

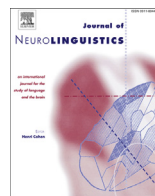


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# Vocabulary acquisition in aphasia: Modality can matter

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### ABSTRACT

The present case study investigated modality-specific aspects of novel word acquisition in aphasia. It was prompted by recent aphasia case studies indicating great interindividual variability in the ability to learn and maintain novel words in aphasia. Moreover, two previous case studies revealed a striking effect of input modality by showing effective word learning and re-learning via visual input only (Kohen, Sola, Tuomiranta, Laine, & Martin, 2012; Tuomiranta et al., 2014). The present participant TS with chronic nonfluent aphasia and post-semantic anomia was administered novel word–referent learning tasks. In the first experiment, the learning phase included simultaneous phonological and orthographic input, while the follow-up was probed separately for spoken and written responses. In the second experiment, we studied the effect of four different input and output modality combinations on her ability to learn to name the novel items. In the first experiment, TS's spoken naming performance during the learning phase was just within the range of healthy controls. Maintenance declined and remained outside that range during the whole 6-month follow-up. However, TS maintained the learned words better in written than in spoken naming throughout the follow-up, and in written naming, her maintenance stayed within the control's range up to 8 weeks post-training. The second experiment indicated that the best learning outcome was achieved

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with orthographic input. Orthographic input combined with orthographic output resulted in fast and accurate learning of the novel words. Interestingly, TS's test profile was opposite to her learning profile, as she repeated better than she read aloud in the linguistic background assessment. The results from the present case highlight the importance of multiple learning channels for word acquisition in individuals with aphasia. Probing the functionality of different input and output channels for learning may also prove valuable in tailoring effective treatment for persons with aphasia.

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## 1. Introduction

Anomia is one of the most frequent symptoms in aphasia and consequently a significant target in treatment (Laine & Martin, 2006, p. 1; Nickels, 2002). In spite of extensive research on naming disorders, surprisingly little attention has been directed to the role of word learning ability in recovery and treatment. Basso, Marangolo, Piras, and Galluzzi (2001) suggested that novel word learning in healthy individuals can be compared to re-establishing access to familiar words in aphasia (see also Breitenstein, Kamping, Jansen, Schomacher, & Knecht, 2004). They also drew parallels between the most effective modes of word learning and re-learning. In their study, the same orthographic learning method that allowed for the most effective learning in the healthy population, also promoted the best word re-learning in the aphasic individuals. To our knowledge, only one aphasia study has made a similar comparison of learning vs. re-learning modes within an individual with aphasia (Tuomiranta et al., 2014). The present case study relates to these issues by focusing on the significance of the input/output channels for acquisition of novel active vocabulary in aphasia.

The capacity for lexical acquisition can be probed with novel word learning tasks, and if these consist of unfamiliar words and unfamiliar referents, it can be argued that they provide a relatively pure measure of the functionality of word learning mechanisms. Learning words that have never belonged to one's vocabulary requires that the learner establishes representations for a novel word form and its referent as well as a link between them. Furthermore, the novel representations need to be stored, integrated with other entries in long-term memory, and be accessible when needed for language performance (e.g. production) (Laine & Salmelin, 2010). The Complementary Learning Systems model (CLS; O'Reilly & Norman, 2002) provides a neurocognitive framework for word learning by relating it to an interaction of cortical and subcortical (especially hippocampal) structures. According to the CLS model, in the initial phase of learning, temporary associations are rapidly created between referents and their corresponding names. These associations are established as episodic memory traces in the hippocampus. For long-term maintenance of these associations, these temporary memory traces have to be consolidated and integrated with other contents in the declarative memory cortically. In contrast to novel word learning, which must be based on brain systems for lexical acquisition, re-learning of lost but familiar words in aphasia may present a mix of novel learning and priming based on re-activation/re-linking of representations that still exist but are inaccessible. Thus, while it is natural enough for anomia treatment studies to focus on familiar vocabulary, it can be more difficult to determine what mechanisms are involved in those studies.

To date, there is a large body of anomia treatment research conducted with familiar words (for a review, see e.g. Laine & Martin, 2006; and the *Academy of Neurologic Communication Disorders and Sciences Aphasia Treatment Website*, <http://aphasiatx.arizona.edu>). In addition, there is limited evidence that some individuals with chronic aphasia retain an ability to learn totally novel active vocabulary (e.g. McGrane, 2006, also reported in Kelly & Armstrong, 2009; Tuomiranta et al., 2011; 2014; Tuomiranta, Rautakoski, Rinne, Martin, & Laine, 2012). One method for probing novel word learning

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