



The metamemory approach to confidence: A test using semantic memory

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ABSTRACT

The metamemory approach to memory confidence was extended and elaborated to deal with semantic memory tasks. The metamemory approach assumes that memory confidence is based on the products and processes of a completed memory task, as well as metamemory beliefs that individuals have about how their memory products and processes relate to memory accuracy. In two experiments participants were asked deceptive and nondeceptive questions involving geographical information. In both experiments, as predicted by the metamemory approach to memory confidence, there was a positive confidence/accuracy relationship for nondeceptive items and a negative relationship for deceptive items. Experiment 2 used items that constrained the memory strategies (e.g., hierarchical reasoning about spatial location) used by the participants. The results supported the hypothesis that the participants were aware of the levels of memory accuracy associated with the different strategies and used that information to generate their memory confidence judgments.

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Introduction

The study of *metamemory*, the knowledge individuals have about the operation of their memory, has grown rapidly in recent years (Dunlosky, 2004; Dunlosky & Metcalfe, 2009; Koriat, 2002; Metcalfe, 2000; Metcalfe & Shimamura, 1994; Nelson & Narens, 1990; Schwartz, 1994). Much of this work has been focused on the prospective metamemory judgment of *feeling of knowing* – the ability of individuals to predict that they will recognize an item after a recall failure (see Nelson and Narens (1990) and Schwartz (1994) for reviews). In this paper, however, we focus on the retrospective metamemory judgment of *confidence* and its underlying mechanisms. We believe that confidence judgments are essential in everyday life because they are used to decide whether actions should be carried out. For example, *Should I knock on the door of this house without checking*

the address? Should I cite the year of this reference without looking it up? Should I go over and greet that familiar looking person? In this paper we extend our previous accounts of confidence for episodic memory tasks (Brewer & Sampaio, 2006; Brewer & Sampaio, submitted for publication; Brewer, Sampaio, & Barlow, 2005; Sampaio & Brewer, 2009) to cover semantic memory.

Much of the research involving memory confidence has focused on special aspects of the problem of the relationship between confidence and accuracy. For example, there is a substantial literature on confidence in eyewitness memory (Bothwell, Deffenbacher, & Brigham, 1987; Read, Lindsay, & Nicholls, 1998; Sporer, Penrod, Read, & Cutler, 1995), but these experiments have rarely been directed at underlying mechanisms of confidence. Instead, they have been designed to provide insights into the unique forensic tasks involved in eyewitness memory. In the area of judgment and decision making there has also been a number of studies of memory confidence; however, this work has been directed at the specific issue of the calibration of confidence and accuracy (e.g., Fischhoff, 1982; Lichtenstein & Fischhoff, 1977). The focus of laboratory

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studies of confidence within cognitive psychology has been to study the strength of the relationship between confidence and accuracy for episodic memory tasks (Mandler & Boeck, 1974; Murdock, 1965; Perfect & Hollins, 1996; Tulving & Thomson, 1971) and for semantic memory tasks (Costermans, Lories, & Ansay, 1992; Nelson, McSpadden, Fromme, & Marlatt, 1986; Perfect, Watson, & Wagstaff, 1993).

In the area of metamemory the focus of theoretical work has been on developing theories of the *feeling of knowing* phenomenon (e.g., Koriat, 1993; Koriat, 1995; Nelson & Narens, 1990). There have been very few attempts to develop general theories of memory confidence. The most impressive and detailed theoretical work carried out so far has been that by Koriat (2008), Koriat (2012) and Koriat and Goldsmith (1996) to extend his earlier accounts of feeling of knowing (Koriat, 1993; Koriat, 1995) to provide an account of confidence judgments for answers to general information questions.

Metamemory theory of confidence

Many of the studies involving memory confidence have shown a positive relationship with memory accuracy, and we believe that a theory of confidence must explain how individuals who no longer have access to the original event that created the memory can generate judgments that successfully predict the accuracy of their memories for the original event. We have been developing an approach to this core problem (Brewer & Sampaio, 2006; Brewer & Sampaio, submitted for publication; Brewer et al., 2005; Sampaio & Brewer, 2009), and although we sometimes refer to it as a “theory,” the approach might better be thought of as a “framework” in which to study memory confidence given the relatively early stages of our understanding of memory confidence.

Our overall goal is to develop a general account of the processes and mechanisms that underlie judgments of memory confidence. More specifically we would like to provide an explanation of how a metamemory judgment of confidence can often successfully predict memory accuracy. Our theoretical approach is to develop an integrated framework which can make sense of our own data and of other findings about memory confidence that are in the literature. Our approach is consistent with the philosopher William Whewell's arguments (1847/1967) that *consilience* across different types of findings lends strong support to a scientific theory. Our specific research strategy is to carry out experiments across a wide range of laboratory tasks and attempt to show that our framework can account for them (i.e., that the framework shows *consilience*).

The core of the metamemory theory of confidence is the assumption that confidence is based on the products (e.g., an image) and processes (e.g., use of recall) of the just completed memory operation, along with a set of metamemory beliefs (e.g., the belief that recollective recalls tend to be accurate) about how these memory products and processes relate to memory accuracy (cf. Robinson, Johnson, & Robertson, 2000, for a thoughtful discussion of the use of products and processes in the area of eyewitness memory). The theory is called the *metamemory theory of*

confidence because it contains an explicit metamemory component consisting of beliefs (in long-term memory) about the relationship of the products and processes to memory accuracy which are used to generate confidence judgments. Our approach can be seen as a form of attribution theory (e.g., Jacoby, Kelley, & Dywan, 1989; Kelley & Lindsay, 1993), since we assume that individuals use information about products and processes of the completed memory task along with their metamemory beliefs about how these are related to memory accuracy to generate confidence judgments.

Current theories of metamemory are frequently divided into three basic types: *direct access theories*, *familiarity based theories*, and *accessibility theories* (Dunlosky, 2004; Metcalfe, 1996; Metcalfe, 2000; Schwartz, 1994). Although these classes of theories are often considered to be in competition with each other, our overall framework includes constructs that are consistent with each of these approaches to metamemory. The *direct access component* is made explicit in the assumption that confidence is judged using information coming from a completed memory operation (e.g., having an image; producing a complete recall). Direct access, although rejected by many researchers (e.g., Dunlosky, 2004; Koriat, 2002; Schwartz, 1994) as an account of feelings of knowing judgments, seems a more plausible theoretical approach when applied to the retrospective judgment of confidence where the memory operation has occurred before the metamemory judgment is carried out. This order of events allows the individual making the confidence judgment direct access to phenomena such as the vividness of a recollective image or the completeness of a recall. The *familiarity component* in the metamemory approach is evident in the assumption that familiarity with information in the question is one of many types of information that individuals use to generate confidence. Finally, an *accessibility component* is postulated to deal with recall tasks, in which the occurrence of a fluent, complete response is assumed to be the major factor contributing to confidence judgments (e.g., Brewer et al., 2005). Thus, the metamemory theory of confidence cuts across the theoretical divisions in metamemory research and, in fact, makes explicit use of theoretical mechanisms from each of the three major classes of metamemory theories.

Multiple mechanisms

Our framework is intended to be general enough to cover all memory tasks. However, there is an aspect of our approach that we have not made as explicit as we should have in our past accounts. We believe that different memory mechanisms are needed for different memory tasks (e.g., using recollective recall in responding to a sentence recognition task or using a hierarchical reasoning strategy in responding to a semantic memory question in the domain of geography). Thus for a particular memory task it is necessary to discover what products and processes are involved and then to work out what metamemory beliefs about memory accuracy are typically associated with these products and processes. Finally, after establishing the degree of validity of the metamemory beliefs, an account of

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