



“I use it when I see it”: The role of development and experience in Deaf and hearing children’s understanding of iconic gesture



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ARTICLE INFO

Article history:

Received 23 October 2015

Revised 6 January 2017

Accepted 21 January 2017

Keywords:

Iconicity

Gesture

Fast mapping

Sign language

ABSTRACT

Iconicity is prevalent in gesture and in sign languages, yet the degree to which children recognize and leverage iconicity for early language learning is unclear. In Experiment 1 of the current study, we presented sign-naïve 3-, 4- and 5-year-olds ($n = 87$) with iconic shape gestures and no additional scaffolding to ask whether children can *spontaneously* map iconic gestures to their referents. Four- and five-year-olds, but not three-year-olds, recognized the referents of iconic shape gestures above chance. Experiment 2 asked whether preschoolers ($n = 93$) show an advantage in fast-mapping iconic gestures compared to arbitrary ones. We found that iconicity played a significant role in supporting 4- and 5-year-olds’ ability to learn new gestures presented in an explicit pedagogical context, and a lesser role in 3-year-olds’ learning. Using similar tasks in Experiment 3, we found that Deaf preschoolers ($n = 41$) exposed to American Sign Language showed a similar pattern of recognition and learning but starting at an earlier age, suggesting that learning a language with rich iconicity may lead to earlier use of iconicity. These results suggest that sensitivity to iconicity is shaped by experience, and while not fundamental to the earliest stages of language development, is a useful tool once children unlock these form-meaning relationships.

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1. Introduction

Language learners are equipped with biases and tools that allow them to map linguistic symbols onto referents in the real world. Child learners make inferences about meaning based on context, syntax, statistical associations, and social cues (e.g., Carey, 1977; Gleitman, 1990; Smith & Yu, 2008; Tomasello, 2008). Children’s rapid acquisition of new words starting not long after their first birthday is all the more striking given the arbitrary relationship between the majority of these words and their meanings. In fact, the arbitrary quality of symbols has been argued to be a hallmark of human language (Hockett, 1960). Nonetheless, iconic, non-arbitrary, symbols can and do exist in human communication systems (Dingemanse, Blasi, Lupyán, Christiansen, & Monaghan, 2015). Although some research has investigated children’s early sensitivity to iconic symbols, the role of iconicity in language learning remains somewhat unclear. Does an understanding of iconic symbols depend on knowing the meaning of the symbol, or does

iconicity help children access a symbol’s meaning? The current study asked whether children can recognize and harness iconicity for word learning.

Iconic symbols are prevalent in the world: children are surrounded by a variety of these symbols including road signs, emoticons, pictures in storybooks, iconographic characters, and gestures. Even within spoken language children sometimes encounter iconic symbols. Words in spoken languages can share sound features with the concepts they describe, such as the onomatopoeic English word *boom*. And both adults and children can leverage such sound-symbolism to understand the meanings of both known and novel sound-symbolic words (Haryu, 2010; Kantartzis, Imai, & Kita, 2011; Nygaard, Cook, & Namy, 2009).

However, the availability of iconic symbols in spoken languages is limited by the constraints of the auditory modality. In contrast, the visual-manual modality of sign languages and gesture lends itself particularly well to iconic symbols, as objects, signs, and gestures all exist in the same perceptual, physical, space (Bosworth & Emmorey, 2010). As such, iconicity in the manual modality can depict various aspects of a referent object such as how one handles an object (Fig. 1A), the shape of a whole object (Fig. 1B), or part of an object (Fig. 1C), among many other referent characteristics (for a review see Taub, 2001). Given the presence of iconicity in

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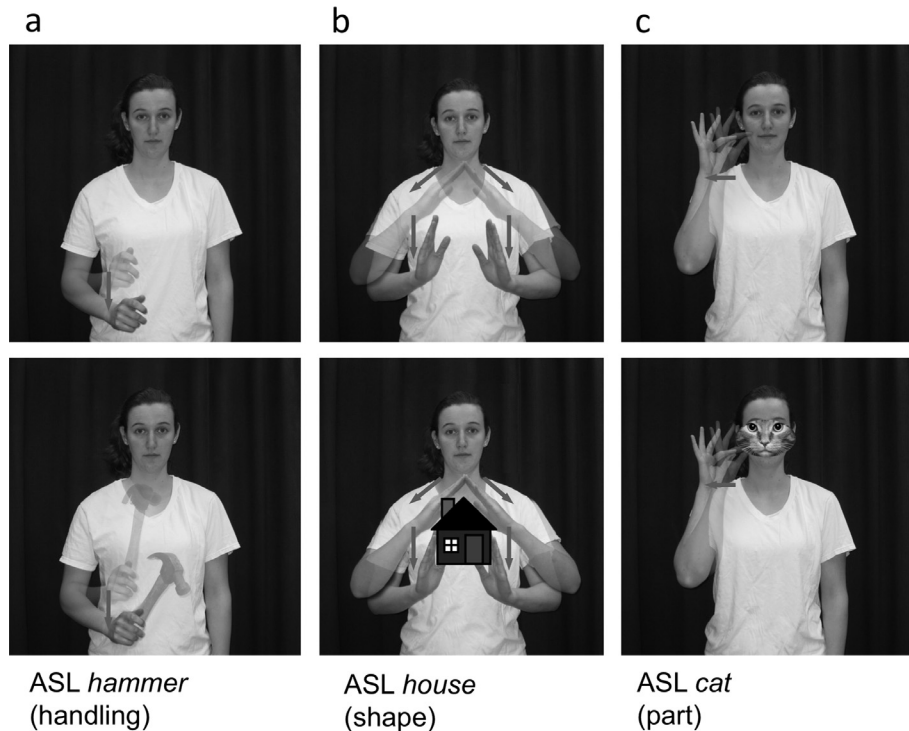


Fig. 1. (a) The ASL handling iconic sign HAMMER mimics how one holds the object; (b) the ASL shape iconic sign HOUSE traces the outline of a prototypical house; and (c) the ASL iconic sign CAT depicts a part of the object's shape.

symbols across languages, there has been an interest in investigating to what extent children of different ages access the kinds of form-meaning relationships between iconic symbols and their referents. This area of research aims, in part, to understand whether children are sensitive to the ways in which symbols may resemble what they describe, and if so, whether this sensitivity has an impact on language learning.

1.1. Sensitivity to iconicity in adult language learning

For adults, the effect of iconicity on the learning and processing of manual signs seems to depend on the language experience of the learner and the context of exposure to the form-meaning mapping. When non-signers are told the meaning of a given iconic sign, they can readily recognize the relationship between the sign and its referent. However, when they are not informed of a sign's meaning, guessing the exact meaning of an iconic sign is challenging (Bellugi & Klima, 1976). Iconicity seems to be beneficial for adults learning a sign language as a second language, as they remember iconic signs better than more arbitrary ones, perhaps because they are taught new iconic signs alongside familiar spoken language translations, and instructors highlight iconic relationships (Beykirch, Holcomb, & Harrington, 1990; Lieberth & Gamble, 1991). In contrast to L2 learners, fluent adult signers' recognition speed and accuracy in a lexical access task are unaffected by iconic primes (Bosworth & Emmorey, 2010), and proficient signers are actually slower to translate iconic signs compared to arbitrary ones from ASL to English (Baus, Carreiras, & Emmorey, 2013). When native signers perceive motor-iconic verbs such as HAMMER¹ in ASL, identical patterns of neural activation occur as when they see verbs with arbitrary forms, and similar neural regions within the left premotor and left inferior parietal cortex are activated when English speakers and ASL signers name tools or actions performed using

tools (Emmorey et al., 2004). Together, these findings suggest that native signers process iconic and arbitrary signs in more or less the same way but that L2 learners may reap some benefit from the iconic nature of signs to learn vocabulary.

Why might iconic signs exist in sign languages if they do not seem to confer a consistent processing advantage for fluent signers? Bosworth and Emmorey (2010) suggest that iconicity is the result of the gestural origins of sign languages. Perhaps iconicity allows for the ready creation of new lexical signs in the emergence of a sign language. Additionally, researchers have proposed that iconicity may be a useful tool for children learning language (Thompson, Vinson, Woll, & Vigliocco, 2012). If iconicity confers a benefit to children during language learning, children should comprehend the iconicity of gestures and signs, and learn iconic forms more readily or rapidly than arbitrary ones. However, accessing the iconicity of gestures and signs is not necessarily straightforward. Interpreting form-meaning similarity may depend on several factors including mental models for concepts, cultural associations, and personal experiences (Taub, 2001). For example, knowing the source of milk (comes from cows) and the manner in which it is obtained (via squeezing the cow's udders) is necessary to know that the ASL sign MILK iconically depicts how a cow is milked. In this case, one must have a particular conceptual representation of the referent to interpret the iconicity of the symbol.

1.2. Iconic gestures in development

Children begin to produce their first gestures between 9 and 12 months but do not begin producing iconic gestures until their second year, and the production of iconic gestures increases with age (Özçalışkan, Gentner, & Goldin-Meadow, 2013). Their iconic gestures are most commonly enactments rather than descriptions of objects' shapes or features (Acredolo & Goodwyn, 1988), or they are conventional iconic gestures used by caregivers in familiar

¹ English glosses for ASL signs appear in SMALL CAPS.

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