

**SEMANTIC REORGANIZATION: DOES LANGUAGE INFLUENCE
INFANTS' PERCEPTION OF COMPONENTS OF EVENTS?**

by

Haruka Konishi

A dissertation submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Education

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by

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ABSTRACT

Infants appear to first discriminate and categorize a possibly universal set of event components like *path* or the trajectory of an action or *figure*, the entity carrying out the action. Only after being exposed to the ambient language will they privilege components such as these that are expressed in their native language. This process of *semantic reorganization* may be one of the mechanisms that underlie the acquisition of relational terms (e.g., verbs and prepositions). Studies support the notion of semantic reorganization (e.g., Göksun et al., 2010). In Japanese, two different verbs are necessary to describe a person crossing a bounded ground (e.g., street) versus an unbounded ground (e.g., field) while in English, the same verb *-crossing-* describes both types of grounds. Both Japanese and English 13-to 15-month-old infants detect Japanese ground distinctions while at 18-to 20-months, only Japanese-reared infants maintain sensitivity to this distinction (Göksun et al., 2011). While language is hypothesized to guide infants' progression from language-general to language-specific event perception, no prior studies have examined this hypothesis.

To pursue this question, the present study investigated whether 13-to 15-month-old English-learning infants (Experiment 1a) and 21-to 24-month-old children (Experiment 2a) showed sensitivity to Japanese ground-path distinctions in the presence of general language. To examine whether language plays a role in English-reared

children’s weakened sensitivity to non-native event components, Experiment 1b assessed whether language experience of a specific type *weakens* 13-to 15-month-old infants’ sensitivity to Japanese ground-path distinctions. To explore the plasticity of semantic reorganization, Experiment 2b investigated whether children’s sensitivity can be *heightened* when novel prepositions presented in sentences attracted their attention to ground-path distinctions. In the presence of general language, Experiment 1a found that at 13 to 15 months of age, English-reared infants showed sensitivity to Japanese ground-path. Experiment 2a demonstrated that 21-to 24-month-old English-reared children no longer showed sensitivity to this event component, corroborating the findings of Göksun et al. (2011). Experiment 1b showed that when a novel word is paired with bounded and unbounded grounds, 13-to 15-month-old infants’ sensitivity to Japanese ground-path becomes dampened, suggesting that language may be the driving force behind children’s language-specific event perception. When novel words were paired uniquely with bounded and unbounded grounds, 21-to 24-month-old discriminated between Japanese ground-path categories (Experiment 2b), suggesting that semantic reorganization is malleable. This is one of the first studies to show that language can be used to heighten and dampen children’s sensitivity to “non-native” event components such as ground type (Casasola et al., 2009; Hespos & Spelke, 2004). Investigating the mechanism underlying semantic reorganization may further our understanding of how children learn to talk about events in their native language and illuminates an ancient debate about the role of language in thought.

Chapter 1

INTRODUCTION

1.1 Verbs and Prepositions

Relational terms (e.g., verbs and prepositions) are fundamental to language development. Verbs and prepositions allow us to communicate static and dynamic relations between objects and participants in events (e.g., Molly is *patting* the cat or the cup is *on* the table). Verbs in particular stipulate the structure of sentences (e.g., transitive verbs require a direct object; “She is taking a *picture*”). Early verb and preposition knowledge may also be predictive of children’s later language and spatial ability. Children who produce more verbs at two years of age are more likely to have a greater vocabulary (as measured by the Preschool Language Scale) and better understanding of passages (as measured by subtests of the Woodcock-Johnson) at 4.5 years of age than children who produced fewer verbs (Lee, 2011). Similarly, Balcomb, Newcombe, and Ferrara (2011) found a relationship between children’s knowledge of prepositions and their ability to localize a goal in a maze, suggesting a relationship between children’s emergent spatial knowledge and spatial language. There is additional evidence to suggest that children who know more verbs at 2.5 years of age are more likely to have a better understanding of grammar (as measured by the Test for Auditory Comprehension of Language) at 4.5 years than children who knew fewer verbs early on (Konishi, Miller, Hermon, Golinkoff, & Hirsh-Pasek, 2013).

Although most children produce their first verbs and prepositions sometime around the second year of life (Choi & Bowerman, 1991; Fenson et al., 1994; Naigles et al., 2009), little is known about when and how children acquire the conceptual knowledge necessary to learn these relational terms in their native language. However, research in the last 5 to 10 years has begun to examine the acquisition of English relational terms (e.g., Casasola & Cohen, 2002; Choi & Bowerman, 1991; Golinkoff & Hirsh-Pasek, 2008; Lakusta, Wagner, O’Hearn, & Landau, 2007; Mandler, 2004; Pulverman, Golinkoff, Hirsh-Pasek, & Sootsman-Buresh, 2008; Shipley & Zacks, 2008; Pulverman, Song, Hirsh-Pasek, Pruden, & Golinkoff, 2013).

1.2 Theoretical Perspectives in Relational Term Learning

The study of relational language learning intersects with linguistic and psychological theory and event perception. Researchers, such as Mandler and Gentner, study infants’ sensitivity to conceptual components that may serve as a basis for later relational terms. Mandler (2004; 2012) takes a developmental perspective suggesting that pre-verbal infants may be equipped with a language-ready organizational system. She proposes that children form *image-schemas*, or non-linguistic mental representations of objects (e.g., animacy) and relations (e.g., containment) (Mandler, 1992). “Images schemas” are a result of perceptual analysis (e.g., discrimination between objects), providing a level of representation that intersects between perception and language that facilitates the process of language acquisition (Mandler, 2004). Other common image schemas include *path* (the trajectory of an action),

containment (when something is fully or partially surrounded by a container) and *support* (the contact of an object on top of a surface) that become combined to result in conceptual categories such as *causality*, and *agency* (Mandler, 2012). Mandler suggests that infants first extract aspects of an event that could later serve as potential concepts to which a verb could refer (Mandler, 2012).

Gentner's *Natural Partitions Hypothesis* suggests that to learn a verb, infants must conceptualize components of events and map verbs in the ambient language onto those components. Gentner (1982) argues that verb learning is dependent upon two factors: (1) a conceptual understanding of the events verbs describes and (2) a recognition of the way in which one's particular language expresses these events. Similarly, Slobin (1996) argues that the same event will be expressed differently depending on the language. He suggests that to acquire verbs, children must learn to "think for speaking." That is, to become sensitive to the way their language expresses events in daily conversation. Slobin (1996) suggests that children use linguistic input to discover the event components that are packaged in the lexical and grammatical items of their native language. This dissertation takes a similar position as Mandler, Gentner, and Slobin such that infants must first become sensitive to non-linguistic concepts that are expressed across languages. These concepts gradually become language-specific with exposure to the native language (Göksun, Hirsh-Pasek, & Golinkoff, 2010; Maguire et al., 2010).

Relational terms are of particular interest here because languages differ in how they encode event components in their relational vocabulary. For example, while

English uses a single preposition for *on* (e.g., put a lid on a pot), Korean has many verbs for *on*, depending on how tightly the *on* relation appears (e.g., ring *on* a finger vs. ball *on* a table) (Choi & Bowerman, 1991). By examining how infants discriminate, categorize, and package events that are codified in relational terms, we can begin to uncover the conceptual knowledge necessary for relational term learning.

1.3 Relational Terms are Difficult to Learn

Relational terms such as verbs are difficult to acquire. Imai, Li, Haryu, Okada, Hirsk-Pasek, and Golinkoff (2008) reported that English-reared children have trouble learning and extending a novel verb even well into the fourth year of life. Children were given a novel label while watching an agent perform a novel action on a novel object. Three-year-old children who heard a novel word corresponding to a noun (e.g., “blick”) correctly chose the novel object as the label’s referent. In contrast, 3-year-old children who heard a novel a verb (e.g., “blicking”) were not able to reliably choose the correct referent (i.e., the action) until 5 years of age. Moreover, Bornstein et al. (2004) showed that nouns comprise the greatest proportion of 20-month-old children’s vocabularies followed by verbs. This pattern was shown across children learning Spanish, Dutch, French, Hebrew, Italian, Korean and American English. These studies support the notion that verbs are difficult to learn, especially in comparison to nouns (Gillette et al., 1999; Imai et al., 2008; Waxman, Fu, Arunchalam, Leddon, Geraghty, & Song, 2013; Waxman & Lidz, 2006; Waxman, Lidz, Braun, & Lavin, 2009).

Why are relational terms difficult to learn? Relational term learning requires three steps (Golinkoff & Hirsh-Pasek, 2008; Hirsh-Pasek, Golinkoff, Hennon, & Maguire, 2004). First, infants must discriminate between the non-linguistic components of actions that words encode. For example, the action of *making a sandwich* can be divided into smaller units such as *getting the ingredients from the cabinet*, *buttering the bread*, and *putting the vegetables in between the bread*. Before children can map words onto these events, infants must individuate them (Nelson, 1989). Second, children must categorize these event components when they are seen in varying contexts. That is, children must recognize that ‘hopping’ is ‘hopping’ regardless of the change in figure or ground (e.g., *girl* is hopping in the *playground* vs. *boy* is hopping in the *hallway*). Third, toddlers must attach a label to these components of events (Golinkoff et al., 2002; Golinkoff, Jacquet, Hirsh-Pasek, & Nandakumar, 1996). Picture a child running to a slide, climbing the ladder, sliding down, and skipping around the slide to go up the ladder again. Now consider the sentence “Max is blicking” accompanying this event. *Blicking* could have many different meanings, from playing to skipping to smiling. It is only after children can attach the label *blicking* to the correct action that they can finally begin to use it. Thus, discriminating between different actions, categorizing, and attaching labels to event components are a prerequisite to learning relational terms. *Categorization* of event components in particular, is a crucial step in learning relational terms and is also the focus of the present study.

1.4 Languages Differ in how they Encode Semantic Components

The acquisition of relational language is further complicated by the fact that languages lexicalize different aspects of the same event. For example, verbs do not unambiguously label actions; they only label a part of an action. According to Talmy (1985), these subsets of actions or event components include *path* (the trajectory of an action, e.g., through, around); *manner* (how an action occurs, e.g., run, march); *figure* (the primary agent or object of an event, e.g., man, girl); *ground* (the reference point of the event's path, e.g., field, street), *containment* (when something is fully or partially surrounded by a container, e.g., *in*) and *support* (the contact of an object on top of a surface, e.g., *on*). Languages differ in how they encode these semantic components. For example, English tends to encode a figure's manner of action in the verb and a figure's path in a satellite prepositional phrase (e.g., A woman *ran* [manner] *out* [path] of the house) whereas languages like Spanish often encode path in the verb and manner outside of the verb, as an optional gerund (e.g., “*Una mujer salió de la casa (corriendo)* ‘A woman exited the house (running)’) (Slobin, 2001; Talmy, 2000). Thus, children must discern how their language chooses to talk about relations within events (Gentner, 1982; Gentner & Bowerman, 2009; Golinkoff & Hirsh-Pasek, 2008). Researchers propose that these sets of pre-linguistic constructs may be prerequisites to learning relational terms (Gentner & Bowerman, 2009; Golinkoff & Hirsh-Pasek, 2008).

To investigate how infants come to show sensitivity to the components of events that are encoded in the relational terms of their native language, we will

introduce a phenomenon called *semantic reorganization* (Bowerman & Levinson, 2001; Göksun, Hirsh-Pasek, & Golinkoff, 2010), or a process in which infants start with “universal” non-linguistic event constructs that are gradually reorganized to match the expression of their native language. Proponents of this theory suggest “...learners come equipped with both pre-existing cognitive biases for semantic reorganization and a phenomenal ability to learn semantic categories from the linguistic input” (Gentner & Bowerman, 2009, p. 32). To determine whether there is evidence to support semantic reorganization, I will briefly review the existing literature on infants’ sensitivity to path-manner, containment-support, and how infants perceive ground-path distinctions. We will then explore whether the ambient language heightens infants’ attention to some relations in events over others. This study investigates the relationship between language and semantic reorganization by examining how language influences English-reared infants’ ability to categorize Japanese ground-path distinctions, an event component that is less common in English relational terms.

1.5 Is Semantic Reorganization Parallel to the Perceptual Reorganization that Occurs in the Phonological Domain?

The process whereby infants come to show sensitivity to the components of events that are encoded in the relational terms of their native language is called *semantic reorganization* (Göksun, Hirsh-Pasek, & Golinkoff, 2010). The theory states

that infants start with “universal” non-linguistic event constructs that are gradually reorganized to match the expression of their native language. One way to gain insight into semantic reorganization is to examine a different and established domain of language: the acquisition of phonology (a branch of linguistics that deals with systems of sounds in language). “Perceptual reorganization,” a developmental process in which specific experiences shape perception, has been demonstrated extensively in the phonological domain (e.g., Jusczyk, 1980; Werker & Tees, 1984; Werker & Tees, 2005). At the beginning of life, infants recognize virtually all the phonetic units of the world’s languages (e.g., Werker & Tees, 1984; Kuhl et al., 2006). By the end of the first year of life, lack of exposure to a range of non-native phonological distinctions weakens children’s universal ability to discriminate between non-native phonemes (e.g., Kuhl et al., 2006; Werker & Tees, 1984). Infants’ sensitivity to event components may develop in a similar fashion (Hespos & Spelke, 2007).

Although many of the problems in the study of semantics have analogs in the field of phonology, it is important to note that the analogy between perceptual and semantic reorganization is not a perfect one. First, these two domains differ in terms of the degree of decline in non-native sensitivities. In the case of speech perception, most adults have difficulty hearing categorical differences between non-native phonemes unless they are explicitly trained (Tees & Werker, 1984). In contrast, adults may recover relatively easily from their initial tendency to favor event components that are prominently encoded in their native language. In fact, Hespos and Spelke (2007) showed that when English-speaking adults were familiarized to either a tight or a

loose-fit relation non-linguistically and later asked to decide if a new exemplar was similar to the relation they were familiarized to, they were able to group the new exemplars based on the tight-fit loose-fit distinction. Similarly, Shafto, Havasi, and Snedeker (2014) reported that English-speaking children and adults initially interpreted a novel verb to correspond to the manner of motion but later perceived it as a path verb in response to concentrated input.

Second, the timing at which infants narrow their perception differs by domain. Infants' sensitivity to non-native phonemes tends to decline at around 8 to 10 months (Kuhl et al., 2006). On the other hand, children show weakened sensitivity to different "non-native" event components at varying times (Choi, 2006; Göksun et al., 2010). Third, some phonemic categories make *no* meaningful difference in one language but do in another language. For example, in English, the phonemes *r* and *l* make a difference in meaning (e.g., *craw* vs. *claw*) but are not differentiated *at all* in Japanese. In contrast, languages differ in the degree to which they encode specific event components and which grammatical category they used to express them (Slobin, 2006). That is, although speakers of manner-biased languages (e.g., English) show a strong bias towards manner verbs (e.g., *jump*) they also encode path (e.g., *ascend*) and ground (e.g., *over*) information in relational terms. This suggests that the effects of perceptual reorganization in the phonological domain may be more severe and categorical while semantic reorganization may be more nuanced and probabilistic.

1.6 Children Show Sensitivity to Event Components

Semantic reorganization may be an important process that underlies relational language acquisition. To make the argument that infants are sensitive to event components that will be encoded differently across various languages, it is necessary to demonstrate that infants attend to and process event components (Golinkoff et al., 2002). Next, evidence for discrimination and categorization of *path-manner*, *containment-support*, and *figure-ground* will be reviewed. These event components are (1) perceptually available to infants, (2) universally codified across languages, but (3) languages vary in how they encode these components (Golinkoff & Hirsh-Pasek, 2008).

1.6.1 Path and Manner

“Marching” is an example of what linguists call a figure’s *manner of motion*, or the way in which a figure moves. *Path of motion* describes the trajectory of an action. When can infants distinguish between different manners and paths? Studies show that 7-month-old (Pulverman et al., 2013) and 14-month-old (Pulverman, Golinkoff, Hirsh-Pasek, & Sootsman, 2008) English-learning infants attend to path and manner changes in non-linguistic dynamic events. Using a habituation paradigm, infants were shown an animated starfish performing both a path and manner (e.g., Starfish *spinning under* the ball). At test, infants increased their attention to both a path change (e.g., Starfish *spinning around* the ball) and a manner change (e.g., Starfish *jumping jacks* under the ball), suggesting that they had noticed the changes in

these two event components. Similar results were found among Spanish-reared and Mandarin-reared infants (Pulverman, Tardif, Rohrbeck, & Chen, 2010; Pulverman et al., 2008), suggesting possible universal sensitivity to path and manner.

However, discrimination of path and manner is not sufficient for acquiring motion verbs. Children need to form a *category* of path and manner to gain a conceptual understanding of motion verbs. English-speaking children must learn, for example, that even when the actors are of different types (e.g., dog or a person), the action of ‘marching’ constitutes a manner category. Furthermore, even when other key event components change (such as the path, as in “marching *alongside* a tree,” or “marching *through* a hallway,” “marching *over* a rock”), the manner of motion used is still called “marching.”

By the same token, children must recognize that the same preposition, ‘around’ (a path category) is used regardless of varying ground objects (e.g., around the *tree*, around the *building*) and manner changes (e.g., walking *around*, skipping *around*). Pruden, Roseberry, Gökusn, Hirsh-Pasek, and Golinkoff (2013) found using the Preferential Looking Paradigm (PLP) that infants categorize paths and manners by 10 and 13 months of age, when these events are presented with animated stimuli and are performed in an invariant manner. The PLP is an experimental method in developmental psychology used to examine how infants perceive stimuli. In a PLP experiment, infants are shown one type of stimulus repeatedly until they eventually decrease their looking towards the stimulus. Then infants are shown the same stimulus that they have been seeing and a second stimulus that differs significantly from the

first stimulus on a split-screen (Figure 1). If infants on average look longer towards the new stimulus, this suggests that infants have discriminated between the stimuli. In the Pruden et al. (2013) study, after being familiarized to the same path (e.g., *over*) presented with four different manners (e.g., *spinning, twisting, bending, jumping jacks*), at test children noticed path changes at 10 months and manner changes at 13 months (Pruden, Gökusn, Roseberry, Hirsh-Pasek & Golinkoff, 2012). There is additional evidence to suggest that 10-to 13-month-old infants form non-linguistic categories of two manners (i.e., *hopping* and *marching*) over five different actors (Song, 2009). Moreover, 13-to 15-month-olds form a category of a common manner of motion in non-linguistic, realistic dynamic stimuli, in the presence of varying path relations (Konishi, Pruden, Golinkoff, & Hirsh-Pasek, under review). Children were familiarized to a single manner performed along three different paths and a ground object (i.e., yellow tent). At test, 13-to 15-month-olds increased their attention to the novel manner change, indicating that they extracted the common manner of motion. Results from these studies demonstrate that in the first year of life, infants reared in different linguistic contexts (English, Spanish, and Mandarin) discriminate and categorize manner and path. These studies suggest that children, regardless of their linguistic background show early sensitivity to path and manner of motion.

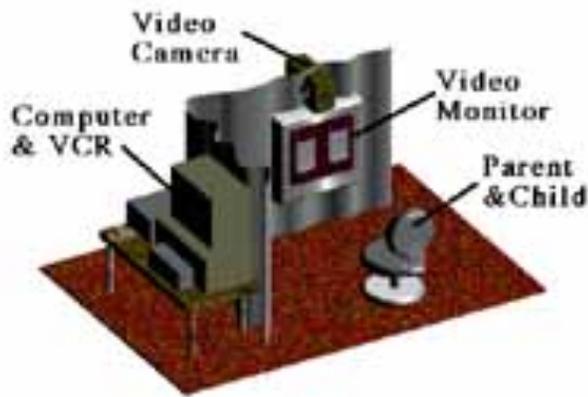


Figure 1.1 Preferential looking paradigm

1.6.2 Containment and Support

A *containment* relation occurs when something is either fully or partially surrounded by a container (e.g., in) and a *support* relation corresponds to the contact of an object on top of a surface (e.g., on). English linguistically divides events with containment and support relations into two semantic categories. By contrast, Korean linguistically marks spatial relations based on whether two objects are placed in a tight-fit or loose-fit relation using the word *kkita* and *nehta* respectively. The verb *kkita* describes a tight-fit relation between objects, cross-cutting the English categories of *put in* and *put on* (Choi & Bowerman, 1991). That is, putting a ring *on* a finger and putting a hand *in* a glove are both described with the same verb *kkita* (tight-fit) in Korean (Choi, 2006). English does not mark this tight-fit or loose-fit relation encoded in Korean verbs.

When do infants show sensitivity to how their native language encodes containment and support? Casasola, Cohen, and Chiarello (2003) assessed 6-month-old English-learning infants' ability to form a category of containment. Infants were habituated to 4 pairs of objects in a containment relation. At test, infants saw a novel example of the familiar containment relation and an example of an unfamiliar support relation. Results showed that infants looked longer at the unfamiliar support relation, suggesting that English-reared infants as early as 6 months can form a category of containment. In addition, Casasola and Cohen (2002) found that 10- and 18-month-old English-reared infants can categorize support relations. Similarly, McDonough, Choi, and Mandler (2003) demonstrated that by 9 months of age, Korean-learning infants categorize the Korean tight-fit relation, using a similar paradigm. Infants were familiarized to different objects depicting the tight-fit relation. At test, infants saw a different instance of the tight-fit relation and a novel loose-fit relation. Korean-reared infants looked longer at the familiar tight-fit relation, suggesting that they formed a category of tight-fit. A parallel condition demonstrated that Korean-learning infants can also form a category of loose-fit (McDonough, Choi, & Mandler, 2003). Such studies suggest that English- and Korean-learning infants show non-linguistic sensitivity to how their native language encodes containment and support by 9 months of age. In addition, Choi et al. (1999) found that 18-month-old English-learning and Korean-reared infants' comprehension of language-specific spatial words. Using a preferential looking paradigm, Choi et al. (1999) revealed that 18-month-old English-reared children preferred an event depicting containment, regardless of tightness of fit,

when they heard the word “in.” Korean-reared children looked longer towards an event depicting tight-fit regardless of containment or support, when they heard the word “kkita”, suggesting that both English- and Korean-reared young children comprehend containment and support in language specific ways (Choi & Bowerman, 1991; Choi, McDonough, Bowerman, & Mandler, 1999; Hespos & Spelke, 2007).

1.6.3 Figure and Ground

Figure refers to an agent or entity that is undergoing motion. *Ground* is a stationary setting with respect to the figure’s movement. For example, in the sentence “Holly is jogging through the park,” *Holly* is the figure and the *park* is the ground. When do infants show sensitivity to figure and ground? Göksun et al. (2011) found that 11-month-old English-reared infants discriminate between figures in dynamic events. Infants were familiarized with a dynamic event in which a man crossed a ground (e.g., a road). At test, they were shown the same man crossing the same ground and a woman crossing the same ground that they saw during familiarization. Infants looked longer at the novel figure (i.e., woman), suggesting that 11-month-old infants can discriminate between figures. The gender of the figure was counterbalanced in this study. In the same study, Göksun et al. (2011) reported that 11-month-old English reared infants discriminated between grounds in static stimuli. Infants were familiarized to a man crossing a ground (e.g., a road) and shown the same man crossing the same ground (e.g., a road) and the same man crossing a new ground (e.g., a railroad track) at test. Infants looked longer at the novel ground, suggesting that they

can discriminate between different grounds. It is not until 14 months that infants discriminate between grounds in dynamic stimuli. Such studies suggest that infants show sensitivity to figure and ground by 14 months of age.

Research shows that infants living in different linguistic environments process event components such as *path-manner*, *containment-support*, and *figure-ground*. However, the question of whether children progress from showing sensitivity to language-general event components to focusing mainly on components of events that will be encoded in their native language remains unanswered. If perceptual narrowing occurs in the semantic domain, children should demonstrate this developmental pattern. To explore this question, children's sensitivity to *path-manner*, *containment-support*, and *ground* are reviewed in the following sections.

1.7 Evidence for Semantic Reorganization

1.7.1 Path and Manner

Children show differential sensitivity to path and manner across development. Maguire et al. (2010) examined how English-, Japanese-, and Spanish-speaking toddlers, preschoolers, and adults interpret the meaning of a novel verb. Participants were familiarized to an animated starfish performing a novel manner along a novel path (e.g., *spinning around* the ball) paired with a language-appropriate novel verb (e.g., "Look, he's blicking!"). At test, one side of the screen displayed the starfish performing the same manner seen during familiarization paired with a novel path (e.g.,

spinning past the ball; manner bias); the other side showed the starfish performing a novel manner with the same path from familiarization (e.g., *bowing around* the ball; path bias). Participants are asked to indicate where the starfish is “blicking” at test. If participants thought that “blicking” referred to the manner of the action, they should choose the video of the starfish performing the same manner shown in familiarization with the novel path. If participants thought that “blicking” corresponded to the path of action, they should choose the video of the starfish performing the same path from the familiarization phase paired with the novel manner. Results suggest that across languages, toddlers (2- and 2.5-year-olds) interpreted the novel verb as a path verb. However by preschool (3- and 5-year-olds) and adulthood, participants displayed language-specific patterns of verb construal. English- and Japanese-speaking adults interpreted the novel verb to be a manner verb while Spanish-speaking adults perceived the novel verb to be a path verb. These findings suggest that children make a shift from language-general to language specific verb construal by three years of age, supporting the developmental process of semantic reorganization.

1.7.2 Containment and Support

A similar pattern is observed with containment and support. McDonough, Choi, and Mandler (2003) investigated English-learning and Korean-reared 9-, 11- and 14-month-olds sensitivity to tight-fit and loose-fit relations. In a habituation paradigm, children saw scenes of an object that was either fit loosely or tightly in a container. After infants habituated to the event, they were presented with either another object

that fit tightly or one that fit loosely in the container. Both Korean- and English-learning infants looked longer at the novel tight- or loose-relation, demonstrating their ability to categorize tight-fit and loose-fit. Results suggest that infants may initially be predisposed to attend to conceptual divisions that are *not* commonly expressed in their native language such as tight-loose relations.

When do infants show decreased sensitivity to event components that are not expressed in their native language? Choi (2006) assessed English and Korean learning children's sensitivity to tight-loose relations at 18, 24, 29 and 36 months of age. Results showed that while English-reared children weaken their sensitivity to tight-loose relations by 29 months, Korean-learning children maintained their sensitivity to this distinction at all time periods tested. In sum, infants seem to display sensitivity to various event components that are not highlighted in their native language, but eventually hone in on event components that are more relevant to their native language, supporting the idea of semantic reorganization.

1.7.3 Ground

Similar to containment and support, *ground* is encoded differently in typologically different languages (e.g., English and Japanese). English is a language that conflates manner in the main verb and expresses the path in satellite prepositional phrases (e.g., run around the tree). The prepositional phrases describe both the trajectory of the figure and spatial properties of the ground object (e.g., *across* implies a stable surface). In contrast, Japanese tends to encode path information (trajectory of

the figure) in the main verb. Japanese has two different types of path verbs: *directional path* and *ground path verbs*. *Directional path (DP) verbs* involve the trajectory of motion relative to a reference point (e.g., *iku* ‘go’, *kaeru* ‘return’, *kuru* ‘come’).

Directional path verbs in Japanese define the direction of motion relative to a source or goal and are not restrictive about the *ground* on which the motion occurs and allows the figure to be inanimate and animate (e.g., “The guests *came over* for dinner”) (Muehleisen & Imai, 1997). Such DP verbs are not necessarily specific to Japanese; they are also commonly expressed in English (e.g., come). In contrast, *ground path (GP) verbs* incorporate the ground in the main verb in Japanese. GP verbs encode the nature of the ground along with the trajectory of motion (e.g., *wataru* ‘go across’, *koeru* ‘go over’, *nukeru* ‘pass through’) (Muehleisen & Imai, 1997). Thus, a verb like *wataru* implies that the ground (e.g., bridge) forms a barrier between two sides and is a flat surface. *Wataru* cannot be used to describe a ground that is *not* flat (e.g., a hill) or when the ground does *not* contain a barrier between two sides (Figure 1.2). In contrast, when crossing a ground that is continuous and has no boundaries on the edges (e.g., field, golf course) the verb *toru* should be used (Figure 1.3). These GP verbs are more restrictive of the nature of the ground compared to DP verbs. While Japanese has several ground-path verbs, English has *some* ways of expressing ground-path information in prepositions (e.g., over implies an obstacle on a surface) (Muehleisen & Imai, 1997). The question is whether English- and Japanese-reared infants will show a similar developmental pattern as the Korean- and English-reared infants with the containment and support relation.

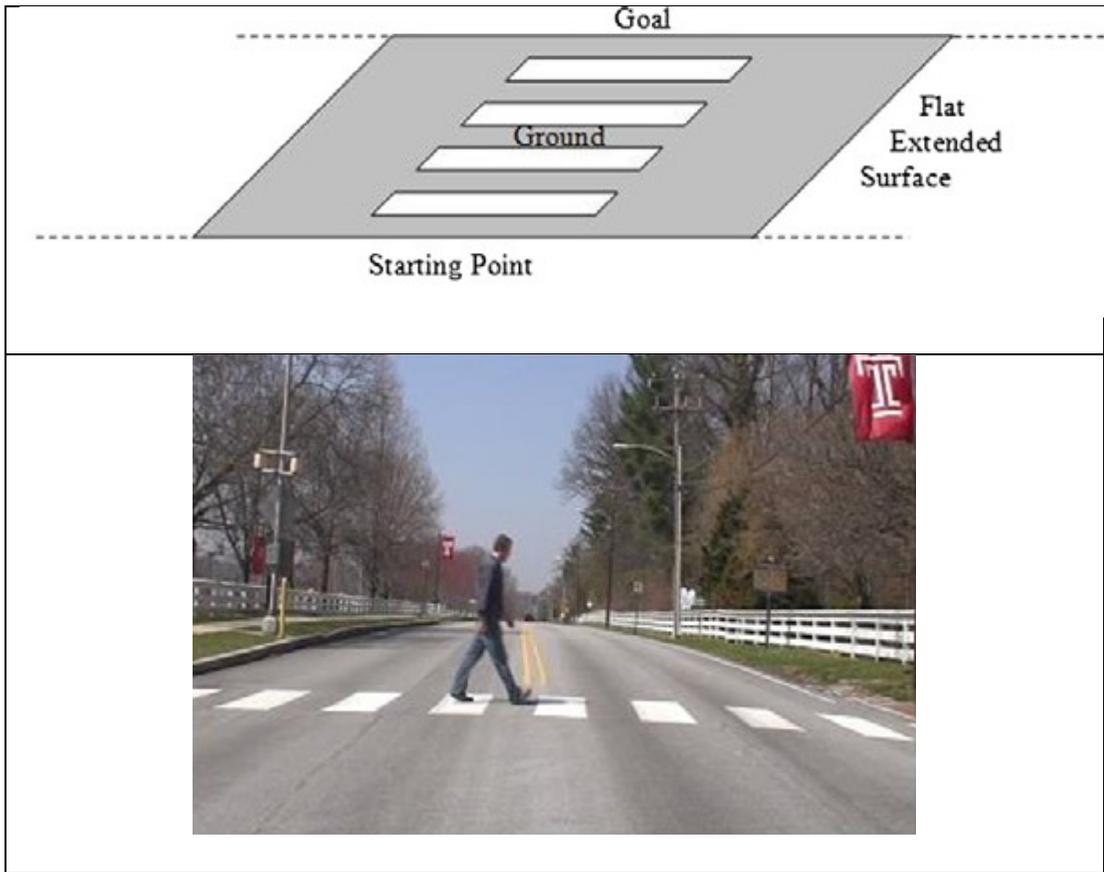


Figure 1.2 An example of a wataru ground

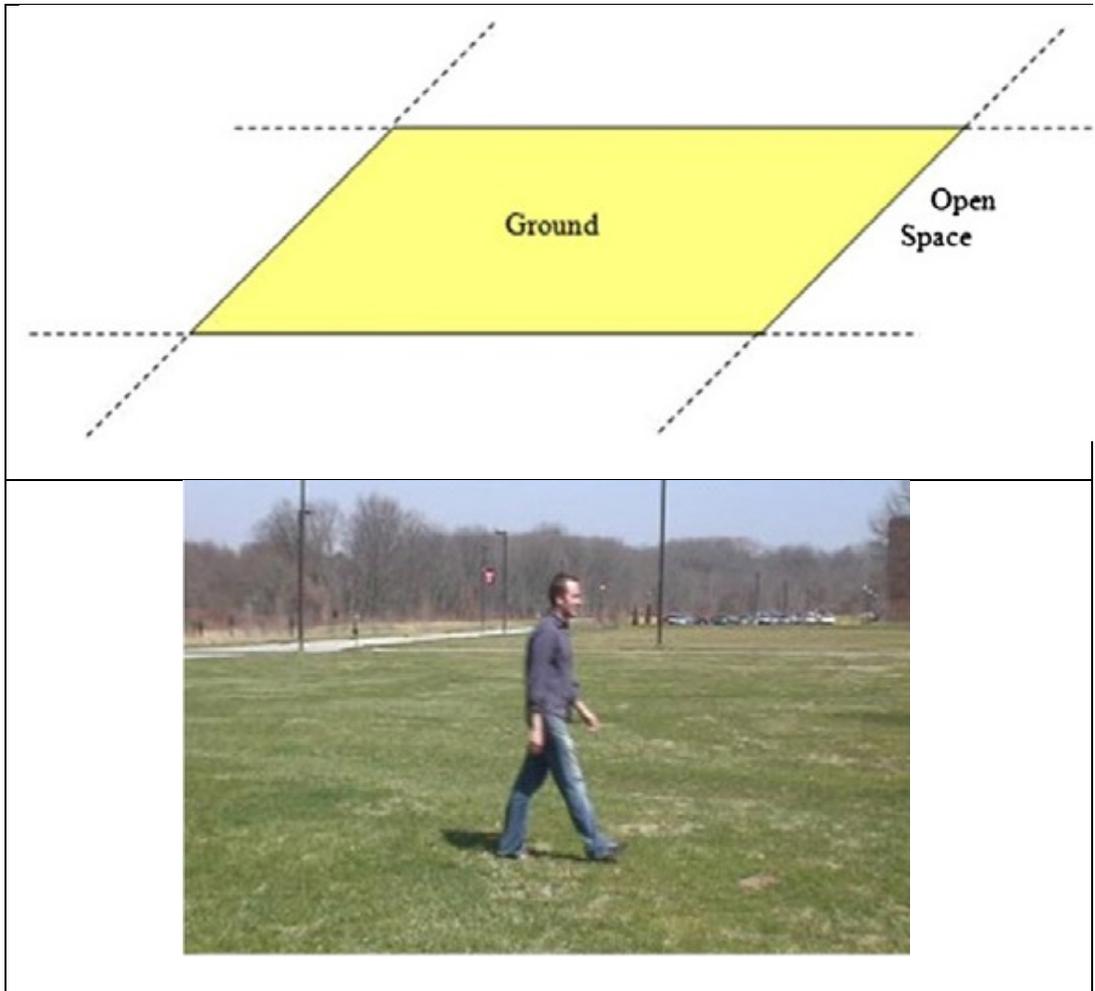


Figure 1.3 An example of a toru ground

In a nonlinguistic study, Göksun et al. (2011) investigated this question by examining whether 14- and 19-month-old English- and Japanese-reared infants are sensitive to the features of ground-path verbs that are expressed in Japanese. In silence, infants were familiarized to a dynamic scene in which a figure (e.g., man) crossed a ground (e.g., a road). At test, infants saw (on a split-screen) either a within-category comparison (the grounds were all from the *wataru* category, such as a railroad track vs. a road) or an across-category comparison (one ground from the

wataru category and one ground from the *toru* category, a ground that does not contain a barrier between two sides (e.g., a road vs. field). If infants were sensitive to the categorical distinction of Japanese ground-path verbs, only infants in the across-category condition would prefer to look longer at the novel ground presented at test.

Critically, they found this pattern for both English and Japanese infants *only* in the across-category condition. Such results suggest that both 14-month-old Japanese and English reared children display similar sensitivity to distinctions between grounds in dynamic events. That is, even English-learning infants discriminated between grounds expressed in Japanese. Additionally, Göksun (2010) found that 14-month-old English-reared infants formed a category of ground-path that is represented in Japanese verbs. Infants were presented with 3 different grounds from the *wataru* category during familiarization. At test, infants were shown a novel *wataru* ground and a *toru* ground. Infants extracted the common properties of the *wataru* grounds by looking longer at the familiar ground (i.e., *wataru* ground) at test. These results are in line with Choi (2006)'s findings that suggest that English-and Korean-reared children of the same age detect the tight-fit loose-fit relation even though this information is only encoded in Korean (Choi, 2006). Moreover, Göksun et al. (2011) found that by 19 months of age, English-reared infants were no longer sensitive to ground distinctions not encoded in their native language, while 19-month-old Japanese-reared infants were equally sensitive to ground distinctions as the 14-month-olds. These findings corroborate the developmental process of semantic reorganization.

1.8 Theoretical Perspectives on Semantic Reorganization: The Influence of Semantic Reorganization on the Perception of Specific Event Components

Not all event components appear to undergo perceptual narrowing to the same degree. The Typological Prevalence Hypothesis suggests that “all else being equal, within a given domain, the more frequently a given way of categorizing is found in the languages in the world, the more natural it is for human cognizers, hence the easier it will be for children to learn” (p.6) (Gentner & Bowerman, 2009). Gentner and Bowerman (2009) tested the Typological Prevalence Hypothesis by examining Dutch-reared and English-speaking children’s production of spatial prepositions. Dutch and English are similar in how they distinguish “in” relations but they differ in their partitioning of “on” relations. Dutch uses one preposition (*op*) for support-from-below relations and another preposition (*aan*) for situations of hanging and attachment. The preposition “on” can be used for these both of these relations in English. According to the Typological Prevalence Hypothesis, semantic categories that are cross-linguistically common should be acquired earlier than categories that are not shared. Thus, both English and Dutch children should acquire the preposition “in” around the same time but speakers of Dutch should be slower to acquire the two “on” relations. This is the pattern that Gentner and Bowerman (2009) found, supporting the Typological Prevalence Hypothesis.

Similarly, although studies show that infants show differential sensitivity to path-manner, containment-support, and ground across development, by the time children are experts of their native tongue, they only maintain sensitivity to semantic

components that are prominently expressed in their native language (Göksun et al., 2010; 2011). Because path and manner are encoded in the relational terms of many languages, children and adults with different linguistic backgrounds show sensitivity to it even after semantic reorganization has taken place (e.g., Allen et al., 2007; Bunker et al., 2012; Papafragou, Massey, Gleitman, 2006). In contrast, sensitivity to event components such as ground and tight-loose are only likely to be maintained by Japanese and Korean speakers, as these components are only encoded in a handful of languages. Thus, the more an event component is expressed across languages, the more likely it is that speakers of different languages display sensitivity to that event component after semantic reorganization has occurred. Thus, because path and manner is encoded in different languages, they may hold a privileged status.

Nonetheless, these data suggest that perceptual narrowing may occur in the semantic domain, as infants progress from initially displaying sensitivity to several event components such as path-manner, containment-support, and ground to showing differential sensitivity to event components that are more prominently expressed in the ambient language. Although these studies validate the idea of semantic reorganization, little is known about what makes children eventually show sensitivity to event components that are commonly encoded in the relational terms in their native language.

1.9 Language Influences Object and Event Processing

Language may encourage infants to progress from perceiving events in a language-general to language-specific manner (Gentner & Bowerman, 2009; Göksun et al., 2010). This assertion is supported by research on how linguistic labels facilitate young children's ability to form categories of objects (e. g., Balaban & Waxman, 1997; Booth & Waxman, 2002; Nazzi & Gopnik, 2001; Plunkett, Hu, & Cohen, 2008). For example, Waxman and Booth (2003) found that regardless of the type of label (novel count nouns or adjectives), 11-month-olds succeeded in categorizing objects. Gentner and Boroditsky (2001) argue that labels not only motivate children to attend to commonalities in their environment but also encourage children to make comparisons which facilitate the acquisition of the corresponding concept (Gentner & Namy, 1999). For example, hearing the label "dog" while seeing different breeds of dogs may allow children to discern that despite differences in size and color all these animals fall under the same category.

Further, by 18 months children begin to recognize that different grammatical forms correspond to different features in their environment. For example, 18-month-olds use a novel count noun to group a set of unfamiliar objects into a category (Booth & Waxman, 2009). That is, hearing the phrase "This one is a blicket" helped 18-month-old children determine whether unfamiliar objects fall under a single object category. However, when the same words were presented as adjectives ("This one is blickish") or if children saw these objects in silence they did not demonstrate this ability. Thus, as children gain increased language knowledge, they begin to show

sensitivity to which grammatical forms refer to which commonalities in their environment (e.g., count nouns correspond to objects).

Some studies have examined the effect that labels have on event perception. Pruden et al. (2013) showed that providing a novel label facilitated 7- to 9-month-olds' ability to abstract the path of motion in animated, dynamic events. In addition, Casasola and Bhagwat (2007) demonstrated that 18-month-old English reared children formed an abstract categorical representation of support (on) when hearing a novel spatial preposition (i.e., "She puts it toke (on)) during habituation but not when hearing a novel count noun (i.e., "It is a toke") or when viewing the events in silence, suggesting that they successfully discriminated between containment and support when hearing a novel spatial preposition. These studies suggest that labels influence event perception in a similar way that they affect object processing. Labels in general are known to encourage category formation. However, as children acquire more language they begin to recognize that certain syntactic frames tend to describe certain things in the environment (e.g., attributes refer to adjectives). For example, novel spatial prepositions correspond to the spatial relations in dynamic events. As a result, children begin to narrow their expectations for how novel words, in a syntactic frame, refer to commonalities across events (Casasola, Wilborun & Yang, 2006; Maguire et al., 2010).

1.10 The Role of Language in Semantic Reorganization

Linguistic input may play a critical role in how infants perceive events through the lens of their language. Casasola (2005) found that English-reared 18-month-olds formed an abstract category of support when hearing the word “on” during habituation but not when viewing the events in silence or hearing neutral language (“Look at that!”). This study suggests that language promotes categorization of support when spatial words accompany events. That is, hearing the same spatial preposition (i.e., on) used across different contexts encourages children to abstract the common spatial relation (i.e., support) that otherwise may not be readily apparent.

By the same token, as children gain familiarity with how their native language encodes events in its relational terms, it may be more adaptive to notice event components that are described linguistically and pay less attention to information in the environment that is not lexically marked. There is some evidence to support this hypothesis, as studies show that increased language knowledge appears to influence infants’ perception of events. Choi (2006) found that 18-month-old English-reared children with a greater vocabulary relative to their peers and who also produced the English preposition “on,” showed dampened sensitivity to tight-fit versus loose-fit relations. Children with a smaller vocabulary who did not produce the preposition “on” still demonstrated sensitivity to tight-fit versus loose-fit categories.

Similarly, Göksun (2010) found that 19-month-old English-reared children with relatively smaller vocabularies continued to make ground-path distinctions while those with higher vocabulary levels did not. These studies suggest that as children

become more sensitive to how their native language encodes events, the less attention they pay to event components that are not lexically marked in the ambient language (Choi & Bowerman, 1991). Thus, language may influence infants to progress from perceiving multiple “non-native” event components to only showing sensitivity to “native” event components (Bowerman & Choi, 2001; Casasola, 2005; Choi & Bowerman, 1991; Gentner & Boroditsky, 2001).

However, it is important to qualify this argument by mentioning that this study does not endorse Whorfian linguistic relativity—the idea that language *determines* the perception of events (Whorf, 1956). Wilhelm von Humboldt, a German Philosopher, who played a role in exploring the Whorfian hypothesis, declared in 1820 that, “The diversity of languages is not a diversity of signs and sounds but diversity of views of the world (Trabant, 2000; p. 25).” Extreme versions of this theory have largely been discredited. A weaker version of the Whorfian view suggests that although language does not completely shape thought, consistent language experience increases infants’ sensitivity to some aspects of events over others (Malt & Wolff, 2010; Hespos & Spelke, 2007; Whorf, 1956). That is, with increased language knowledge, children begin to package these nonlinguistic event components in the way that they are encoded in their native language (Choi, 2006; Gleitman & Papafragou, 2013; Li, Abarbanell, Gleitman, & Papafragou, 2011).

1.11 The Present Study

Although past studies suggest that there is a relationship between children's language knowledge and their ability to perceive events in a language-specific way (Choi, 2006; Göksun, 2010), such studies fail to experimentally test whether language influences infants' perception of events. Thus, it is difficult to determine whether language played a *causal* role in children's dampened sensitivity to event components that are expressed differently in their native language (e.g., tight-loose relations). In addition, Casasola et al. (2009) demonstrated that language can heighten 18-month-old English-reared infants' sensitivity to tight-loose relations but not when viewing the events in silence. Although this is one of the only studies that experimentally showed that language can be used to reawaken children's ability to form a category of tight-fit, they did not examine whether language triggered children's dampened sensitivity to event components that are expressed differently in their native language.

To address these gaps, this dissertation investigates whether language plays a critical role in how infants shift from perceiving events in a language-general to a language-specific manner. If language influences children to eventually narrow their perception to native-event components, we should be able to use language to dampen infants' existing sensitivity to non-native event components. To pursue this question, Experiment 1b assesses whether 13-to 15-month-olds' sensitivity to ground-path categories can be *weakened* with the use of language. To explore whether Göksun et al. (2011)'s findings can be extended using different stimuli, Experiment 1a examines whether 13-to 15-month-old English-reared infants show sensitivity to ground-path

when general language (i.e., “Wow, look at her!”) accompanies events. The semantic component *ground* was chosen, as ground-path information is expressed differently in English (e.g., over, through) compared to Japanese, making these event components ideal candidates to examine these questions.

Although the phonological domain is known for its limited plasticity, only a handful of studies have explored the malleability of semantic reorganization (Casasola et al., 2009; Shafto et al., 2014). Such studies have shown that young children and adults can change their sensitivity to non-native distinctions (e.g., tight-fit vs. loose-fit). However, the extent to which these findings are generalizable to other event components is not known. To assess this question, Experiment 2b explores whether 21-to 24-month-old children’s sensitivity to Japanese ground-path categories can be *heightened* using language. Experiment 2a investigates 21-to 24-month-old’s sensitivity to ground-path categories in the presence of general language, to examine the validity of Göksun et al. (2011)’s results. As semantic reorganization may play an important role in infants’ acquisition of relational language (Konishi et al., 2012), it is imperative to explore the mechanism underlying this phenomenon.

Chapter 2

DOES LANGUAGE DAMPEN 13-TO 15-MONTH-OLD INFANTS' SENSITIVITY TO JAPANESE GROUND-PATH?

The present series of studies investigate whether language plays a role in how infants shift from perceiving events in a language-general to language-specific manner. The first half of the dissertation examines whether (Experiment 1a) 13-to 15-month-old English-reared infants show sensitivity to ground-path when general language (i.e., “Wow, look at her!”) accompanies events and whether language can be used to *dampen* children’s sensitivity to ground-path categories (Experiment 1b). This age range was chosen because Göksun et al. (2011) found that 13-to 15-month-old English-reared infants formed a category of Japanese ground-path when these events were presented in silence. The purpose of Experiment 1a is to extend Göksun et al. (2011)’s finding using general language. Infants in Experiment 1a should discriminate between the two ground-path categories by looking longer at one type of ground-path category at test, as Göksun et al. (2011) found that 13-to 15-month-old infants formed a category of ground-path without any linguistic cues. In contrast, if 13-to 15-month-olds do not display sensitivity to Japanese ground-path categories, they should not show a significant preference for either ground at test. Although Göksun et al. (2011) found that 13-to 15-month-olds showed sensitivity to ground-path categories, the 13-to 15-month-olds in the present study may not display this ability due to differences in

design. Göksun et al. (2011)'s study was entirely non-linguistic while the present study contains general language during training trials. Studies have shown that the presence of both auditory and visual stimuli can interfere with infant processing (e.g., Napolitano & Sloutsky, 2004).

2.1 Experiment 1a: Can 13-to 15-month-old English-Reared-Infants Show Sensitivity to Japanese Ground-Path Categories?

2.1.1 Methods

2.1.1.1 Participants

Seventeen, 13-to 15-month-old full term monolingual English-reared infants from middle-class households participated ($M=14.1$, $SD=.86$; 7 males). Infants' vocabulary scores were collected via the MacArthur-Bates Communicative Development Inventory (MCDI) (Fenson et al., 1994). The MCDI is a reliable and valid vocabulary measure assessing language and communication development of children between 8 to 30 months of age via parental report (Fenson et al., 1994). Infants' receptive vocabulary as measured by the MCDI ranged from 9 to 53 words ($M=31.9$, $SD=15.8$). Three infants were excluded from further analyses because they were bilingual.

2.1.1.2 Stimuli

2.1.1.2.1 Visual Stimuli

The stimuli were a series of realistic video clips depicting a female actor traveling across different types of grounds from left to right. *Wataru* grounds (railroad track, road, field, bridge, street, running track, trail, and avenue) have flat barriers dividing two points, have specific starting and ending points, bounded, and extended in a line. When the grounds do not meet these criteria, *toru* ‘continuous plane’ is used (soccer field, playground, soft-ball field, and out-doors hockey field). After one crossing event was completed, the clip repeated again from the beginning of the event. The actor had an average height of 40 pixels. The pace of walking was controlled across all trials and conditions by ensuring that the actor crossed a given ground in 6 seconds. Stimuli were videotaped outdoors and all videos had some trees in the background (Figure 2.1).

Wataru grounds	Toru grounds
	
	

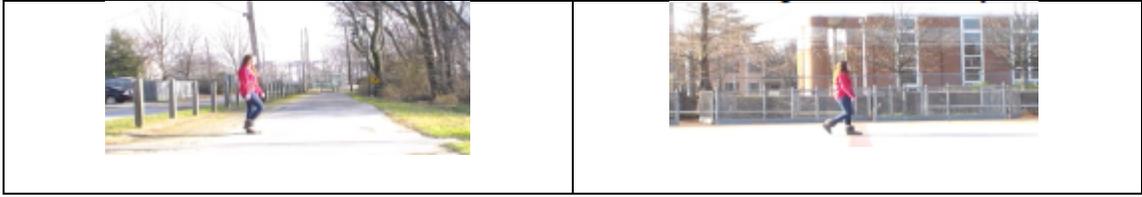


Figure 2.1 Wataru and toru grounds used in the present study

2.1.1.2.2 Auditory Stimuli

The auditory stimuli were sentences spoken by a female speaker in infant-directed speech. The linguistic stimuli were neutral (“Wow, look at her!”).

2.1.1.3 Procedure

The study employed the Intermodal Preferential Looking Paradigm (Golinkoff, Hirsh-Pasek, Cauley & Gordon, 1987; Golinkoff et al., 2013) although the test stimuli were presented in silence. Parents were instructed to close their eyes and refrain from talking or directing their child’s attention. A camera, hidden behind a small hole in a black curtain underneath the television, recorded infants’ eye movements. The video lasted for approximately 3 minutes.

2.1.1.4 Trial Types

Infants viewed four types of trials in the following order: (1) one *salience* trial, (2) twelve *training* trials (3) three *exposure* trials, and (4) two *test* trials. All infants saw across-category comparisons during test trials (e.g., railroad track - *wataru* vs. field – *toru*), as Göksun et al. (2011) showed that infants only detected across-category comparisons.

2.1.1.4.1 Salience Trial

Infants saw the two events side-by-side and in silence that later appeared as the test trial (1 trial; 12 secs). The purpose of the salience trial is to determine whether infants have any *a priori* preference for either test event.

2.1.1.4.2 Training Trials

Twelve full screen training trials showed infants three different grounds from the *wataru* and *toru* category twice (12 trials; 6 seconds each) and heard the sentence “Wow, look at her!” *Wataru* and *toru* grounds were presented consecutively in alternation. The sequence of categories was randomized; half of the infants saw *toru* grounds first and the other half saw *wataru* grounds first. Although the children in Experiment 1a were merely exposed to two different types of ground-path categories during the training trials, because the training trials in Experiment 1b aimed to train infants to associate one label with two different ground-path categories, these trials will still be referred to as training trials.

2.1.1.4.3 Exposure Trials

Infants saw an actor cross either three new *wataru* or *toru* grounds that they did not see during training trials in silence on a full screen (3 trials; 12 secs each). The purpose of the exposure trials was to reorient infants’ attention to a single ground-path category (*wataru* or *toru*) after seeing the alternating training trials. Four between-subjects conditions were created to ensure that half of the infants saw *wataru* grounds and the other half saw *toru* grounds during exposure trials. Again, the sequence of categories was randomized.

2.1.1.4.4 Test Trials

Infants saw the same actor as during exposure trials, travel along a novel ground from the *wataru* category (e.g., bridge) and a novel ground from the *toru* category (e.g., field) simultaneously on a split screen for 12 seconds (2 trials). The four between-subjects conditions ensured that the side of the screen on which the familiar ground category (relative to what infants saw during exposure trials) appeared was randomized. If infants are sensitive to the ground-path distinction encoded in Japanese, they should show a significant preference for the out-of-category *toru* event, having already been familiarized to the *wataru* category. In contrast, those who saw three types of *toru* grounds during exposure trials should look longer at the novel *wataru* ground at test, if they are sensitive to Japanese ground-path. If infants do not show sensitivity to ground-path distinctions they should not show a preference for either event (Table 2.1).

Salience:	Woman crossing a bridge	Woman crossing a field (12 secs)
Training: “Wataru”	Woman crossing a railroad track - (6 seconds) “Wow, look at her!”	
Training: “Toru”	Woman crossing the soccer field - (6 secs) “Wow, look at her!”	
Training: “Wataru”	Woman crossing a road- (6 secs) “Wow, look at her!”	
Training: “Toru”	Woman crossing the playground- (6 secs) “Wow, look at her!”	
Training: “Wataru”	Woman crossing a street- (6 secs) “Wow, look at her!”	
Training: “Toru”	Woman crossing the golf course- (6 secs) “Wow, look at her!”	
Training: “Wataru”	Woman crossing a railroad track - (6 seconds) “Wow, look at her!”	
Training: “Toru”	Woman crossing the soccer field - (6 secs) “Wow, look at her!”	

Training: “Wataru”	Woman crossing a road- (6 secs) “Wow, look at her!”	
Training: “Toru”	Woman crossing the playground- (6 secs) “Wow, look at her!”	
Training: “Wataru”	Woman crossing a street- (6 secs) “Wow, look at her!”	
Training: “Toru”	Woman crossing the golf course- (6 secs) “Wow, look at her!”	
Exposure “Wataru”	Woman crossing a trail -“Wow, look at her!” (12 secs)	
Exposure “Wataru”	Woman crossing an avenue-“Wow, look at her!” (12 secs)	
Exposure “Wataru”	Woman crossing a track-“Wow look at her!”(12 secs)	
Test:	Woman crossing a bridge	Woman crossing a field (12 secs)
Test:	Woman crossing a field	Woman crossing a bridge (12 secs)

Table 2.1 Design of Experiment 1a

2.1.1.5 Inter-Stimulus Event

A 3-second baby face accompanied by the children’s song “Oh, Susana” was used to separate the trials in each phase of the experiment. The purpose of the attention-getter was to renew infants’ interest in the video and to reorient their looking to the center of the screen between trials.

2.1.1.6 Coding and Reliability

Trained research assistants blind to the side of the target in the videos coded offline recordings of infants’ visual fixation to each event (Supercoder; Hollich, 2008). The coding of infant looking time data was done frame-by-frame at a rate of 30 frames per second. During training and exposure trials, infants’ looking to the center of the

screen was coded; for salience and test trials, visual attention to the left and right side of the screen was coded. Intercoder reliability between two different research assistants, calculated for 20% of participants, was $r \geq .98$.

A novelty-preference score (i.e., NPS) was calculated by taking looking time towards the novel test event and dividing by the sum of looking towards the novel test event and the familiar test event, a measure widely used in infant studies (e.g., Göksun et al., 2011; Pruden et al., 2013). Proportions above .50 mean that infants looked longer at the novel event than the familiar event; below .50 mean that the familiar event was favored.

2.1.2 Results

Data were examined for possible outliers (i.e., standardized z scores >2 SD) by computing the standardized z scores of the salience phase data. If infants' z scores were 2 standard deviations above or below the mean, their data were excluded entirely. The exclusion of outliers ensured that only infants who showed approximately equal preference to test events at salience were included in the final sample. Including infants with a significant preference for a single test event during salience could disproportionately influence the entire sample's visual preference at test. For example, if the whole sample yields a novelty preference at test, this preference could be driven by the outlier's initial preference for the novel ground-path category. Additional data from 2 infants were excluded from further analyses, as their salience phase data were outliers. Because infants' performance during salience and test did not

vary by condition or by whether children saw *toru* or *wataru* exemplars first at training or whether they were familiarized to *wataru* or *toru* grounds during exposure trials, this variable was collapsed for further analyses $F(3,13)=2.5, p>.05, \eta_p^2=.37$.

2.1.2.1 Salience Trial

A paired-sample t-test was conducted to evaluate whether infants had any a priori preferences for test events. A paired-sample t-test comparing infants' looking time towards the novel ($M=.45, SD=.14$) and familiar ($M=.54, SD=.14$) event during the salience phase revealed that infants did not show a preference for either event during the salience phase $t(16)=1.3, p>.05, d=.64$ (Table 2.2).

2.1.2.2 Training Trials

Infants' looking times to each of the 12 training trials were examined to assess their attention over the course of the training phase. A repeated-measures analysis of variance (ANOVA) with training trial as a within-subject variable revealed no main effect of training trial $F(1,16)=.93, p>.05, \eta_p^2=.39$. However, there was a significant difference in looking time between the first training trial ($M=.90, SD=.04$) and the last training trial ($M=.81, SD=.14$), $t(16)=2.9, p<.05, d=1.4$, suggesting that infants showed a significant decline in looking across the 12 training trials (Figure 2.2) (Table 2.2).

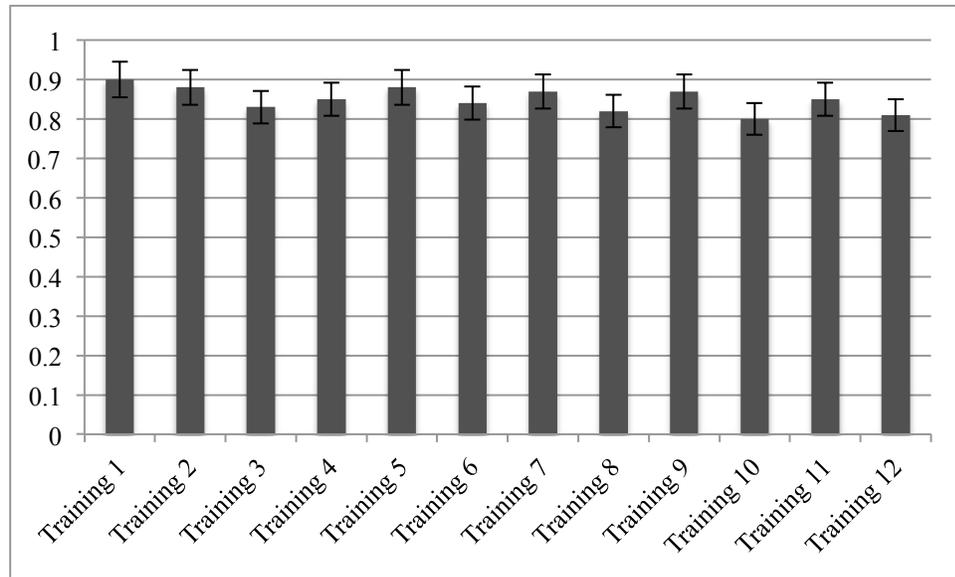


Figure 2.2 Infants' proportion of looking time during training trials

2.1.2.3 Exposure Trials

A repeated measures ANOVA with exposure trial as a within-subject variable yielded no main effect, $F(1,16)=1.04$, $p>.05$, $\eta_p^2=.06$. On average, infants watched the first exposure trial for 9.9 s ($SD = 1.7$), the second exposure trial for 9.5 s ($SD = 2.2$), and the third exposure trial for 8.9 s ($SD = 2.6$). Further, there was no significant difference in looking time between the first and third training trial $t(16)=1.2$, $p>.05$, $d=.45$. Infants maintained their attention during exposure trial events (Table 2.2).

2.1.2.4 Test Trials: Do 13-to 15-Month-Old Infants Show Sensitivity to Japanese Ground-Path Categories?

Infants' looking times during each of the test trials were averaged together, resulting in a single NPS score. Infants were divided into high vs. low vocabulary groups by a median split to test the effect of vocabulary level on infants' novelty

preference at test. A repeated-measures ANOVA with trial type (trial: salience vs. average of test trials) as a within-subject variable and gender (male; female) and vocabulary level (high; low) as between-subject variables yielded a main effect of trial, $F(1,13)=9.8, p<.05, \eta_p^2=.43$ but no interactions. Results suggest that infants looked longer towards the novel ($M=.63, SD=.16$) event than the familiar ($M=.36, SD=.16$) event at test. Further, a one-sample t-test found that 13-to 15-month-old infants' NPS during test was significantly above chance $t(16)=3.2, p<.05, d=1.6$ (Figure 2.3) (Table 2.2). Fourteen out of 17 infants (82%) preferred the novel ground category at test.

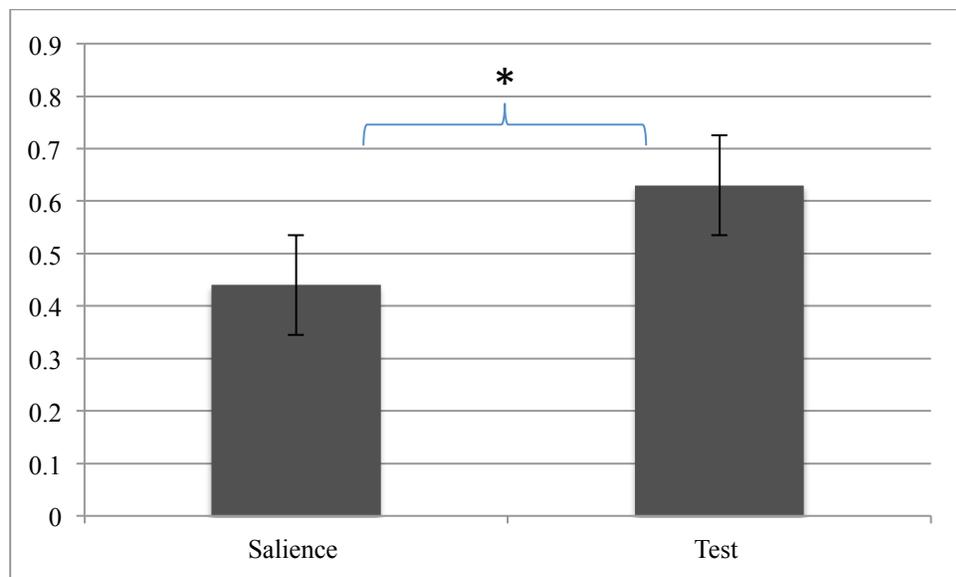


Figure 2.3 Infants' proportion of looking during salience and test trials
* $p \leq .05$

	Saliency <i>M (SD)</i>	Training <i>M (SD)</i>	Exposure <i>M (SD)</i>	Test <i>M (SD)</i>
Ex 1a: General language	.45(.14)	.85(.06)	.77(.12)	.63(.16)
Ex 1b: Novel spatial preposition	.47(.13)	.80(.10)	.67(.18)	.46(.09)

Table 2.2 Infants' proportion of looking during all trials by Experiment

2.1.3 Discussion

Experiment 1a examined whether English-reared infants showed sensitivity to Japanese ground-path in the presence of general language. Because Göksun et al. (2011) demonstrated that English-reared infants showed sensitivity to Japanese ground-path at 13 to 15 months, we expected the 13-to 15-month-old infants in the present study to discriminate between Japanese ground-path categories. Results showed that at 13 to 15 months of age, infants looked longer to the novel ground category at test. These findings suggest that 13-to 15-month-old English-reared infants can discriminate between two different Japanese ground-path categories, validating the findings of Göksun et al. (2011) using general language. Since 13-to 15-month-old English-reared infants showed sensitivity to Japanese ground-path categories with neutral language, Experiment 1b aims to assess whether language can be used to weaken 13-to 15-month-olds' ability to discriminate ground-path categories.

2.2 Experiment 1b: Can Language Dampen 13-to 15-month-old English-Reared Infants' Sensitivity to Categorical Distinctions of Japanese Ground-Path?

The purpose of Experiment 1b was to assess whether language influences infants to narrow their perception to non-native event components such as Japanese ground-path categories. To address this question, Experiment 1b investigated whether 13-to 15-month-old English-reared infants' sensitivity to ground-path distinctions will dampen when a common label is used across *wataru* and *toru* grounds during training trials ("Look, she's walking *toke* the _____ (ground)!"). If a common spatial preposition encourages children to group the two ground-path categories together, they should display weakened sensitivity to ground-path by showing no preference for either event at test. Yet, if 12 training trials are not sufficient to weaken children's sensitivity, 13-to 15-month-olds may still show sensitivity to ground-path categories by looking longer towards one type of ground-path category at test. This age range was chosen because Experiment 1a found that 13-to 15-month-old English-reared infants formed a category of Japanese ground-path in the presence of general language. Because the purpose of Experiment 1b is to determine if language can be used to *dampen* children's ability to form a category of Japanese ground-path, we wanted to recruit children who show this sensitivity. Whether infants are able to collapse their existing Japanese ground-path categories is an important question, as most previous studies have found that language heightens children's ability to process event components such as tight-loose and path and manner (Casasola et al., 2009; Shafto et al., 2014). The present study is one of the first studies to explore whether

children's ability to categorize events can be weakened using language (Plunkett et al., 2008).

2.2.1 Methods

2.2.1.1 Participants

Fifteen, 13-to 15-month-old full term monolingual English-reared infants ($M=14.3$, $SD=1.1$; 7 males) from middle-class households were recruited for the experiment. Infants' receptive vocabulary as measured by the MCDI ranged from 16 to 69 words ($M=32.7$, $SD=19.4$). Two infants were excluded from further analyses due to fussiness ($N=1$) and bilingualism ($N=1$).

2.2.1.2 Procedure

The procedure, design, and visual stimuli were identical to that of Experiment 1a. The only difference between Experiment 1a and 1b is the type of auditory stimuli presented during training trials. Training trials aim to “teach” infants that exemplars of *wataru* and *toru* both receive a common label (i.e., *toke*). Infants saw an actor walk across three different grounds from the *wataru* and *toru* category twice (12 trials; 6 secs each) and heard the sentence “Look, she’s walking toke the _____ (ground)!” The novel word *toke* was used here, as Casasola et al. (2009) used this nonsense word as a preposition and found that English-reared children used the novel preposition *toke* to heighten their sensitivity to tight-fit and loose-fit.

Novel words were used to control for children’s experience with familiar words. In addition, the novel word was presented as a preposition because path verbs are less common in English than in other languages (Talmy, 1985) and are acquired later in development (e.g., exit, descend) (MacWhinney, 2000). Moreover, when ground-path distinctions are made at all in English they tend to be expressed in prepositional phrases (Muehleisen & Imai, 1997), making it appropriate to present the novel word as a preposition. The specific ground in the sentence was mentioned because without it, the novel word may be interpreted as an adverb such as fast (“She’s walking *toke*”). If hearing a single label paired with *wataru* and *toru* exemplars influences infants to collapse the two different Japanese ground-path categories, infants should not show a significant preference for one event at test (Table 2.3).

Salience:	Woman crossing a bridge	Woman crossing a field (12 secs)
Training: “Wataru”	Woman crossing a railroad track -“Look, she’s walking toke the railroad track” (6 seconds)	
Training: “Toru”	Woman crossing the soccer field -“Look, she’s walking toke the soccer field” (6 secs)	
Training: “Wataru”	Woman crossing a road-“Look, she’s walking toke the road” (6 secs)	
Training: “Toru”	Woman crossing the playground-“Look, she’s walking toke the playground” (6 secs)	
Training: “Wataru”	Woman crossing a street-“Look, she’s walking toke the street” (6 secs)	
Training: “Toru”	Woman crossing the golf course-“Look, she’s walking toke the golf course” (6 secs)	
Training: “Wataru”	Woman crossing a railroad track -“Look, she’s walking toke the railroad track” (6 seconds)	
Training: “Toru”	Woman crossing the soccer field -“Look, she’s walking toke the soccer field” (6 secs)	
Training:	Woman crossing a road-“Look, she’s walking toke the road”	

“Wataru”	(6 secs)	
Training: “Toru”	Woman crossing the playground-“Look, she’s walking toke the playground” (6 secs)	
Training: “Wataru”	Woman crossing a street-“Look, she’s walking toke the street” (6 secs)	
Training: “Toru”	Woman crossing the golf course-“Look, she’s walking toke the golf course” (6 secs)	
Exposure “Wataru”	Woman crossing a trail -“Look, she’s walking toke the trail” (12 secs)	
Exposure “Wataru”	Woman crossing an avenue-“Look, she’s walking toke the avenue” (12 secs)	
Exposure “Wataru”	Woman crossing a track-“Look, she’s walking toke the track” (12 secs)	
Test:	Woman crossing a bridge	Woman crossing a field (12 secs)
Test:	Woman crossing a field	Woman crossing a bridge (12 secs)

Table 2.3 Design of Experiment 1b

2.2.1.3 Coding and Reliability

The coding was the same as Experiment 1a with 20% of all videos coded by a second person for inter-coder reliability ($r=.97$, $SD=.13$).

2.2.2 Results

Additional data from 2 infants were excluded from further analyses, as their salience phase data were outliers. Because infants’ performance during salience and test did not vary by condition or by whether infants saw *toru* or *wataru* exemplars first at training or whether they were familiarized to *wataru* or *toru* grounds during exposure trials, this variable was collapsed for further analyses $F(3,11)=.35$, $p>.05$, $\eta_p^2=.08$.

2.2.2.1 Salience Trial

A paired-sample t-test revealed that infants did not show a significant preference for either the familiar ($M=.52$, $SD=.13$) or novel event ($M=.47$, $SD=.13$) during salience $t(14)=.69$, $p>.05$, $d=.38$ (Table 2.2).

2.2.2.2 Training Trials

A repeated-measures ANOVA with training trial as a within-subject variable revealed no main effect, $F(1,14)=3.1$, $p>.05$, $\eta_p^2=.18$. In addition, there was no significant difference in looking time between the first training trial ($M=.87$, $SD=.08$) and the last training trial ($M=.78$, $SD=.27$), $t(13)=1.2$, $p<.05$, $d=.15$, suggesting that infants maintained their looking across the 12 training trials (Figure 2.4) (Table 2.2).

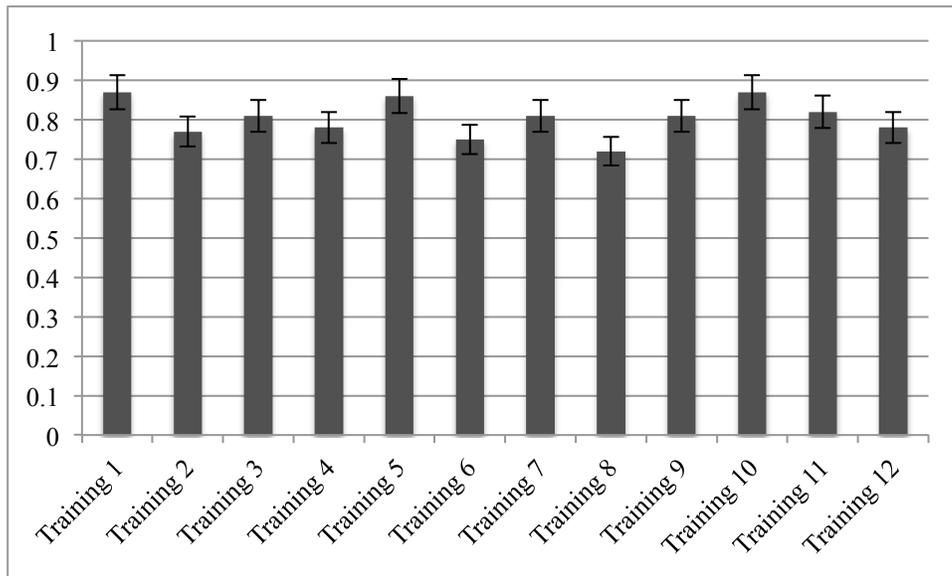


Figure 2.4 Infants' proportion of looking time during training trials

2.2.2.3 Exposure Trials

A repeated measures ANOVA with exposure trial as a within-subject variable yielded no main effect, $F(1,14)=.37, p>.05, \eta_p^2=.02$. Infants watched the first exposure trial for 7.9 s ($SD = 3.6$), the second exposure trial for 8.6 s ($SD = 2.8$), and the third exposure trial for 8.4 s ($SD = 2.6$). There was no significant difference in looking time between the first and third trial, $t(14)=.38, p>.05, d=.24$. Infants maintained their attention during exposure trial events (Table 2.2).

2.2.2.4 Test Trials: Do 13-to 15-Month-Old Infants Show Sensitivity to Japanese Ground-Path When a Novel Word Accompanies Events?

A repeated-measures ANOVA with trial type (trial: salience vs. average of test trials) as a within-subject variable and gender (male; female) and vocabulary level (high; low) as between-subject variables revealed no main effect of trial, $F(1,11)=.81, p>.05, \eta_p^2=.006$ and no interactions. In addition, children's proportion of looking towards the novel ground category ($M=.46, SD=.09$) at test was not significantly above chance $t(14)=1.5, p>.05$. Five out of 15 infants (33%) preferred the novel ground category at test (Table 2.2).

2.2.2.5 Comparison Between Experiment 1a and Experiment 1b

To compare infants' performance by experiment, infants' proportion of looking at salience and test were assessed. A repeated-measures ANOVA with trial type (salience trial; test trial) as a within-subject variable and experiment (Experiment 1a: general language; Experiment 1b: novel spatial words) as a between-subject variable was conducted. Results revealed a significant main effect of trial type

(salience trial; test trial), $F(1,30)=5.8, p<.05, \eta_p^2 = 0.16$, and a significant main effect of experiment (Experiment 1a; Experiment 1b), $F(1,30)=8.1, p<.05, \eta_p^2 = 0.21$. These resulting main effects of trial type and experiment led us to conduct a paired-samples t-test for our two experiments (Experiment 1a; Experiment 1b). We compared between infants' NPS values in the test phase by Experiment. Infants who heard general language during training trials (Experiment 1a), ($M=.63, SD=.16$) showed a greater novelty preference than those who heard a novel word that was used over both types of ground-path events (Experiment 1b), ($M=.46, SD=.09$), $t(30)=3.4, p<.01, d=1.3$ (Figure 2.5).

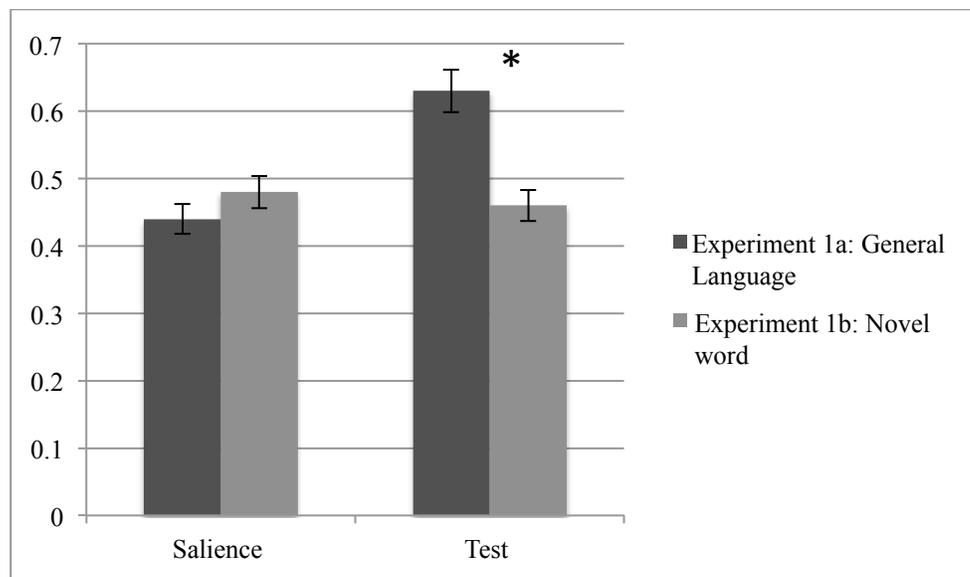


Figure 2.5 Infants' proportion of looking time during salience and test by experiment
* $p \leq .05$

2.2.3 Discussion

Experiment 1b investigated whether a single label paired with two different ground-path categories would encourage 13-to 15-month-old English-reared infants to

dampen their sensitivity to Japanese ground-path. Thirteen-to fifteen-month-old infants were expected to display weakened sensitivity to Japanese ground-path distinctions, as hearing a common novel spatial preposition used across examples of *toru* and *wataru* grounds should discourage discrimination between these two ground-path categories. Supporting this prediction, 13-to 15-month-olds showed equal preference to both test events at test, indicating that they no longer displayed sensitivity to Japanese ground-path categories. The findings of Experiment 1a and 1b demonstrate that language plays an important role in dampening infants' sensitivity to "non-native" event components (i.e., ground-path). To investigate the extent to which perceptual narrowing in the semantic domain is plastic, the next series of studies aim to resurrect children's sensitivity to Japanese ground-path categories. Experiment 2a will assess 21-to 24-month-old English-reared infants' sensitivity to Japanese ground-path using general language and Experiment 2b will examine whether language can be used to heighten children's ability to discriminate between these categories.

Chapter 3

DOES LANGUAGE HEIGHTEN 21-to 24-MONTH-OLD CHILDREN'S SENSITIVITY TO JAPANESE GROUND-PATH?

3.1 Experiment 1a: Do 21-to 24-Month-Old Children Show Sensitivity to Japanese Ground-Path Categories?

The purpose of Experiment 2a is to extend Göksun et al. (2011)'s findings by assessing 21-to 24-month-old's sensitivity to ground-path categories using general language. Göksun et al. (2011) found that 18-to 20-month-old English-reared children do not show sensitivity to Japanese ground-path non-linguistically. As a result, most 21-to 24-month-old children in the present study should not notice ground-path changes when tested with general language, by looking at both ground-path categories approximately equally at test. However, due to differences in design, the present study may find different results from Göksun et al. (2011). Göksun et al. (2011) only showed one type of ground-path category (bounded) before test trials, whereas the children in the present study are exposed to two types of ground-path categories during training trials (bounded and unbounded). Although not likely, showing both types of ground-path categories at training, may help children discriminate between ground-path categories. Experiment 2b aimed to heighten children's sensitivity to ground-path by highlighting these spatial relations with novel spatial prepositions.

3.1.1 Methods

3.1.1.1 Participants

Twenty-two, 21-to 24-month-old ($M=22.7$, $SD=1.4$; 13 males) full term monolingual English-reared children participated. Children's receptive vocabulary as measured by the MCDI ranged from 17 to 100 words ($M=53.4$, $SD=25.6$). Three children were excluded from further analyses due to fussiness ($N=2$) and prematurity ($N=1$).

3.1.1.2 Procedure

The same procedure, design, and visual and auditory stimuli as Experiment 1a were used (Table 2.1).

3.1.1.3 Coding and Reliability

The coding was the same as Experiment 1a and 1b with 20% of all videos coded by a second person for inter-coder reliability ($r=.97$, $SD=.12$).

3.1.2 Results

Additional data from 3 children were excluded from further analyses, as their salience phase data were outliers. Because children's performance during salience and test did not vary by condition or by whether children saw *toru* or *wataru* exemplars first at training or whether they were familiarized to *wataru* or *toru* grounds during

exposure trials, this variable was collapsed for further analyses $F(3,17)=.42, p>.05, \eta_p^2=.04$.

3.1.2.1 Salience Trial

A paired-sample t-test was conducted to assess whether children had any a priori preferences for the test events. Results suggest that children showed equal preference to the familiar ($M=.48, SD=.10$) and novel event ($M=.51, SD=.10$), $t(20)=.59, p>.05, d=.30$, during the salience trial.

3.1.2.2 Training Trials

A repeated-measures analysis of variance (ANOVA) with training trial as a within-subject variable revealed no main effect of training trial $F(1,20)=3.1, p>.05, \eta_p^2=.19$. In addition, there was no significant difference in looking time between the first training trial ($M=.88, SD=.10$) and the last training trial ($M=.85, SD=.19$), $t(20)=.69, p>.05, d=.19$, suggesting that children maintained their looking across the 12 training trials (Figure 3.1).

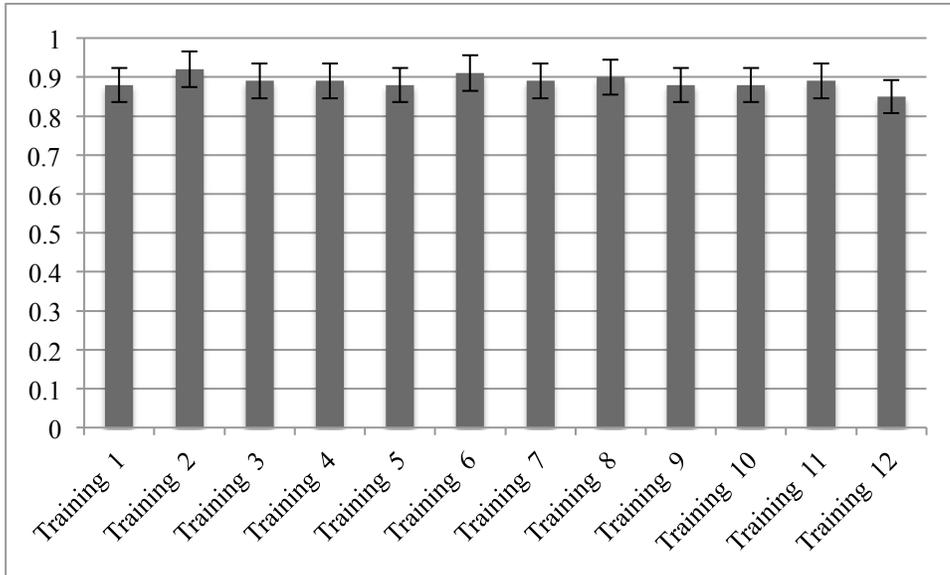


Figure 3.1 Children’s proportion of looking time during training trials

3.1.2.3 Exposure Trials

A repeated measures ANOVA with exposure trial as a within-subject variable yielded no main effect, $F(1,20)=2.1, p>.05, \eta_p^2=.09$. On average, children watched the first exposure trial for 9.8 s ($SD = 2.8$), the second exposure trial for 10.22 s ($SD = 2.4$), and the third exposure trial for 8.8 s ($SD = 2.2$). Moreover, there was no significant difference in looking time between the first and third exposure trial, suggesting that children maintained their attention during exposure trial events, $t(20)=1.4, p>.05, d=.39$.

3.1.2.4 Test Trials: Do 21-to 24-Month-Old Children Show Sensitivity to Japanese Ground-Path?

A repeated-measures ANOVA with trial type (trial: salience vs. average of test trials) as a within-subject variable and gender (male; female) and vocabulary level

(high; low) as between-subject variables found no main effect of trial, $F(1,17)=.98$, $p>.05$, $\eta_p^2=.06$ nor interactions. Results suggest that children looked approximately equally towards the novel ($M=.47$, $SD=.11$) and familiar ($M=.52$, $SD=.11$) event at test. Further, a one-sample t-test found that 21-to 24-month-old children's looking during test was not significantly above chance $t(20)=1.07$, $p>.05$, $d=.45$ (Figure 3.2). Eight out of 21 children (38%) showed a preference for the novel ground category at test.

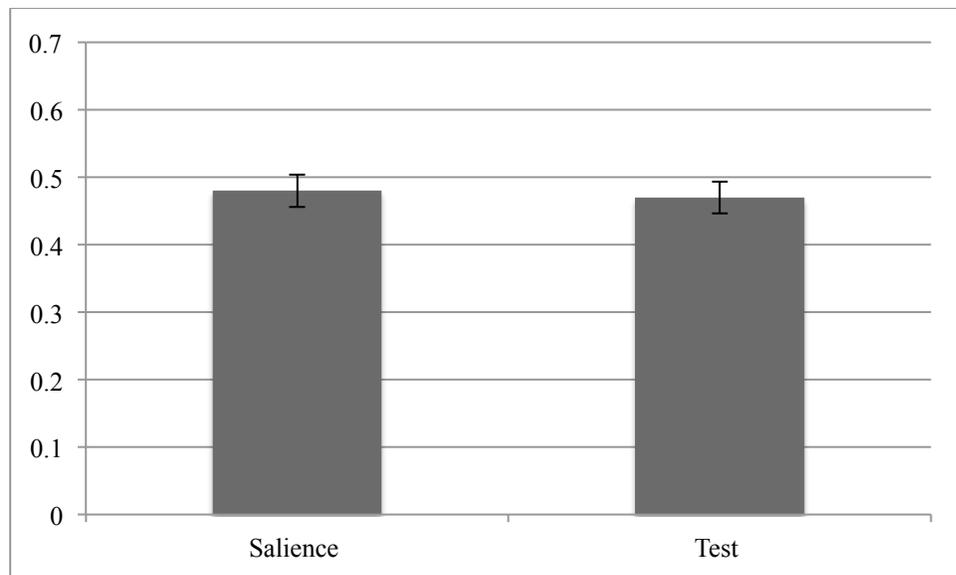


Figure 3.2 Children's proportion of looking time at salience and test

3.1.3 Discussion

Experiment 2a assessed whether 21-to 24-month-old English-reared children showed sensitivity to Japanese ground-path categories in the presence of general language. Because Göksun et al. (2011) demonstrated that by 18 to 20 months of age,

English-reared infants no longer showed sensitivity to Japanese ground-path, 21-to 24-month-old children in the present study should not discriminate between Japanese ground-path categories. In support of this prediction, findings of Experiment 2a suggest that at 21 to 24 months, English-reared children do not discriminate between different Japanese ground-path categories. These results extend the findings of Göksun et al. (2011) using general language.

Because Experiment 2a verified that 21-to 24-month-old English-reared-children do not show sensitivity to Japanese ground-path categories in the presence of general language, we are in a position to examine whether language can heighten children's ability to discriminate them. That is, hearing a novel spatial preposition with a *toru* exemplar and another spatial preposition with a *wataru* exemplar should encourage discrimination between these two ground-path categories. Casasola and Bhagwat (2007) reported that a novel word facilitated 18-month-old English-reared children's categorization of support relations (i.e., placing one object on another) that they otherwise did not demonstrate when the stimuli were seen in silence. This study suggests that there is reason to believe that novel labels may promote English-reared children's sensitivity to ground-path distinctions that they would not notice without specific linguistic cues.

3.2 Experiment 2b: Can Language be Used to Heighten 21-to 24-month-old English-Reared Children's Sensitivity to Japanese Ground-Path Distinctions?

As shown in Experiment 2a, 21-to 24-month-old children do not show sensitivity to ground-path at this age in the presence of general language (Göksun et al., 2011). By pairing one novel spatial preposition (*keet*) with the grounds from the *wataru* category and another novel spatial preposition (*toke*) with the grounds from the *toru* category, we sought to heighten children's detection of Japanese ground-path categories. If novel spatial words encourage children to discriminate between *wataru* and *toru* grounds, they should look longer towards one type of ground-path category at test. However, if 12 trials are not enough exposure to heighten children's sensitivity to ground-path categories, they should show no preference for either ground at test.

3.2.1 Methods

3.2.1.1 Participants

Eighteen, 21-to 24-month-old English-reared children ($M=22.3$, $SD=1.3$; 12 males) participated in the study. Children's receptive vocabulary as measured by the MCDI ranged from 8 to 86 words ($M=44.9$, $SD=21$). Six children were excluded from further analyses due to fussiness ($N=4$) and caregiver interference ($N=2$).

3.2.1.2 Procedure

The procedure, design, and visual stimuli were the same as Experiment 2a (Table 3.1). However, the linguistic information offered during training trials differed from Experiment 2a. Children saw the same twelve training trials on a full television

screen. However, now the exemplars from the *wataru* category were accompanied by the label *keet* while exemplars from the *toru* category were accompanied by the label *toke*. That is, when children saw *wataru* exemplars, they heard the sentence “Look, she’s walking *keet* the ____ (e.g., road, bridge)!” When children saw *toru* exemplars, they heard the sentence “Look, she’s walking *toke* the ____ (e.g., field, playground)!”

We hypothesized that hearing two different labels for *wataru* grounds and *toru* grounds would influence children to discriminate between two ground-path categories by looking longer at the novel ground-path category. Children who saw three types of *wataru* grounds during exposure trials should look longer at the novel *toru* ground at test. In contrast, those who saw three types of *toru* grounds during exposure trials should look longer at the novel *wataru* ground at test. A preference for neither event during test, would suggest that the language did not prompt children to make a distinction between Japanese ground-path categories.

Salience:	Woman crossing a bridge	Woman crossing a field (12 secs)
Training: “Wataru”	Woman crossing a railroad track -“Look, she’s walking keet the railroad track” (6 seconds)	
Training: “Toru”	Woman crossing the soccer field -“Look, she’s walking toke the soccer field” (6 secs)	
Training: “Wataru”	Woman crossing a road-“Look, she’s walking keet the road” (6 secs)	
Training: “Toru”	Woman crossing the playground-“Look, she’s walking toke the playground” (6 secs)	
Training: “Wataru”	Woman crossing a street-“Look, she’s walking keet the street” (6 secs)	
Training: “Toru”	Woman crossing the golf course-“Look, she’s walking toke the golf course” (6 secs)	
Training: “Wataru”	Woman crossing a railroad track -“Look, she’s walking keet the railroad track” (6 seconds)	

Training: “Toru”	Woman crossing the soccer field -“Look, she’s walking toke the soccer field” (6 secs)	
Training: “Wataru”	Woman crossing a road-“Look, she’s walking keet the road” (6 secs)	
Training: “Toru”	Woman crossing the playground-“Look, she’s walking toke the playground” (6 secs)	
Training: “Wataru”	Woman crossing a street-“Look, she’s walking keet the street” (6 secs)	
Training: “Toru”	Woman crossing the golf course-“Look, she’s walking toke the golf course” (6 secs)	
Exposure “Wataru”	Woman crossing a trail -“Look, she’s walking keet the trail” (12 secs)	
Exposure “Wataru”	Woman crossing an avenue-“Look, she’s walking keet the avenue” (12 secs)	
Exposure “Wataru”	Woman crossing a track-“Look, she’s walking keet the track” (12 secs)	
Test:	Woman crossing a bridge	Woman crossing a field (12 secs)
Test:	Woman crossing a field	Woman crossing a bridge (12 secs)

Table 3.1 Design of Experiment 2b

3.2.1.3 Coding and Reliability

The coding was the same as Experiment 1a, 1b, and 2a with 20% of all videos coded by a second person for inter-coder reliability ($r=.96$, $SD=.12$).

3.2.2 Results

Additional data from 5 children were excluded from further analyses, as their salience phase data were outliers. Because children’s performance during salience and test did not vary by condition or by whether children saw *toru* or *wataru* exemplars first at training or whether they were familiarized to *wataru* or *toru* grounds during

exposure trials, this variable was collapsed for further analyses $F(3,14)=.66, p>.05$, $\eta_p^2=.12$.

3.2.2.1 Salience Trial

A paired-sample t-test was conducted to assess whether children had any a priori preferences for the test events. This test revealed that children showed a significant preference for the familiar event ($M=.56, SD=.13$) during the salience phase, $t(17)=2.1, p<.05, d=1$, suggesting that children had an a priori preference for the familiar test event. To account for initial salience preferences, I will compare children's performance during the test trials to their performance during the salience trial (Table 3.2).

3.2.2.2 Training Trials

A repeated-measures analysis of variance (ANOVA) with training trial as a within-subject variable revealed a main effect of training trial $F(1,17)=.84, p<.05$, $\eta_p^2=.05$. Further, there was a significant difference in looking time between the first training trial ($M=.91, SD=.09$) and the last training trial ($M=.74, SD=.32$), $t(17)=2.3, p<.05, d=.72$, suggesting that children showed a significant decline in looking across the 12 training trials (Figure 3.3) (Table 3.2).

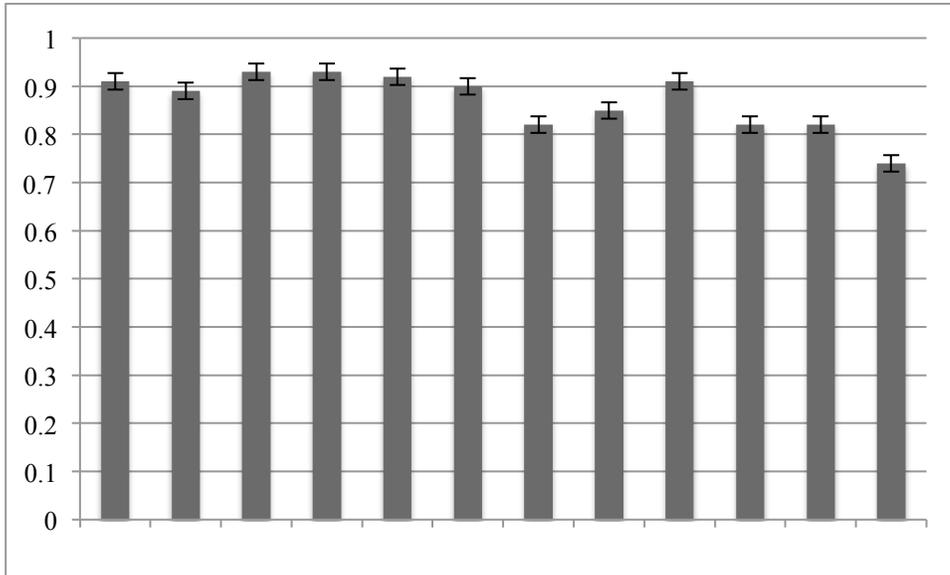


Figure 3.3 Children's proportion of looking time during training trials

3.2.2.3 Exposure Trials

A repeated measures ANOVA with exposure trial as a within-subject variable yielded no main effect, $F(1,17)=.006$, $p>.05$, $\eta_p^2=.00$. Children watched the first exposure trial for 9.5 s ($SD = 3.6$), the second exposure trial for 9.4 s ($SD = 3.2$), and the third exposure trial for 9.4 s ($SD = 2.8$). There was no significant difference in looking between the first and third training trial $t(18)=.11$, $p>.05$, $d=.03$, suggesting that children maintained their attention during exposure trial events (Table 3.2).

3.2.2.4 Test Trials: Do 21-to 24-Month-Old Children Show Sensitivity to Japanese Ground-Path When Novel Words Accompany Events?

A repeated-measures ANOVA with trial type (trial: salience vs. average of test trials) as a within-subject variable and gender (male; female) and vocabulary level

(high; low) as between-subject variables revealed a main effect of trial, $F(1,14)=11.4$, $p<.05$, $\eta_p^2=.45$ but no interactions, suggesting that children's proportion of looking towards the novel event significantly increased from the salience to test trial. A paired-samples t-test confirmed that children had a significant preference for the novel ($M=.59$, $SD=.12$) over the familiar ($M=.43$, $SD=.13$) test event. In addition, a one-sample t-test found that looking time during test was significantly above chance $t(17)=3.3$, $p<.05$, $d=1.2$. (Figure 3.4). Thirteen out of 18 children (72%) preferred the novel ground category at test. Taken together, these findings suggest that despite children's initial preference for the familiar event, they displayed a significant preference for the novel event at test (Table 3.2).

3.2.2.5 Comparison of Experiment 2a and Experiment 2b

To compare infants' performance by experiment, children's proportion of looking at salience and test were assessed. A repeated-measures ANOVA with trial type (salience trial; test trial) as a within-subject variable and experiment (Experiment 2a: general language; Experiment 2b: novel spatial words) as a between-subject variable was conducted. Results yielded a significant main effect of trial type (salience trial; test trial), $F(1,37)=8.6$, $p<.05$, $\eta_p^2 = 0.18$, and a significant main effect of experiment (Experiment 1a; Experiment 1b), $F(1,37)=10.3$, $p<.05$, $\eta_p^2 = 0.21$. These resulting main effects of trial type and experiment led us to conduct a paired-sample t-tests for our two experiments (Experiment 2a; Experiment 2b) in which we compared infants' NPS values at test. Children who heard novel words during training trials

(Experiment 2b), ($M=.59$, $SD=.12$) showed a greater novelty preference at test than children who heard general language (Experiment 2a), ($M=.47$, $SD=.12$), $t(37)=3.2$, $p<.01$, $d=1$ (Figure 3.4).

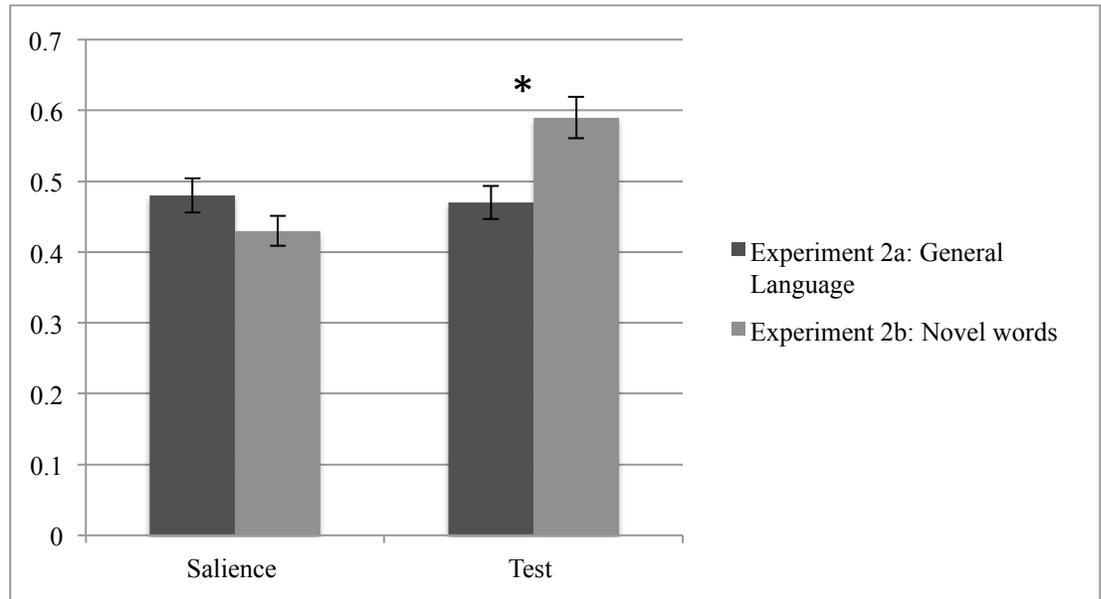


Figure 3.4 Children's proportion of looking during salience and test by experiment
* $p \leq .05$

	Salience <i>M (SD)</i>	Training <i>M (SD)</i>	Exposure <i>M (SD)</i>	Test <i>M (SD)</i>
Ex 2a: General language	.51(.10)	.89(.11)	.80(.15)	.47(.11)
Ex 2b: Novel spatial preposition	.43(.13)	.87(.11)	.78(.21)	.59(.12)

Table 3.2 Children's proportion of looking during all trials by Experiment

3.2.3 Discussion

Experiment 2b investigated whether pairing novel words *toke* and *keet* with *wataru* and *toru* grounds would encourage English-reared children to discriminate between Japanese ground-path categories. If semantic reorganization is malleable, children's perception of Japanese ground-path distinctions should be promoted using language. Pairing two novel words with two different ground-path categories encouraged children to look longer towards the novel ground-path category. Results indicated that the presence of two novel words heightened 21-to 24-month-old English-reared children's sensitivity to Japanese ground-path, suggesting that children's perception of events is relatively malleable. Further, because general language (Experiment 2a) did not facilitate categorization of ground-path categories, specific language such as spatial words may guide children's attention to some relations in events over others.

Chapter 4

GENERAL DISCUSSION

Recent research has made progress in uncovering the non-linguistic components of events that are related to the acquisition of relational terms. To acquire verbs and prepositions, infants must show sensitivity to a number of event components such as path-manner, containment-support, and ground. Infants then organize these event components to match the way they are expressed in their native language. Despite the burgeoning literature on children's conceptualization of events, little is known about how semantic reorganization unfolds. Although it is assumed that the ambient language dampens children's attention to components of events, only a handful of studies have examined this hypothesis. To pursue this question, this dissertation investigated if language plays a causal role in how infants shift from perceiving events in a universal- to language-specific manner. Additionally, the malleability of semantic reorganization was assessed by examining whether language can resurrect children's sensitivity to non-native event components. The results of this dissertation have implications for language acquisition because relational term learning has its roots in their ability to process non-linguistic event components.

4.1 Children's Sensitivity to Ground-Path: Further Evidence for Semantic Reorganization

Extending the findings of Göksun et al. (2011), Experiment 1a revealed that when neutral language is present, 13-to 15-month-old English-reared infants showed sensitivity to Japanese ground-path by demonstrating a significant preference for the novel ground-path category. Experiment 2a showed that by 21 to 24 months of age, English-reared children has no significant preference for either ground at test, suggesting that children no longer discriminated between Japanese ground-path categories in the presence of general language. Although Göksun et al. (2010) conducted a series of experiments to validate English-reared children's sensitivity to the category of Japanese ground-path non-linguistically, no other studies have examined infants' ability categorize ground information. These results corroborate the findings of Göksun et al. (2011) with different stimuli and design. Moreover, these findings provide supporting evidence for the developmental process of semantic reorganization. Preverbal English-reared infants appear to show sensitivity to non-native event components such as Japanese ground-path before language has a chance to influence their perception. However, by 21 to 24 months, influenced by the ambient language, children begin to tune into certain event components over others. Using neutral language, the present studies validated the findings of Göksun et al. (2011) and the phenomenon of semantic reorganization.

4.2 Does *Language* Influence Semantic Reorganization?

Increasing evidence suggests that perceptual narrowing appears to occur in the semantic domain (Choi, 2006; Göksun et al., 2011). Infants seem to display sensitivity to various event components that are not highlighted in their native languages (e.g., tight-fit, ground-path) but eventually weaken their sensitivity to non-native event components and hone in on components that are more relevant to their ambient language. Although language is hypothesized to influence children to dampen their sensitivity to non-native event components, little empirical work has been done to examine this question.

To assess whether language is responsible for children's progression from language-general to language-specific event perception, Experiment 1b investigated whether language can be used to weaken 13-to 15-month-olds' sensitivity to Japanese ground-path categories. The results of Experiment 1b suggest that pairing a single label across two different Japanese ground-path categories influences 13-to 15-month-old English-reared infants to dampen their sensitivity to Japanese ground-path by showing no preference for either ground at test. These findings provide evidence to suggest that language may be the driving force behind semantic reorganization.

Infants early on notice a common set of event components regardless of their linguistic environment (Choi, 2006; Göksun et al., 2011). Influenced by the distinctions encoded in their native language, infants appear to focus more on components of events that are more relevant to their native language around the second year of life. This is one of the first studies to experimentally demonstrate that

language has the function of orienting infants' attention to some relations in events over others (i.e., semantic reorganization). Most previous studies have examined children's ability to resurrect their perception of spatial relations (tight-fit) using language (Casasola et al., 2009) but very little work has attempted to dampen children's sensitivity to event components. These findings support the notion that event components that are lexically marked will receive increased attention (Bowerman & Choi, 2001). Apparently, hearing the same word used across varying environments motivates infants to abstract commonalities across contexts. In contrast, event components that are less described in the relational terms of children's native language may receive less attention over time. As a result, children weaken their sensitivity to such event components. This is the process of semantic reorganization at work (Figure 4.1). Experiment 1b addresses one of the mechanisms underlying semantic reorganization.

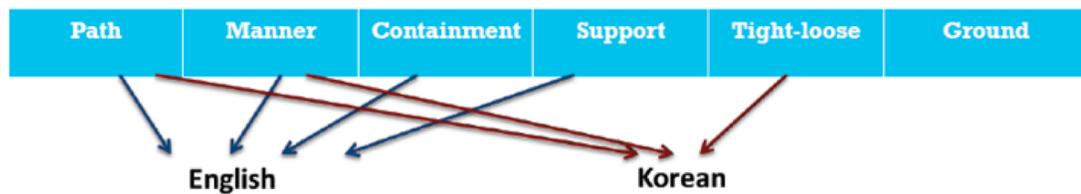


Figure 4.1 Visual representation of semantic reorganization

Experiment 2b further highlighted the effect that language has on children's sensitivity to event components, by showing that that hearing two different labels with two different types of ground-path categories influences children to discriminate

between them. Both Experiment 1b and 2b show that language can manipulate children's sensitivity to Japanese ground-path categories. However, a remaining question is whether the findings of Experiment 1b and 2b are specific to language or is the consequence of a more general, attention-engaging function associated with auditory stimuli. Studies have examined the effects of novel words versus non-linguistic stimuli on infant object categorization. Balaban and Waxman (1997) examined the influence of novel words versus novel tone sequences on 9-month-olds' object categorization. Infants viewed a series of pictures representing one object category (e.g., rabbits) along with an auditory stimulus. In the word condition, the stimulus was a naming phrase (e.g., "a rabbit") while in the tone condition, this was a sine-wave tone. Infants in the word condition successfully formed object categories; those hearing tones did not. Subsequent work with a broader range of stimuli has extended this finding: words (including content-filtered words) promoted successful categorization, but non-linguistic sounds (e.g., tones, melodies, mechanical sounds, and mouth sounds) failed to have the same effect (Balaban & Waxman, 1997; Fulkerson & Haaf, 2003; Woodward & Hoyne, 1999).

These results suggest that there may be something unique about language that facilitates object categorization. The question is whether such a link can be made between language and event components (i.e., ground-path). Is there something about language that encourages or discourages categorization of event components or would tones paired with two different Japanese ground-path categories have the same effect?

The object categorization literature (Balaban & Waxman, 1997) suggests that tone sequences are not likely to impact categorization of Japanese ground-path.

In addition, as children gain increased language knowledge, they appear to require more specificity in terms of whether language influences the perception of event components. For example, by age 2, young children recognize which syntactic frames correspond to which spatial relations (Fisher, Klinger, & Song, 2006). Children who heard “It is a *corp*” interpreted the novel count noun as corresponding to a novel object but interpreted the same novel word presented as a preposition “It is *acorp* the box” as referring to the spatial relation (Fisher et al., 2006). The infants in the present study (Experiment 1b) showed dampened sensitivity to Japanese ground-path categories only when they heard a single label but not in the presence of neutral language (Experiment 1a). Similarly, children in Experiment 2b showed heightened awareness to Japanese ground-path only when they heard the two novel words during the training trials but not when they heard general language (Experiment 2a). These results suggest that language is not merely serving as an attention-getter but that the two novel words (*toke* and *keet*) may be encouraging children to distinguish between two Japanese ground-path categories (*wataru* and *toru*). Another unexplored question is whether the same findings would emerge if novel words were presented as a verb, noun or an adjective. Although presenting novel words as verbs may yield the same results as prepositions, using them as nouns or adjectives may not. The use of novel nouns may encourage children to focus on the agent whereas novel adjectives may influence children to look at the figure’s attributes. Because some English verbs such

as climb encode ground-path information, a similar finding as Experiment 1b and 2b may be found with novel verbs.

However, no previous studies have examined whether non-linguistic stimuli such as tones would influence infants' sensitivity to a non-native event component. Thus, whether tone sequences could affect English-reared children's sensitivity to Japanese ground-path remains unknown. Additionally, examining the effects that tones may have on children's sensitivity to Japanese ground-path categories, helps address another possible interpretation of our results. Perhaps, some may argue that 21-to 24-month-old children's ability to resurrect their sensitivity to Japanese ground-path categories have more to do with their willingness to learn any type of novel category (Welder & Graham, 2006) rather than language playing a unique role. If children are unable to form a category of Japanese ground-path in the presence of tones, this discredits the possibility that children can learn any type of novel category through any type of auditory stimuli, and strengthens the argument that *language* is the driving force behind semantic reorganization. Future studies will examine this question.

4.3 Implications for the Language-Thought Debate

Languages differ in how they divide the world into slightly different categories. Does language really shape how people perceive the world? The Whorfian Relativity view would argue that speakers of different languages see the world differently. The alternative Modular view suggests that cognition is universal and is

unaffected by language (e.g., Li & Gleitman, 2002; Papafragou, Massey, & Gleitman, 2006; Gleitman & Papafragou, 2013). Both Whorfians and Modularists seek yes or no answers; whether language does or does not uniformly influence cognition. The relationship between language and thought may be more nuanced than previously discussed.

A weaker version of the Whorfian hypothesis focuses on the more transient effects of language and thought, instead of suggesting that constant use of specific languages permanently changes the way one thinks. Studies supporting this view have shown that language can affect people's non-verbal cognition in the domains of analogy (Lowenstein & Gentner, 2005), space (e.g., Casasola & Bhagwat, 2007; Levinson, 1996), time (Boroditsky, Schimdt, & Phillips, 2003), and objects (Loftus, Miller, & Burns, 1978). In fact, Choi and Hattrup (2012)'s study that investigated how language-specific semantics influences non-linguistic categorization of spatial relations, speaks to this point. English-and Korean-speaking adults participated in a similarity judgment task with the relations of containment, support, tight-fit, and loose-fit. Each trial consisted of a target video depicting an actor creating a particular spatial relation (e.g., putting x on a stick) appearing on the screen for 5 seconds. Following this event was a screen depicting two spatial relations shown side-by-side (e.g., putting shapes on a box vs. putting bottles in a pocket). Participants were asked to choose the video that was more similar to the target (Figure 4.2). Results showed that both perception and language influenced their judgment. Loose-support was viewed as different from tight-support by both language groups. However, support and

tight-fit categorization was guided by language-specific differences. For tight-support relations, English-speakers chose support as the common feature, whereas Korean speakers picked out tight-fit as the unifying feature (Figure 4.2). These findings suggest that language guides categorization of spatial relations primarily when perceptual features compete for similarity.

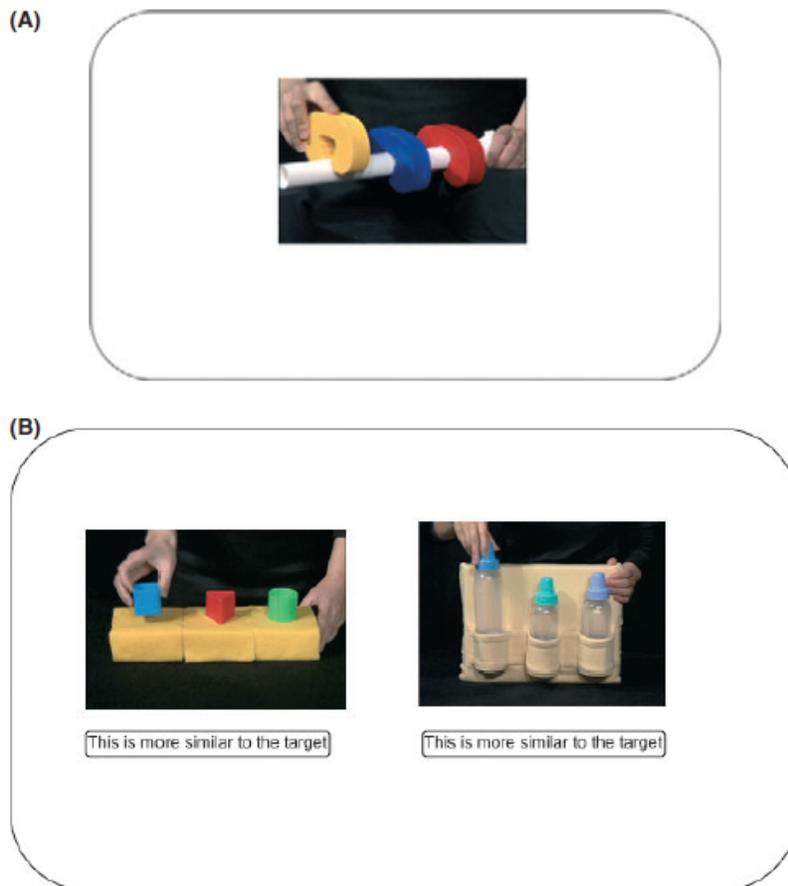


Figure 4.2 Sample item presented in Choi and Hattrup (2012)

Additionally, findings of the present study showed that it is not that *any* form of language influences children's sensitivity to Japanese ground-path. When one word is paired with two different ground-path categories (Experiment 1b), it discourages discrimination between them. In contrast, when two novel words (Experiment 2b) are paired with one or two different Japanese ground-path categories, they can promote children's ability to categorize these spatial relations. However, Experiment 2a showed that neutral language does not promote discrimination of Japanese ground-path categories. Thus, language appears to have the function of orienting infants' attention to some relations in events over others when specific words such as spatial words are paired with event components. The results of the present study supports the weaker version of the Whorfian perspective that suggests that language influences perception when it specifically encourages discrimination of spatial categories (Bowerman & Choi, 2001; Choi & Bowerman, 1991; Gentner & Boroditsky, 2001; Talmy, 1985).

4.4 Plasticity of Semantic Reorganization

One characteristic of speech perception is that there is limited plasticity after perceptual narrowing takes place. Less is known about the malleability of semantic reorganization. Adults have been known to show sensitivity to distinctions that are not often encoded in their native language (Hespos & Spelke, 2004; Shafto, Havasi, & Snedeker, 2014). Some work with children showed that 18-month-old English-reared children form categories of tight-fit versus with the help of novel words (Casasola et

al., 2009). The studies presented in this dissertation add to this literature by showing that language can resurrect children's sensitivity to Japanese ground-path categories, as Experiment 2b showed that 21-to 24-month-old English-reared children's sensitivity to Japanese ground-path can be promoted by pairing two labels with two different ground-path categories. Although more research with other event components is necessary to evaluate the generalizability of these findings, results of the present study suggest that the perceptual narrowing that occurs in the semantic domain may be more malleable than the narrowing that occurs in the phonological domain (Shafto, Havasi, & Snedeker, 2014). Because most event components are probabilistically encoded in the relational terms of many languages, it may be important that children maintain their ability to show sensitivity to different event components even after semantic reorganization has taken place. For example, because some English prepositions such as *over* and *through* encode ground information, it may be important that English-reared children still maintain the ability to learn more ground-path categories. As lexicalization biases become updated based on experience (Shafto et al., 2014), children may need to anticipate the possibility that verbs or prepositions might encode event components (e.g., ground-path) that are not common in their native language.

However, despite how readily the 21-to 24-month-olds in the present study resurrected their sensitivity to Japanese ground-path categories, it is important to mention that we do not consider the 21-to 24-month-old English-reared-children in the present study to be equivalent to monolingual-Japanese children. The extent to which

English-reared children's sensitivity to Japanese ground-path categories will remain intact is unknown. However, it is likely that without continuous exposure, children's sensitivity to Japanese ground-path categories will fade, especially as they learn more English relational terms. Choi (2006)'s findings suggest that 18-month-old English-reared children who understood the English preposition "on" were less likely to show sensitivity to tight-fit loose fit-relations. In contrast, because monolingual Japanese-reared children have exposure to ground-path verbs, they will not only maintain sensitivity to Japanese ground-path categories but will also come to comprehend and produce ground-path verbs. This experiment aimed to mimic how the early stages of semantic reorganization may work in the real world. Thus, the participants of Experiment 2b represent English-reared children who are at the initial stages of adopting the patterns of Japanese ground-path categories but they do not represent seasoned monolingual Japanese children who have much experience with Japanese ground-path verbs.

4.4.1 Can Adults Resurrect their Ground-Path Distinctions?

An interesting question is whether English-speaking adults' sensitivity to Japanese ground-path can be heightened with the use of language. Perhaps the fact that children increased their sensitivity to Japanese ground-path categories with just 3 minutes of exposure could be due to the fact that they showed sensitivity to this distinction at approximately 13 to 15 months. As a result, discrimination of Japanese

ground-path categories may be more challenging for adults than 21-to 24-month-old children who recently had this sensitivity. Yet, past studies using two different concepts (i.e., tight-fit vs. loose-fit, path and manner) (Hespos & Spelke, 2007; Shafto, Havasi, & Snedeker, 2014) suggest that although English-speaking adults may have more difficulty in showing sensitivity to Japanese ground-path than the 21-to 24-month-olds (Experiment 2b), they may still succeed in discriminating between ground-path categories after training. If adults can be trained to notice Japanese ground-path categories with equal ease, this indicates that there is evidence of plasticity in adults as well as young children. In contrast, if adults fail to notice ground-path distinctions even after training, this suggests that they have become accustomed to their own language's way of viewing events. This might suggest that adults, having had Japanese ground path concepts as infants, have difficulty resurrecting them as readily as do infants. In the phonological domain, Pierce, Klein, Chen, Delcenserie, and Genesee (2014) showed that internationally adopted 9-to 17-year-old children who were entirely separated from their birth language (Chinese) at 12 months of age, still displayed brain activity to Chinese that were identical to that of native Chinese speakers. Perhaps as in the phonological domain, if adults have difficulty showing sensitivity to Japanese ground-path categories, this may be due to effects of their native language interfering with their ability to adopt the patterns of their second language. Future studies will examine adults' ability to heighten their sensitivity to Japanese ground-path.

Additionally, exploring the malleability of semantic reorganization leads to a better understanding of how second language learners approach relational term learning. The challenges they face are a) to overcome patterns of their native language that are established in infancy and b) to learn how to encode events in a different way for the second language. Although there appears to be plasticity in semantic reorganization (Shafto et al., 2014), less is known about how second language learners come to describe events in a way that is semantically appropriate for their second language.

Song, Pulverman, Infiesta, Golinkoff, and Hirsh-Pasek (2015) examined the effectiveness of second language instruction on English-speaking college students' ability to adopt lexicalization biases or particular ways of encoding events in relational terms, of their second language (Spanish). Beginning, intermediate, and advanced students of Spanish were asked to describe in writing four pages of a wordless picture book in Spanish. Results showed that intermediate students, who had approximately five previous Spanish courses, still showed influence from English, using a higher proportion of manners verbs than native Spanish speakers. Only the advanced students, who had approximately seven previous, semester-long courses, used path verbs to the same extent as the native Spanish speakers. Studying abroad had an independent effect on lexicalization, with students who studied abroad for a full semester having more similar lexicalization patterns to native speakers. Further studies are necessary to investigate the factors involved in acquiring the lexicalization patterns of a second language. Perhaps explicitly teaching how events are encoded in a second

language in comparison to their first language may be one way to facilitate students' second language acquisition. Instead of merely focusing on vocabulary and grammar, instruction might highlight lexicalization biases in the second language and compare them with those in the students' native language.

4.5 Semantic Reorganization and Children's Later Relational Term Knowledge

In the phonological domain, individual differences in infants' abilities to discriminate two vowels at 6 months significantly predict language outcomes at 13, 16, and 24 months of age as measured by the MCDI (Kuhl, Conboy, Padden, Nelson, & Pruitt, 2005). Similarly, Newman et al. (2006) found that 12-month-old infants' performance on a speech segmentation task related to their expressive vocabulary (as measured by the Test of Language Development) at 24 months. An open question is whether a similar pattern may be true for the semantic domain: Do individual differences in infants' abilities to categorize native event components have consequences for their later vocabulary acquisition (Konishi et al., 2012)? Might such an effect be limited to verbs and prepositions or to all vocabulary?

The findings of Experiment 1b and 2b demonstrated that children are sensitive to how the linguistic input describes events, as language can be used to manipulate how children perceive ground-path categories. These results suggest that as infants gain exposure to the ambient language, they learn to package event components according to the demands of their native language. The outcome of the natural semantic reorganization that occurs in learning a first language is a dominant yet

somewhat flexible lexicalization bias. How do infants become sensitive to how their ambient language encodes events? Research in the phonological domain suggest that infants track transitional probabilities or the likelihood that one event follows another to discriminate between native-and non-native phonemes from speech (Maye, Werker, & Gerken, 2002). Maye, Werker, and Gerken (2002) familiarized eight-month-old English- reared infants with speech sounds from a phonetic continuum (i.e., [da] to [ta]), offering them either a bimodal or unimodal frequency distribution of these contrasting sounds. On the phonetic continuum, at one end of the continuum is da and the other end is ta (Figure 4.3). Infants who were in the bimodal condition, were more likely to hear stimuli near the end points of the continuum more frequently than the center. In contrast, those in the unimodal condition heard stimuli from the center of the continuum most frequently. At test, only the infants who were in the bimodal condition discriminated between the syllables [da] and [ta], suggesting that infants use statistical learning, a domain-general bias to track phonemes. Once infants have gained a sufficient number of words with overlapping phonetic features in their lexicon, they begin to abstract phonetic commonalities between those words, creating an established phonemic category. Indeed, research shows that 14-month-olds with larger vocabularies are successful in learning similar-sounding words (“bih” and “dih”; Werker et al., 2002), suggesting that children may be using their knowledge of phonetic properties when encountering novel words. Although no previous studies have examined infants’ ability to track the transitional probabilities of native event components and their ability to learn relational terms, such domain-general abilities

may be at play in semantic reorganization. Thus, tracking the regularities of how their native language encodes events may allow infants to detect common distinctions and learn how to think for speaking (Slobin, 1996).

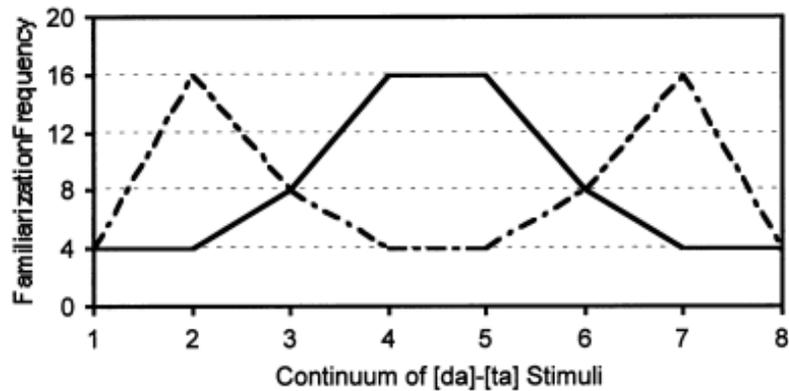


Figure 4.3 Bimodal vs. unimodal distribution of [da]-[ta] during familiarization. The dotted line represents the bimodal stimuli and the solid line represents the unimodal stimuli.

Although it is not clear if infants' ability to track transitional probabilities of events is important for semantic reorganization, children's ability to perceive events may have implications for their later relational vocabulary and might be a predictor for their later language ability. In fact, Konishi et al. (2012) explored links between children's ability to categorize components of non-linguistic events at 13-15 months and their comprehension of verbs at 27-33 months. At Time 1, infants saw silent dynamic scenes performed by a human actor containing the complexity involved in real world events. Using a design created by Pruden et al. (2013), categorization of *path* (a figure's trajectory with respect to a ground object) and *manner* (how an action

is performed) was the focus. Either the same manner (say, *running*) was shown taking place across three different paths (*around, through, and behind*) or the same path (e.g., *around* a tent) was shown with 3 different manners (*running, crawling, and walking*). Then, after familiarization, either the path or the manner was changed and visual fixation was monitored using preferential looking. Fifteen out of 25 infants (60%) displayed a novelty preference, suggesting that infants' ability to form categories of event components ranged.

At Time 2, 12 months later, we tested the same children on their *comprehension* of early-acquired manner verbs (e.g., kick) in a two-choice pointing task that showed dynamic scenes. Time spent viewing the target event at Time 1 significantly correlated with Time 2 verb comprehension ($r = .45, p < .05$). Skill in categorizing non-linguistic event components predicts to children's later verb knowledge. Such results remained even after controlling for children's vocabulary knowledge (as measured by the MCDI) at Time 1 and Time 2. These findings suggest that the ability to categorize the semantic components present in nonlinguistic events may well be implicated in children's ability to learn verbs. However, future studies should consider measuring children's general cognitive skills, as it could influence the relationship between infants' early event categorization skills and later relational vocabulary.

More research is necessary to investigate whether semantic reorganization plays a critical role in relational term learning. If lexicalization biases emerge through a process of semantic reorganization, infants' early ability to process event

components could be used as a marker for their later relational vocabulary by researchers and practitioners. Further, caregivers, practitioners, and educators could use this information to provide interventions to scaffold children's ability to perceive events in a language-specific manner.

4.6 Conclusions

Relational terms such as verbs are fundamental to language, as they often describe the core meaning of the sentence. To acquire verbs, children must progress from perceiving events in a language-general to language-specific way. Although researchers have hypothesized that language narrows children's perception of events, very few studies have examined this question. This dissertation provides compelling evidence for the idea that language plays a critical role in how children dampen and heighten their sensitivity to non-native event components. Thus, in a similar fashion as language narrows children's phonological space, language exposure may facilitate semantic reorganization, influencing children to pay less attention to those relations that are less common in their native language.

Additionally, the findings of the present study speak to the malleability of semantic reorganization. Even after children have undergone perceptual narrowing for event components, they appear to resurrect their sensitivity to non-native event components with relatively little exposure. These experiments further our understanding of how children learn to conceptualize events to talk about them in their native language.

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Appendix

HUMAN SUBJECTS PROTOCOL

DATE: January 27, 2015

TO:

Roberta Golinkoff, PhD FROM:
University of Delaware IRB

STUDY TITLE: [545383-5] Language Experience Influences Event Perception

SUBMISSION TYPE: Continuing Review/Progress Report

ACTION:

APPROVED APPROVAL

DATE: January 27,
2015

EXPIRATION DATE: January 26, 2016

REVIEW TYPE: Expedited Review

REVIEW CATEGORY: Expedited review category # (7)

Thank you for your submission of Continuing Review/Progress Report materials for this research study. The University of Delaware IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All sponsor reporting requirements should also be followed.

Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office. Please note that all research records must be retained for a minimum of three years.

Based on the risks, this project requires Continuing Review by this office on an annual basis. Please use the appropriate renewal forms for this procedure.