



Benefits of augmentative signs in word learning: Evidence from children who are deaf/hard of hearing and children with specific language impairment



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ABSTRACT

Background: Augmentative signs may facilitate word learning in children with vocabulary difficulties, for example, children who are Deaf/Hard of Hearing (DHH) and children with Specific Language Impairment (SLI). Despite the fact that augmentative signs may aid second language learning in populations with a typical language development, empirical evidence in favor of this claim is lacking.

Aims: We aim to investigate whether augmentative signs facilitate word learning for DHH children, children with SLI, and typically developing (TD) children.

Methods and procedures: Whereas previous studies taught children new labels for familiar objects, the present study taught new labels for new objects. In our word learning experiment children were presented with pictures of imaginary creatures and pseudo words. Half of the words were accompanied by an augmentative pseudo sign. The children were tested for their receptive word knowledge.

Outcomes and results: The DHH children benefitted significantly from augmentative signs, but the children with SLI and TD age-matched peers did not score significantly different on words from either the sign or no-sign condition.

Conclusions and implications: These results suggest that using Sign-Supported speech in classrooms of bimodal bilingual DHH children may support their spoken language development. The difference between earlier research findings and the present results may be caused by a difference in methodology.

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What this paper adds?

This paper adds to our knowledge of the use of augmentative signs for word learning in children with an atypical development. Only a limited amount of research has focused on this topic, whilst augmentative signs are used in educational and care practice with various groups of children with an atypical development, such as children with Specific Language Impairment (SLI) and children who are Deaf/Hard of Hearing (DHH). Although it seems axiomatic that augmentative signs aid comprehension of spoken language for DHH children, it is unclear whether such signs can increase word learning. It

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might be that better comprehension results from understanding the sign (better), without having to pay attention to the spoken word. It has not been demonstrated that augmentative signs support acquisition of spoken words. Also, concerning children with SLI, it is possible that the signs distract from the words, thereby impeding the learning process. The present study aims to investigate if augmentative signs can aid word learning in a well-defined context for children who are DHH, children with SLI, and TD children. We found a positive effect of signs on word learning for the DHH children, but there was no sign effect for the children with SLI and the control group.

1. Introduction

Typically developing (TD) children and typical adults have been found to benefit from a combination of pictures and augmentative signs or gestures (movements, usually of the hands, that accompany speech and add to the spoken message) when they are acquiring or learning their first or second spoken language (e.g., Brünken, Plass, & Leutner, 2004; De Nooijer, van Gog, Paas, & Zwaan, 2013, 2014; Kelly, McDevitt, & Esch, 2009; Mayer & Moreno, 2003; Tellier, 2008). This beneficial effect of input from more than one modality on (word) learning is referred to as the multimodality effect. It is not yet clear, however, whether this multimodality effect can also benefit groups who cannot perceive or process auditory information optimally, such as children who are Deaf/Hard of Hearing (DHH) and children with Specific Language Impairment (SLI). Since Sign-Supported speech (i.e., a combination of speech and signs from Sign Language) is used in most classrooms of special education for DHH children and in some classrooms of special education for children with SLI in the Netherlands (partly with the purpose of improving spoken language skills), it is important to investigate its effect on children's language learning. Therefore, the present study investigates multimodal word learning by DHH children and children with SLI.

1.1. Multimodal learning and processing of information

An influential theory on multimodal learning and processing is the Dual Coding Theory (Paivio, 2010; Paivio, Clark, & Lambert, 1988). This theory suggests that information that is processed in both the visual-manual and auditory-oral channel creates a stronger connection in memory. Consequently, this information is better retained. Thus, speech-gesture combinations are processed by an auditory and a visual system (and by the motor system if the gesture is repeated by the learner), which each activate the underlying concept through their individual channel. This then creates two paths to this concept in memory, and three if the gesture is repeated by the learner. Empirical evidence in favor of this theory was found by, for example, Birchfield et al. (2008), Brünken et al. (2004), De Nooijer et al. (2013, 2014); Fischer and Zwaan (2008); Tellier (2008). Each of these studies shows that (textual or linguistic) information is better retained if it is presented to the learner in more than one modality.

At some point, though, there must be a maximum amount of information which can be processed simultaneously without causing a cognitive overload and impeding comprehension and learning. Mayer and Moreno (2003) indicated that cognitive overload can occur in combining two channels if, for example, unrelated or contradictive information is presented simultaneously. Therefore, multimodal input in general and augmentative signs in particular need to be treated cautiously and consciously.

1.2. Multimodality and language learning in typical populations

The literature on multimodal presentation of information in typical populations shows, in general, that processing information through multiple channels (e.g., spoken text and gestures) can aid second language word learning in typical populations, especially when the gesture is iconic (i.e., when it shows a clear resemblance to its referent, like forming an orb shape with the hands when speaking of a ball) (e.g., Kelly et al., 2009; Macedonia, Müller, & Friederici, 2011; Macedonia & von Kriegstein, 2012; Tellier, 2008). An example of gestures' facilitating effect for both adults and (young) children is the *enactment effect* when learning new words and expressions in a second language (Macedonia & von Kriegstein, 2012; Tellier, 2008). The enactment effect is achieved when actively repeating a gesture instead of only observing it. Furthermore, observing a speech-gesture combination in which both modalities express the same information aids adults' word retention in a second language (Kelly et al., 2009). Also, observing iconic and emblematic gestures when hearing new words (in a first or second language) and the explanation of their meaning aid retention of those new words for both children and adults (Gullberg, 2008; Macedonia et al., 2011).

1.3. The role of multimodality in language learning by DHH children and children with SLI

The above studies suggest that multimodal presentation of to-be-learned materials can aid language learning in typical populations. Loncke, Campbell, England, and Haley (2006) suggest that multimodality forms a solid basis for Augmentative and Alternative Communication. This does not mean, however, that multimodal communication is necessarily helpful for DHH children and children with SLI. Only a few studies have focused on multimodal learning in individuals with a hearing impairment or SLI and the results are often mixed, even within the same study (e.g., Dowaliby & Lang, 1999; Giezen, 2013), with a positive effect for some of the participants, but not for others.

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