
Gibson's Ecological Theory of Development and Affordances: A Brief Review

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INTRODUCTION

This review describes the key ideas of the influential psychologist Eleanor J. Gibson, developed over 70 years of research with infants, children, adults, and a wide range of nonhuman species. Gibson's ecological approach to perceptual learning and development describes how perception—extracting meaningful information from the environment to guide actions adaptively—improves with experience, the acquisition of new means of exploration, and the development of new perception-action systems (Adolph and Kretch).

The Gibson's ecological theory is a theory of human development that was created by American psychologist Eleanor J. Gibson during the 1960s and 1970s. Gibson emphasized the importance of environment and context in learning. Perception is important because it allows humans to adapt to their environment. Gibson stated that children learn to detect information that specifies objects, events, and layouts in the world that they can use for their daily activities (Miller, 2002).

Gibson built her theory of perceptual learning over a 70-year research career. She published her first paper on perceptual learning in 1932 and her last book in 2002 (Gibson, 2002). It is Gibson's emphasis that the *foundation* for perception is ambient, ecologically available information – as opposed to peripheral or internal sensations – that makes Gibson's perspective unique in perceptual science in particular and cognitive science in general (Gibson, 1966).

Her theory is consistent with but not identical to James Gibson's (1979) ecological approach to perception. Although the Gibsons were married and shared many arguments and ideas about perceptual learning and development, they wrote only five articles together (E. J. Gibson, 2002). Thus, in this review, "Gibson" refers to Eleanor Gibson unless otherwise noted. Gibson's 1969 book, *Principles of Perceptual Learning and Development*, described her theory in detail and jump-started a new field of inquiry.

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AFFORDANCES

Gibson developed the affordance concept to complement his theory of direct perception that stands in sharp contrast with the prevalent inferential theories of perception. A comparison of the two approaches shows that the distinction between them also has an ontological aspect (Dotov, Nir, and de Wit, 2012).

Above all, what animals learn to perceive are affordances for action (E. J. Gibson, 1980, 1982, 1992; 2000). Affordances are possibilities for action, what the environment offers the animal (J. J. Gibson, 1979). Possibilities for action depend on the fit between the animal's bodily capabilities and the physical properties of the environment.

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 psychical, yet neither. An affordance points both ways, to the environment and to the observer (Gibson, 1979)

Gibson used experimental procedures while also attempting to retain ecological validity by simulating important features of the child's natural environment. In keeping with the idea of affordances, Gibson tried to provide multimodal stimulation for infants in these experiments (multiple kinds of objects, faces, or surfaces, for example) and ways of obtaining feedback through movement and exploration (Miller, 2002)

One of Gibson's well-known perceptual experiments involved the construction of a "visual cliff," simulating a real cliff. Gibson and Walk (1960) placed infants near the cliff and placed mothers on the other side of the cliff. They found that infants perceived depth and were unwilling to crawl over the cliff at approximately 6–7 months. Later experiments showed that 12-month-old infants had learned to use their mothers' facial expressions as signals of potential affordances. If mothers smiled, infants were more likely to crawl over the "dangerous" cliff, but if mothers made a frightened face, infants avoided the cliff (Sorace, Emde, Campos, & Klinnert, 1985).

Gibson's theory of perception is *information-based* rather than sensation-based and to that extent, an analysis of the environment (in terms of affordances), and the concomitant specificational information that the organism detects about such affordances, is central to the ecological approach to perception. Throughout the 1970s and up until his death in 1979, Gibson increased his focus on the environment through development of the theory of affordances - the real, *perceivable* opportunities for action in the environment, that are specified by *ecological information* (Mace, 1977).

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In Gibson's view, the information at receptors is sufficient to support complete percepts from the start, and thus animals needn't learn to perceive; rather, they perceive to learn (E. J. Gibson, 1989). Gibson asserted that development was driven by a complex interaction between environmental affordances and the motivated humans who perceive them. For example, to an infant, different surfaces "afford" opportunities for walking, crawling, grasping, etc. As children gain motor skills, they discover new opportunities for movement and thus new affordances (Miller, 2002). The more chances they are given to perceive and interact with their environment, the more affordances they discover, and the more accurate their perceptions become.

Gibson identified four important aspects of human behavior that develop (Gibson and Pick, 2000):

Agency: Self-control, intentionality in behavior. Agency is learning to control both one's own activity and external events. Babies learn at an early age that their actions have an effect on the environment. For example: Babies were observed kicking their legs at a mobile hanging above them. They had discovered their kicking made the mobile move.

Prospectively: Intentional, anticipatory, playful, future-oriented behaviors. For example: A baby will reach out to try and catch an object moving toward them because the baby can anticipate that the object will continue to move close enough to catch. In other words, the baby perceives that reaching out his/her hand will afford him/her to catch the object. Search for order: Tendency to see order, regularity, and pattern to make sense of the world. For example: Before 9 months, infants begin to recognize the strong-weak stress patterns in their native language.

Flexibility: Perception can adjust to new situations and bodily conditions (such as growth, improved motor skills, or a sprained ankle). Examples: Three-month-old infants lying under a mobile had a string attached to their right leg and then to the mobile so that when they moved their leg the mobile would move. When the string was switched to the left legs, the infants would easily shift to moving that leg to activate the mobile.

Gibson's theory has been criticized for its "unclear account of cognition" (Miller, 2002). Gibson's theory pertains to direct perception and does not take into account that behaviors may involve indirect, interpretive cognition. Gibson's methodology involves an expensive and complicated experimental set up, which may prove cost- and time-prohibitive for many researchers. Finally, Gibson's research was almost exclusively confined to infants and very young children, so it is difficult to make generalizations throughout the lifespan.

Aside from her own writings, Gibson's work is rarely described as a theory of development. When Gibson's primary area of research, affordances, is referenced, the citations typically refer only to James Gibson (Michaels, 2003). Gibson is credited with popularizing

affordances in perceptual research. However, unlike Gibson, researchers have studied affordances in all age groups, including adults.

CONCLUSION

Gibson's theory of learning extends beyond perception and the hallmarks of human behavior. Many psychologists think of cognition exclusively in terms of problem solving, reasoning, conceptualizing, remembering, and so on. However, Gibson (1991) points out that these processes, like the hallmarks of behavior, "begin with and depend on knowledge that is obtained through perception". Given that Gibson's tenet was that "perception is based on information, not on sensations", his work and that of his contemporaries today can be seen as crucial for keeping prominent the primary question of *what* is perceived (i.e., affordances, via information) – before questions of mechanism and material implementation are considered.

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