independent mobility is more critical, because without possibilities for mobility, active perception of environmental affordances through the use of one's own body is impossible. My empirical research (Articles II and IV) has revealed that at least in the Finnish data independent mobility became restricted as the level of urbanization increased. In transportation and community planning account should be taken of which factors in the material environment of all types of communities promote children's possibilities for independent mobility and action. A comprehensive network for foot traffic in residential areas located away from vehicular traffic (see Björklid, 1982), as well as the existence of nearby sports, play, and recreational facilities are examples of such factors (Kytta & Horelli, 2002; Aarnikko et al., 2002).

Increasingly the perceived safety or lack of safety of the social environment play an important role. In many European countries, social fears have already surpassed the actual dangers posed by traffic as reasons for restricting children's outdoor mobility (see Article II). Social safety can be approached by designing the physical environment in such way that it prevents problems (the Crime Prevention Through Environmental Design [CPTED] model<sup>64</sup>). All measures that increase the use of public space also enhance safety. A culture of so-called "shared responsibility", in which the whole community is responsible for children, promotes social safety. It requires active use of outdoor facilities and a mix of users of various ages, whose mere presence creates feelings of being safe.

Lapintie (1997) has criticized community planners for trying to create villages within cities. In his view, there are other models for a good urban environment other than the traditional village. A postmodern person is not expected to be committed to his neighbourhoods. In my opinion, however, it is hard to imagine a child-friendly environment other than a village. Children and many other user groups, especially "weak" groups, are still dependent on the affordances of the immediate surroundings.

Microenvironments are key factors in the development of child-environment relationships. Microenvironments especially facilitate sensitization to various environmental affordances. So it is not insignificant what kinds of homes, courtyards,

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<sup>64</sup> More information is available at <http://www.cpted.com.au>

schoolyards, and day-care centers children frequent, and what kinds of routes connect these places. Adults can actively teach children to find affordances, either by teaching them step by step or by showing them through example the ways to perceive, utilize, or shape affordances. Schools and day-care centers can also actively teach children to find environmental affordances. A schoolyard that is near a natural area can be used in many ways as a pedagogic tool. The “*Forest schools*”<sup>65</sup> of Scandinavian day-care centers are examples of activities through which adults try to sensitize children to the versatile affordances of the natural environment.

The design of affordances should be seen as facilitative, not deterministic. Potential affordances can be designed and created actively. Industrial designers have proven that the actualization of affordances can be influenced (Norman, 1988). Ultimately, however, the actualization of affordances depends on the individual. Designers should exhibit interest in the extent to which the affordances of various spaces are really actualized for the users. A designer cannot be the “average perceiver”; it is impossible for him or her to wear all the various affordance spectacles of different users. The closer the designer is to the user’s daily routines, the better are his or her chances of seeing the affordances the way the users see them. Feedback is the only reliable information concerning users’ actualized affordances. The actual use of spaces should be evaluated after spaces have been occupied, whether the spaces are single buildings or whole communities, as is done in postoccupancy evaluation (POE, Preiser et al., 1988). One should then try to determine the actualized affordances for various user groups, and which user group is best served by the facilities. Also one should pay attention to the degree of usability of individual affordances.

Every environment has in principle an infinite number of affordances. In some cases, such as in Wasteland-type environments, the affordances are restricted. For instance, functional, differentiated town planning may produce quite nonversatile environments. Community planning that does not differentiate various functions into separate islands, but allows for the mixing of living, recreation, services, and jobs, is likely to produce an environment with versatile affordances. One can leave behind nonversatile functionalism without abandoning the basic idea of functionalism: to create a functional relationship with the environment (see Rossi, 1966). The nonactualization of affordances is usually due to problems of accessibility, not a lack of affordances. In Cell and Glasshouse environments the problem of accessibility has to do with restrictions on children’s mobility. Adults can face other kinds

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<sup>65</sup> <http://www.foresteducation.org.uk>

of problems when it comes to accessibility of affordances, such as long distances or other barriers to mobility and sociocultural barriers for actualization of affordances.

The versatility of affordances is also determined by the extent of polymorphic and monomorphic space in the environment (Jones, 2000). Monomorphic spaces are strongly classified spaces that are dominated by one single use that excludes the possibility of other uses. This is the case with gardens, which are too “precious” for children to run about in. Polymorphic places are weakly classified and they can sustain alternative uses by children even in the presence of the dominant use; examples of such spaces include barns and sport fields where access by children is not seen as problematic, and which function sometimes as picnic places, and at other times as sports fields (Jones, 2000). The actualization of versatile affordances is naturally more likely in polymorphic spaces. In my assessment model the Wasteland type represents a monomorphic space where even mobility licenses do not facilitate the actualization of affordances because the affordances are nonversatile.

To what extent do the physical qualities of places give either subtle or direct hints about the promoted use of them? With what kinds of hints does the environment determine who can use the space and for what purpose? Which users seem to be excluded from the space? How versatile is the space, etc.? These questions should be taken into account in the planning of residential environments. It should also be tested in practice how the different user-groups interpret these messages in the material environment.

The best environmental affordances for children are probably not created by designers. Children are experts at play, and at the same time are competent creators of versatile affordances. In Article V, I discussed the fact that as children participate in planning they try to increase the fit between themselves and the environment, and in this way enhance their own well-being. Participatory planning should be extended to all user groups of the environment, especially children. One way of evaluating the success of participatory projects would be to examine the environmental affordances before and after the project. Were the affordances of a courtyard at a day-care center increased after renovation, and was the fit between the children and the courtyard enhanced?

The infinite numbers of potential environmental affordances open up various worlds. Each user of the environment – child, adult, elderly person, disabled person – should on this basis be able to create their own world. In a human-friendly environment affordances are actualized for each user; the environment is seen as clusters of various affordances which can eventually mix. The transactional study of environments, of which ecological perceptual psychology is a good example, treats the

material environment as a major factor in the development of person-environment relationships. It functions as an arena in which designers of the environment and all the various users of the environment can meet. The ecological reality becomes a common meeting place.

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I Kyttä, M. (2002). The affordances of children's environments. *Journal of Environmental Psychology*, 22 (1), 109–123.

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II Kyttä, M. (2003). The extent of children's independent mobility and the number of actualized affordances as criteria of a child-friendly environment. Accepted to be published in the *Journal of Environmental Psychology*.

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