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The role of pictures and gestures as nonverbal aids in preschoolers' word learning in a novel language

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ABSTRACT

Previous research suggests that presenting redundant nonverbal semantic information in the form of gestures and/or pictures may aid word learning in first and foreign languages. But do nonverbal supports help all learners equally? We address this issue by examining the role of gestures and pictures as nonverbal supports for word learning in a novel (e.g. original/pretend) language in a sample of 62 preschoolers who differ in language abilities, language background, and gender. We tested children's ability to learn novel words for familiar objects using a within-subjects design with three conditions: word-only; word + gesture; word + picture. Children were assessed on English translation, immediate comprehension and follow-up comprehension 1 week later. Overall performance on the tasks differed by characteristics of the learners. The importance of considering the interplay between learner characteristics and instructional strategies is discussed.

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1. Introduction

As many teachers are aware, learning can be facilitated when redundant information is presented in two forms. For example, teachers may hold their hands out wide while explaining the concept "big", or they may use a picture to help describe the moon in the sky. Paivio (1971, 1986) proposes a Dual Coding Theory to account for the advantages of presenting information in two modalities. This theory posits that verbal and nonverbal information are processed in two separate, mutually supportive systems. Two systems allow information to be more readily retrieved, resulting in better recall for information presented in two modalities over input merely presented in one modality (e.g., either verbally or nonverbally). Further, Dual Coding Theory claims that the ways in which verbal and nonverbal mechanisms contribute to learning will vary with the specific task and stimulus characteristics, past and present events and individual differences (Clark & Paivio, 1991). In the current study, we examine the extent to which nonverbal information, specifically pictures and gestures, aids preschoolers' word learning in a novel (e.g. original/pretend) language, and whether or not individual differences in child language ability, language background, and gender affect word learning across conditions.

Word learning in itself is difficult because words are arbitrary symbols with no inherent relationship to their referents (Quine, 1960). That is, there is nothing about the word "table" in English that connects it to the object *table*. Nonverbal supports may be particularly helpful for word learning because redundant semantic information may provide more robust representation of concepts associated with words. Pictures and gestures are two potential avenues through which to offer this nonverbal support.

1.1. Pictures as nonverbal supports

Beginning around 18 months of age, children can understand the symbolic nature of pictures and can generalize words learned through the labeling of a picture to real objects in the world. For example, Preissler and Carey (2004) taught 2-year-olds a new label "whisk" by pairing the word with a simple drawing of the object. When children were shown the picture and a real whisk and asked to identify the "whisk", children chose the real object and not the picture, indicating that children understood the word to refer to the object and not the picture alone. Similarly, Ganea, Pickard, and DeLoache (2008) found that 15- and 18-month-old children were able to learn novel names for new objects during a picture book labeling interaction. Further, the children were able to extend their learning of the novel word from the picture to the picture's real referent. Thus, young children can learn words from pictures and generalize to real world objects, suggesting the use of pictures in word learning is an appropriate instructional strategy.

Indeed, many intervention studies and studies of multifaceted vocabulary instruction include the use of pictures to support word learning. For example, in a recent kindergarten study (Loftus, Coyne, McCoach, Zipoli, & Pullen, 2010), interventionists reviewed

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words introduced during storybook reading by showing children pictures of the target word from the book while providing them with a definition of the word. For another example, in a kindergarten study by Silverman (2007), teachers reinforced word learning by showing illustrations including representations of target words from the book in which the words were introduced as well as photographs representing target words in other contexts outside of the book. In a recent preschool study (Pollard-Durodola et al., 2011), teachers introduced new words before storybook reading by providing simple definitions and showing picture cards with representations of the target words. As these examples show, there is a tradition of including pictures to support word learning in vocabulary intervention. However, the empirical research on the role of pictures in word learning is limited and findings are mixed.

In a classroom study on the effectiveness of using pictures and objects in instructing science lessons with older children, Best, Dockrell, and Braisby (2006) found that children made the largest gains in science vocabulary knowledge when pictures or objects were used in combination with semantic scaffolding, in comparison to children who had received only verbal semantic support. Finally, work with adults suggests similar results. Mayer (1999) conducted several studies designed to teach young adult students how things work (i.e., a car's brakes), and found that students who received an explanation presented as words and pictures or animations outperformed students who received an explanation in words alone. However, a more recent study which taught second grade students science terms, names for musical instruments, and animal and habitat words, found no advantage of learning words when paired with pictures than when presented as words alone (Cohen & Johnson, 2011). None of the above studies, however, considered individual differences of the learners in the analysis.

Some studies suggest pictures are useful tools for teaching vocabulary to children learning English as a second language. In a research synthesis of studies on the topic, Gersten and Baker (2000) show that studies that taught vocabulary to English Language Learners by using pictures showed improved results over other methods. Further, Silverman and Hines (2009) studied the use of multimedia to support vocabulary and content learning in elementary school. They found that English language learners (ELLs) in kindergarten through second grade who saw short video clips that supplemented teacher-led instruction of words in the context of storybooks made greater gains in their vocabulary than ELLs who had not had multimedia-enhanced instruction. The addition of video to the lesson closed the gap between ELLs and non-ELLs in knowledge of words targeted during the lesson, and it narrowed the gap in general vocabulary knowledge. Importantly, the use of multimedia had greater learning effects for the ELLs than the monolingual English-speaking children, highlighting the importance of considering student characteristics when implementing instructional strategies.

Thus, using pictures to teach vocabulary is prevalent in classroom environments for both native language learning and foreign language learning. However, there are few empirical studies on the topic, and studies that do investigate the role of pictures in word learning offer mixed findings and typically do not consider individual differences in the learners as a moderator. In the current study, we examine the role of pictures in novel word learning and ask whether the role of pictures differs for children from different language backgrounds, language abilities and gender.

1.2. Gestures as nonverbal supports

Research shows that teachers gesture when teaching vocabulary (Lazaraton, 2004). This is not surprising, as gestures are a natural part of speech, and gesture and speech form an integrated communicative system (McNeill, 1992). Iconic gestures in particular can serve as useful nonverbal aids in that they visually represent the concepts to which they refer – for example, flapping the arms to represent a bird flying (McNeill, 1992). In a study of toddlers' vocabulary acquisition, Capone and McGregor (2005) found that while all children learned the new words in their experiment, children required less assistance to recall the words taught with iconic gestures than the words presented in speech alone. The authors use this finding to propose that the use of gesture in instruction leads to a richer semantic knowledge of new words. A study of kindergarten students' novel word acquisition (Weismer & Helsketh, 1993) demonstrated that the use of gestures during the instruction of prepositions had a significant positive effect on children's vocabulary learning. This was evident for children with typical language development as well as children with specific language impairments. However, this positive effect was only significant when children were assessed with a comprehension task; the gestures had no significant effect on novel word production of children from either group.

Gesture appears to aid foreign language learning as well: Kelly, McDevitt, and Esch (2009) taught monolingual English-speaking adults Japanese verbs with iconic gestures and found that adult L2 learners acquired new words most effectively when the new words were taught with gestures that reinforced their meanings. Macedonia, Muller, and Friederici (2011) found that German-speaking adults were better able to learn words in a novel language when paired with iconic gestures than with meaningless gestures. Tellier (2008) taught English words to monolingual French-speaking children and found that children learned the words better when the words were taught with accompanying gestures. However, in this study the children not only saw the gestures but they also produced them. Similarly, Allen (1995) found that university students at an American university who were taught expressions paired with emblematic gestures (and who also enacted the gestures themselves) in their foreign language French classes learned those expressions better compared to students who did not see or enact gestures paired with the expressions. Thus, from toddlers to adults, observing and enacting gestures can facilitate language learning.

Several studies that use gestures as nonverbal aids in more complex, non word-learning tasks have relevant findings as well. Valenzeno, Alibali, and Klatzky (2003) showed preschool children videotaped lessons with and without gestures about the concept of symmetry. Children who saw the verbal plus gesture lesson performed better on a post-test of symmetrical judgment than children who saw the verbal only lesson. Similarly, Church, Ayman-Nolley, and Mahootian (2004) used English instructional videos with and without gestures to teach the concept of conservation to both monolingual English-speaking and native Spanish-speaking ELL students (7-year-olds). The researchers found that using gesture in classroom instruction increased comprehension of native English speakers as well as ELLs, but it was particularly helpful for the ELLs. McNeil, Alibali, and Evans (2000) used gestures as a nonverbal aid with instructions explaining a block building task. They found that the redundant gestures aided in comprehension of more complex messages, but not simpler messages, suggesting that the effect of gesture might depend on the complexity of the task for the learner. Finally, Cohen and Otterbein (1992) found that adult subjects were better able to recall sentences when those sentences were presented with gesture than without. In sum, this previous work suggests that providing redundant semantic information in the form of pictures or gestures can be advantageous for both word learning and concept instruction.

1.3. The role of learner characteristics

It is clear from the literature reviewed above that the effect of nonverbal aids in learning may differ for learners who differ in

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