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Individual differences in nonlinguistic event categorization predict later motion verb comprehension

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ABSTRACT

This study probes how individual differences in early event perception predict later verb knowledge. At Time 1, when infants were 13 to 15 months of age, they saw videotaped silent scenes performed by a human actor. The goal was to see whether infants could form categories of *path* (a figure's trajectory with respect to a ground object) and *manner* (how an action is performed). Infants either saw the same manner (e.g., *jogging*) taking place across three different paths (*around*, *through*, and *behind*) or saw the same path (e.g., *around* a tent) taking place across three different manners (*running*, *crawling*, and *walking*). After familiarization, either the path or the manner was changed and visual fixation was monitored using preferential looking. At Time 2, the same children were tested on their *comprehension of verbs* in a two-choice pointing task showing two simultaneous actions (e.g., running vs. jumping). Success at categorization of path and manner at Time 1 predicted verb comprehension at Time 2, even when taking language knowledge at both time points into account. These preliminary results represent headway in identifying the factors that may contribute to children's language learning. They suggest that skill in categorizing semantic components present in nonlinguistic events is predictive of children's later verb vocabulary.

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Introduction

The power that language affords for expression would be lost if we could name only objects such as *ball* and *table.* Relational terms such as verbs and prepositions allow us to describe relations between entities (e.g., the ball is *under* the table, the cat is *chasing* the mouse). Relational term learning involves three steps (Golinkoff et al., 2002; Golinkoff & Hirsh-Pasek, 2008; Pulverman, Hirsh-Pasek, Golinkoff, Pruden, & Salkind, 2006). First, infants must parse and discriminate between event components. For example, the action of *playing on the playground* can be divided into smaller units such as *running to a slide, climbing the ladder, sliding down* and *skipping around the slide,* and *going up the ladder* again. Second, children must categorize these event components when they are seen in varying contexts. That is, children must recognize that "sliding" is "sliding" regardless of a change in figure or ground (e.g., the *girl* [the figure] is sliding down the *slide* [the ground object] vs. the *boy* is sliding down the *stairs*). Third, children must learn how their language encodes these components of events (e.g., Golinkoff et al., 2002; Golinkoff & Hirsh-Pasek, 2008). English, for example, typically encodes how an action is performed (the *manner*) within the main verb, placing the path of the action (e.g., *around* the slide) into a satellite prepositional phrase (Talmy, 2000). Spanish, on the other hand, emphasizes the *path* of the action (i.e., the movement of the figure with respect to a ground object) in verbs, placing the manner of motion into optional gerunds (as in "*Una mujer sale de la casa corriendo*": "A woman exits the house [running]"). Thus, learning verbs requires parsing and categorizing action sequences and mapping labels to these event components (Maguire, Hirsh-Pasek, & Golinkoff, 2006). The current study focused on the relationship between the second and third steps: the categorization of the event components of path and manner and later verb knowledge.

Infants' processing of event components

Combining linguistic theory and event processing, research has begun to examine the conceptual precursors to relational terms during infancy (e.g., Casasola & Cohen, 2002; Choi & Bowerman, 1991; Choi & Hattrup, 2012; Golinkoff & Hirsh-Pasek, 2008; Lakusta, Wagner, O'Hearn, & Landau, 2007; Mandler, 2004; Pulverman, Golinkoff, Hirsh-Pasek, & Sootsman Buresh, 2008; Pulverman, Song, Hirsh-Pasek, Pruden, & Golinkoff, 2013). Pulverman and colleagues (2008, 2013), for example, demonstrated that 7-month-old English-learning infants attend to path and manner changes in nonlinguistic dynamic events. Using a habituation paradigm, infants were habituated to an animated starfish performing both a path and a manner (e.g., *spinning under* the ball). At test, infants dishabituated to both a path change (e.g., spinning *over* the ball) and a manner change (e.g., *jumping jacks* under the ball), suggesting that they had discriminated between different instances of these two event components.

However, discrimination of path and manner is not sufficient for event processing; children need to form a *category* of these event components. Recent work suggests that infants can in fact categorize paths and manners by 13 months of age. In one study (Pruden, Roseberry, Göksun, Hirsh-Pasek, & Golinkoff, 2013), infants were familiarized to an animated starfish traveling on the same path (e.g., *under* a ball) performed with three different manners (e.g., *spinning, twisting,* and *toe-touching*). At test, they were presented with the starfish traveling on the same path in a new manner (e.g., *jumping jacks under* the ball) versus the starfish traveling on a new path in a new manner (e.g., *jumping jacks over* the ball). If infants can form a category of the path *under,* they should recognize *over* as being a new path despite the change in manner in both displays. Infants succeeded at this task by 10 months of age, and by 13 months they succeeded in an analogous task for the categorization of manner (Pruden, Göksun, Roseberry, Hirsh-Pasek, & Golinkoff, 2012). Additional evidence suggests that 10- to 12-month-old infants form nonlinguistic categories of manners (e.g., *hopping* and *marching*) over five different actors and across changing paths (Song, Golinkoff, Ma, Seston, & Hirsh-Pasek, 2008). Indeed, infants appear to prefer to process events categorically rather than focus on metrical changes (Roseberry, Goksun, Hirsh-Pasek, & Golinkoff, 2012). Together, these studies demonstrate that infants can categorize path and manner, both of which might be building blocks of relational terms.

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