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Perceiving children's affordances: Recalibrating estimation following single-trial observation of three different tasks

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ABSTRACT

The adults' ability to perceive affordances for children was investigated in three different tasks. Forty adults made two estimations of the maximum reachability of a 5-year-old boy from a standing position, during a reach-and-jump task and in making a maximum step. A laser light point was displayed on a wall for the estimations of the standing reach and reach-and-jump tasks, or on the floor for the estimations of the step length task. The participants in the experimental group observed the child performing the task between a first and a second estimation, but the participants in the control group did not. In general, the observers were less accurate in estimating the child's maximum step length than in the other tasks. The observation of a single trial was enough to adjust perceivers' estimations, reducing error magnitude to about 50% of the initial error, but only in tasks with a poor first estimation. An absolute error of 5 cm persisted after one-trial observation. The magnitude of the adjustment in the estimation of affordances for others is task-dependent, and is more pronounced in tasks that imply greater action scaling than in tasks that require direct body scaling.

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1. Introduction

The ability to perceive children's capabilities and limits for action is fundamental to help secure their safe development. Caregivers must be able to perceive the child's possibilities for action in different environments in order to adjust their supervising strategies and to structure the environment in a safe way. For example, parents must know their children's gait velocity to assist them in crossing the crosswalk safely, and must know their children's reaching limits to avoid leaving dangerous objects (e.g., hot cookware) accessible to them. Adults recalibrate their estimations about what a child can and cannot do following a single observation. Parents and educators do it after occasional observation in daily life situations such as helping to reach inaccessible objects, giving support to help climbing a stair, and many other common situations (Heft, 1988).

The perception of the possibilities for action in a given environment is known as the perception of affordances (Gibson, 1979). Affordances are invariant properties of the environment taken with reference to the individual, and are determines by the fit between the properties of the environment and the action capabilities of the actor (Turvey, 1992). The characteristics of the environment offer different things to different actors, resulting in specific individual perception of possibilities for action. The affordances in a given environment for a child are frequently very different of the affordances of that same environment for an adult: an object that is within arm's reach for an adult might be unreachable for a child, but it might be reachable for another child that can climb on a chair. Children's body dimensions and motor competence influence the way they perceive and act in the world (Adolph, 1997).

Affordances for others can be perceived by an observer because they are specified by public information that is available not only to the actor but also to other people (Mark, 2007). However, the discrepancy between body dimensions and motor behavior of children and adults makes the perception of children's action capabilities an important challenge for adults.

The debate about adult's perception of children's affordances is quite recent in the literature (Chang, Wade, & Stoffregen, 2009; Cordovil & Barreiros, 2010a,2010b, 2011; Cordovil, Santos, & Barreiros, 2012). Studies on the perception of affordances for the child-adult dyad (Chang et al., 2009), and on the perception of affordances for children (e.g., Cordovil & Barreiros, 2010a; Cordovil, Santos, & Barreiros, 2012) indicated that even though the information about children's affordances seems to be available and detectable, its perception is not always accurate. The characteristics of the child, the nature of the task, environmental singularities, and the characteristics of the observer may be responsible for some variation in the accuracy of the estimation. For example, younger children's affordances are more difficult to estimate than older children's affordances (Cordovil & Barreiros, 2010a, 2011), and the experience in dealing with children seems to improve the accuracy of the estimation of reachability (Cordovil & Barreiros, 2010b; Cordovil et al., 2012).

The increased accuracy in judging affordances implies devoting more attention to relevant cues in the environment. This process involves different timescales and it has been referred to as education of attention (Gibson, 1979) or attunement (Fajen & Devaney, 2006; Wagman, Shockley, Riley, & Turvey, 2001; Weast, Shockley, & Riley, 2011). The improvement of the perception of affordances is achieved through practice, and the effects of practice are facilitated by feedback information (Wagman et al., 2001). Besides being attuned to the relevant cues, observers need to be correctly scaled to the detected information, which is a process of calibration (Bingham & Pagano, 1998; Fajen, Riley, & Turvey, 2009; Jacobs & Michaels, 2006; Mark, 1987; Mark, Balliett, Craver, Douglas, & Fox, 1990; Withagen & Michaels, 2005). Mark (1987) showed that observers were able to calibrate specific accurate action boundaries, under conditions of artificially changed body dimensions, following a very small amount of practice. Action is crucial for the perceptual tuning of actor and environment, but it is possible that a minimal amount of practice is enough to calibrate the perception of the affordances for others.

Furthermore, the amount of practice might be dependent on the nature of the task to be perceived and the magnitude and direction of perceptual error. Some affordances may be more difficult to predict than others. The estimation of functional simple variables, such as reaching capability, is more precise than the estimation of functional active variables that involve actions of higher complexity, such as a reach-and-jump task (Pepping & Li, 2005; Ramenzoni, Riley, Davis, Shockley, & Armstrong, 2008).