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Source monitoring and associative structure

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ABSTRACT

Paired associates were used to study source memory. In three studies each word of the pairs was presented in one of the four locations of a two by two array. An event code explanation of memory representation, based on the hierarchical propositional network of Anderson and Bower (1974), was used to explain two seemingly paradoxical results: (a) Location identification of the cue word depended on successful target recall, and (b) source memory for the cue and target words was the same. Furthermore, the creation of an event code in memory can explain why the source locations of unrecalled target words were identified above chance level. This explanation seems preferable to a word code explanation in which source information for each item is attached to itself and also to the other item in the pair. It is suggested that the event code explanation may also play a role in accounting for source identification without recognition.

Introduction

It is as important to remember details of an event, such as its time or place, as it is to remember the event itself (Johnson, Hashtroudi, & Lindsay, 1993; Johnson & Raye, 1981, 1998). How source information is remembered has been the focus of intensive research. Moreover, the assessment of source-monitoring performance has typically occurred in conjunction with the testing of recognition memory. This is true in the studies of the neuroscience of source monitoring (Mitchell & Johnson, 2009) and in the development of mathematical models of source monitoring (Banks, 2000; Batchelder & Riefer, 1990; Glanzer, Hilford, & Kim, 2004; Rotello, Macmillan, & Reeder, 2004), as well as in multiple-item paradigms such as the associative recognition task (Achim & Lepage, 2003; Hockley, 2008), where pairs of items are presented followed by a recognition test of the complete pairs. Researchers have generally assumed source information to be stored in memory at the item level. If an item is not recognized, then its contextual information cannot be remembered. Thus, source-identification tests have been accompanied by recognition tests with source identification assumed to be contingent on successful recognition.

But source information in memory about real events is not typically accessed by another presentation of that event. By the predominant use of the recognition paradigm we may have unintentionally limited our knowledge of the learning and retention of source information. Because real events are typically assembled from contiguous but often unrelated features of an experience, source information must often be remembered when only some aspect of the event is referred to in a test query. For example, the sparse question "How was your vacation?" can result in a variety of information being remembered, including source and context information. Consequently, for the successful identification of source information the components of each event must have first been bound together in memory (Chalfonte & Johnson, 1996). Our results presented below suggest this to be the case.

Paired associates learning is rarely used in source monitoring experiments. (For exceptions see Bröder, 2009;

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Cook, Marsh, & Hicks, 2006.) In our preliminary studies using a paired-associates learning task, the two words of each presented pair occupied two locations in a 2×2 matrix, as shown in Fig. 1. The words used represented concrete objects, and participants were told to try to create a visual image combining the words. Later, when one of the items was presented as the cue word, the participants had to recall the other word, the target word. They also had to identify the original location of each word in the pair.

Word pairs, of course, are not complex events; but the recall of an ensemble of information before making a source judgment is more difficult than simply recognizing a single word. Because of the prevailing belief that an individual word is the locus and effective cue for its source information in memory, we expected to find more source information remembered for cue words than for target words. We assumed that a cue word could elicit its source information during each recall test, but that a target word had to be recalled before its location could be identified. To our surprise, we found in preliminary studies that successful source identification of a cue word was greatly dependent on recall of its corresponding target word. Secondly, it appeared that levels of source monitoring performance for the cue word and the target word were identical. These two results have implications about how source information is stored in episodic memory.

The phenomena of interest we describe here represent the *less than expected* source identification of the cue words of studied pairs compared to the source identification of the target words, which are much less available. In our studies every cue word was available at test, but only about half of the target words were, namely, only those that could be recalled. Thus, with regard to source identification there were approximately twice as many presented cue words present as test items as there were target words.

When source information is identified better than expected

There is another result reported in the research literature that may be related to those focused upon here. This phenomenon involves the *greater than expected* source identification of studied items that have not been recognized or recalled (e. g., Starns & Hicks, 2008; Starns, Hicks, Brown, & Martin, 2008). For example, using a paired-associates paradigm, Cook et al. (2006) found that under certain conditions the sex of the voice presenting an item could later be identified, even when the test item itself was not recalled. Ball, DeWitt, Knight, and Hicks (2014), using extra-list cues semantically related to unrecognized test items, found that the rating task previously used to evaluate an item could be identified at a level greater than expected by guessing. Other authors have also demonstrated this phenomenon of source identification without recognition (e. g., Kurilla & Westerman, 2010).

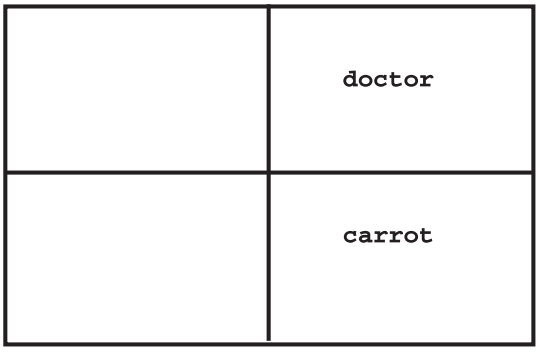

Fig. 1. Example of words in a pair and their source locations.

A common explanation of the nature of source memory is that the representation of the word in memory becomes associated with information indicating that the word was presented during the experiment. Various types of source information, such as time of occurrence, location, type font, or sex of speaker's voice may become associated as information tags (Quillian, 1968) to the representation of the word. We refer to this as the word-code explanation. According to this view, a participant may be able to retrieve temporal information for an item from memory, but not be able to retrieve location information. That is, recognition of the word may occur but not the retrieval of other source information. Similarly, location information may be retrieved but not temporal information. In this latter situation the item may not be recognized but other source information may be retrieved.

Some types of source information may be remembered and not others because in the word-code explanation of source memory each word is made up of features which may be selectively activated and used in associations (Anisfeld & Knapp, 1968). Hence, semantic components of the word provide context to be associated to co-occurring information. A similar mechanism generating associations rather than features has been labeled by Underwood (1965) as implicit associative responses. These types of generated context can act as a mediator for the source information. That is, different types of source information may become associated to different aspects of the generated context. Context information may be inadequate to support the recognition of an item but may be able to retrieve enough information from memory to identify source information associated with the item. For a further discussion of this explanation of source information without recognition or recall see Cook et al. (2006) and Ball et al. (Figs. 1–5 and 2014).

Word code explanation

The word code explanation can be applied to the paired associates paradigm used here. One possible version of the word code explanation is diagrammed in Fig. 2. The Link *a* in memory associates the two words in the pair. Because participants do not know which word will be the test cue, during presentation participants may bind the source information of each word to both items of the pair. Link $x1$ binds source information about the location of the cue to the cue word, and Link $y1$ binds source information about the target word to the cue word. Similarly Links $x2$ and $y2$ bind source information about the two words to what will be the target word. Thus, regardless of which item is the cue, recall of the other item plus source information for both items can be retrieved. In this word code