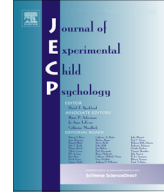




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Children's perception of action boundaries and how it affects their climbing behavior



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ABSTRACT

There are some concerns that children today may be less calibrated to their action capabilities because of the “risk-free” culture that has proliferated during recent decades. This study investigated the extent to which judgments of reaching affordances presented in different directions (i.e., overhead, diagonal, and horizontal) are related to children's climbing behavior on a climbing wall. A sample of 30 schoolchildren from 6 to 11 years old (20 boys and 10 girls) estimated maximum reach and grasp distances and subsequently attempted to climb across an indoor climbing wall. Children who perceived the extents of their reach more accurately completed the climb more often and more quickly. Judgments in the primary directions of climbing locomotion (horizontal and diagonal) were better predictors of success than vertical judgments. Judgments about whether objects are reachable and graspable are complex and influenced by various dynamic factors (including perceptual–motor calibration), and as such different levels of accuracy are likely in different reaching directions. It appears that young children are relatively sensitive to their action boundaries for climbing and, therefore, may be able to make informed decisions themselves about whether a surface is climbable.

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Introduction

Play-like physical activities, such as climbing trees or other obstacles, provide young children with important opportunities for the development of perceptual–motor skills. However, in today's modern world, such opportunities are increasingly being denied or marginalized (Palmer, 2015). There are warnings of a concerning trend that children today may be less calibrated to their action capabilities because of the “risk-free” culture that has proliferated during recent decades (Louv, 2008; Wen, Kite, Merom, & Rissel, 2009). In many Western societies, child carers routinely shield children from activities that are perceived to be risky, such as unsupervised outdoor play. This risk-averse parenting has been linked to the threat of legal or moral judgments surrounding nonconformity to health and safety procedures (Carver, Timperio, & Crawford, 2008). Indeed, it is possibly a reflection of the increasingly cautious approach to children's play that, in risk scenarios, parents tend to underestimate their own children's action boundaries (Cordovil & Barreiros, 2011; Cordovil, Santos, & Barreiros, 2012). Do parents deem activities such as climbing as dangerous because they fear that their children are not capable of perceiving their own action boundaries? And more generally, are children not capable of demonstrating movement competencies to climb trees or obstacles safely? To answer these questions, more information about how children perceive their environment and their action boundaries is necessary (Heft, 1988). In the current study, we aimed to investigate the development of children's climbing capabilities in terms of their ability to perceive and act on affordances. Specifically, we examined affordance judgments of reaching and grasping in different directions and how they are related to children's climbing behavior on a climbing wall.

Climbing requires a high level of perceptual–motor control, and yet it can be performed by relatively young children. For successful climbing coordination, the perception of reach and grasp ability affordances is paramount (Gibson, 1966, 1979/2014). If the environment affords climbing for a child, then that child possesses properties that allow for climbing to take place in that environment. More specifically, if a hold on a climbing wall affords reaching for, then the child possesses the action capabilities (e.g., long enough arms but also strength, flexibility, and coordination abilities) that allow him or her to reach the hold. The region of peripersonal space in which a hold is within reach has a critically different meaning than the region in which the hold is out of reach (i.e., extrapersonal space) (Pepping & Li, 2005). It is important that the child's perception–action system can identify this critical boundary because it specifies the type of behavior that is afforded.

The current study aimed to add to a growing body of literature on child reaching and climbing. The ability to reach, and hence to perceive reaching affordances, develops from a very young age. Research has shown that infants as young as 9 months direct exploratory reaches toward objects and pictures (e.g., Yonas, Granrud, Chov, & Alexander, 2005). Reaching research with infants has shown that skilled reaching actions become apparent from about 4 to 6 months of age (Johnson, 2010). Perception and action relative to reaching affordances has been linked to children's postural and self-sitting abilities (Rochat & Goubet, 1995, 1999) and has been shown to constrain exploration and learning (Soska & Adolph, 2013). From 3 to 5 years of age onward, there are no differences in the accuracy of vertical and horizontal reaching judgments as compared with adults (Johnson & Wade, 2007, 2009; Rochat, 1995).

Research on reaching with adults has shown that they are relatively accurate at perceiving their maximum reaching capabilities in seated forward reaching (Carello, Groszofsky, Reichel, Solomon, & Turvey, 1989; Ishak, Adolph, & Lin, 2008; Mark, 1987) and standing overhead reaching (Pepping & Li, 2000a, 2000b, 2008; Ramenzoni, Davis, Riley, & Shockley, 2010; Ramenzoni, Riley, Shockley, & Davis, 2008; Weast, Shockley, & Riley, 2011). The majority of the reaching affordances work so far has indicated that overestimation of action capabilities is more common than underestimation. However, whereas participants accurately judged their action boundaries for familiar body-scaled reaching tasks, they underestimated their abilities when performing similar reaching actions that include a jump or a launch (Cole, Chan, Vereijken, & Adolph, 2013; Pepping & Li, 2000a, 2008; Ramenzoni et al., 2008, 2010; Weast et al., 2011). Pepping and Li (2005) reported consistent underestimation of overhead reaching affordances when participants were not allowed to move and explore while making their judgments (see also Cole et al., 2013). It is possible that reaching capabilities are underestimated in unfamiliar situations where participants must remain still.

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