Retrieving autobiographical memories: How different retrieval strategies associated with different cues explain reaction time differences

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ABSTRACT

Previous research has shown that memories cued by concrete concepts, such as objects, are retrieved faster than those cued by more abstract concepts, such as emotions. This effect has been explained by the fact that more memories are directly retrieved from object versus emotion cues. In the present study, we tested whether RT differences between memories cued by emotion versus object terms occur not only because object cues elicit direct retrieval of more memories (Uzer, Lee, & Brown, 2012), but also because of differences in memory generation in response to emotions versus objects. One hundred university students retrieved memories in response to basic-level (e.g. orange), superordinate-level (e.g. plant), and emotion (e.g. surprised) cues. Retrieval speed was measured and participants reported whether memories were directly retrieved or generated on each trial. Results showed that memories were retrieved faster in response to basic-level versus superordinate-level and emotion cues because a) basic-level cues elicited more directly retrieved memories, and b) generating memories was more difficult when cues were abstract versus concrete. These results suggest that generative retrieval is a cue generation process in which additional cues that provide contextual information including the target event are produced. Memories are retrieved more slowly in response to emotion cues in part because emotion labels are less effective cues of appropriate contextual information. This particular finding is inconsistent with the idea that emotion is a primary organizational unit for autobiographical memories. In contrast, the difficulty of emotional memory generation implies that emotions represent low-level event information in the organization of autobiographical memory.

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1. Introduction

The concreteness effect refers to the finding that words representing concrete concepts (e.g. book, chair) are processed and recognized faster than words representing more abstract information (e.g. freedom, intelligence) in many different cognitive tasks, such as reading, naming, priming, word association, lexical decision, and laboratory memory tasks (Bleasdale, 1987; Bransford & McCarrell, 1974; DeGroot, 1989; Holcomb, Kounios, Anderson, & West, 1999; Kieras, 1978; Kounios & Holcomb, 1994; Levy-Drori & Henik, 2006; Paivio, 1986, 1991; Richardson, 2003; Schwanenflugel, 1991; Schwanenflugel & Shoben, 1983; Strain, Patterson, & Seidenberg, 1995; West & Holcomb, 2000; Whaley, 1978). These studies demonstrate that concrete words are processed faster than abstract words because concrete information has more contextual (Schwanenflugel & Shoben, 1983; contextual availability theory) and pictorial (Paivio, 1986; dual-coding theory) support than abstract information.

A concreteness effect has also been observed in memory for real-life events. For example, many autobiographical memory researchers

(Anderson & Conway, 1993; Berntsen & Rubin, 2002; Brown & Schopflocher, 1998a,b; Conway, 1990; Conway & Bekerian, 1987; Fitzgerald, 1980; Fitzgerald & Shifley-Grove, 1999; Larsen & Plunkett, 1987; Robinson, 1976; Rubin, 1982, 2000; Rubin & Berntsen, 2003; Rubin & Schulkind, 1997a,b; Schlagman, Kliegel, Szhulz, & Kvavilashvili, 2009; Schlagman & Kvavilashvili, 2008; Wagenaar, 1986) have used cue word methods to study retrieval of autobiographical memories. In these studies, the nature of the cues presented to participants was manipulated, and the time required to retrieve cue-related personal memories was measured. Some of these studies compared memories cued by concrete concepts, such as object names (e.g., BOOK), to more abstract concepts, such as emotion labels (e.g., HAPPY; Conway & Bekerian, 1987; Fitzgerald, 1980; Larsen & Plunkett, 1987; Robinson, 1976; Uzer et al., 2012), and demonstrated that concrete terms lead to faster retrieval than abstract terms.

The *ease-of-retrieval account* (Conway & Bekerian, 1987; Larsen & Plunkett, 1987; Robinson, 1976) is commonly used to explain RT differences between emotion-induced memories and memories cued by object names. The ease-of-retrieval account is based on two assumptions: 1) autobiographical memories are mostly generated, and 2) generation is easiest when concrete cues access related memories compared to abstract cues, such as emotional states, that must be reframed or

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elaborated on before related memories can be accessed. In other words, retrieving memories in response to emotional cues take longer than retrieving memories in response to object names because generating memories in response to emotion cues is more difficult and time consuming than generating memories in response to object cues (Conway & Bekerian, 1987; Larsen & Plunkett, 1987; Robinson, 1976).

Recently, Uzer et al. (2012) proposed an alternative *dual-strategies approach* to explain RT differences in cued-retrieval studies. The dual-strategies approach agrees that autobiographical memories are sometimes generated. However, it also proposes that autobiographical memories can be directly retrieved, and that direct retrieval is much more common than previously suggested. The dual-strategies approach also argues that average RTs are a frequency-weighted blend of both fast responses, which occur when a memory is directly recalled, and slow responses, which occur when generation is required.

In three experiments, Uzer et al. (2012) decomposed this cue-type effect by showing that participants used more direct retrieval when they were cued with objects than when they were cued with emotions. They concluded that a) the prevalence of directly retrieved memories in cue-word tasks along with those retrieved involuntarily in real-life (Ball & Little, 2006; Berntsen, 1996, 1998, 2007, 2009, 2010; Berntsen, Staugaard, & Sørensen, 2013; Rasmussen & Berntsen, 2011; Rasmussen, Ramsgaard, & Berntsen, 2015; Berntsen & Hall, 2004; Mace, 2005, 2006, 2007, 2010; Schlagman & Kvavilashvili, 2008; Schlagman, Kvavilashvili, & Schulz, 2007; Staugaard & Berntsen, 2014) imply that event memories are mostly pre-stored and b) event memories are more likely to be indexed by concrete information than abstract concepts, such as feelings. At the same time, this research suggests that generative retrieval is an additional cue generation process in which the person search for another cue or set of cues that would trigger one of these pre-stored event representations (Addis, Knapp, Roberts, & Schacter, 2012; Conway, 2009; Morton, Hammersley, & Bekerian, 1985; Norman & Bobrow, 1979; Uzer et al., 2012; Uzer & Brown, under review; Whitten & Leonard, 1981; Williams & Hollan, 1981).

Reiser, Black, and Abelson's (1985) *directed search model* also proposes a similar cue generation process for retrieving autobiographical memories. This model is based on the idea that retrieval is more like a re-understanding process, and when people retrieve an event, they first find a context that includes the target event, and then specify features that discriminate the target event from other experiences in that context. Based on verbal protocol data collected from Yale undergraduate students, Reiser et al. (1985) showed that activities are primary search contexts, because they include most of the information required to retrieve appropriate information. Similarly, Williams and Hollan (1981) described three steps in retrieving specific memories: 1) finding a context, 2) searching within the context, and 3) verifying. Williams and Hollan (1981) proposed that when retrieving an event or object, people first try to find possible contexts (e.g. activity, location) associated with the provided cue. Once they come up with a context, they continue to search for additional information within that context, and finally they verify whether the recovered information is appropriate or not. According to Williams and Hollan (1981), retrieval follows this cycle until the person finds an appropriate response.

There are also other retrieval models which propose that retrieval consists of three iterative stages (Burgess & Shallice, 1996; Conway & Pleydell-Pearce, 2000; Norman & Bobrow, 1979; Williams et al., 2007). In the first stage, a retrieval cue is elaborated; in the second stage, relevant information is accessed from long-term memory; and in the final stage the retrieved information is evaluated to decide whether it satisfies current task demands. If it does not fulfill the demands, a second cycle is initiated to generate new set of cues.

Uzer and Brown (under review) argue that each event we experience is composed of some basic components (e.g., the person, location and object of the event) and that each event is represented by a node in which each core component is combined together. Each event node is also indexed by these event components (see Barsalou, 1988;

Brown, Hansen, Lee, Vanderveen, & Conrad, 2012; Conway, 2009; Linton, 1986; Morton et al., 1985; Shimamura, 2014 for similar arguments). There is always some level of activation in an event node accumulating from the event components, or from other associated event nodes. Access to an event representation occurs when activation of the event node exceeds certain threshold (e.g., J.R. Anderson, 1993). For instance, when there is a match between the cue(s) in the environment and the encoded event, activation in the node exceeds threshold and involuntary retrieval occurs (Berntsen, 2012).

Within this framework, direct retrieval in a word cueing task can be considered as a process in which memory is accessed in the first cycle (see above). On the other hand, in generative retrieval, memories are recalled on subsequent cycles. Uzer and Brown (under review) used the term "generative" rather than "reconstructive" to describe these extended retrieval process. This was due to differentiate *cue generation approach* (Addis et al., 2012; Burgess & Shallice, 1996; Conway, 2009; Morton et al., 1985; Norman & Bobrow, 1979; Reiser et al., 1985; Uzer et al., 2012; Uzer & Brown, under review; Whitten & Leonard, 1981; Williams & Hollan, 1981) from the *constructive approach* (Conway & Pleydell-Pearce, 2000) in explaining memory generation. *Dual-strategies account* agrees with cue generation approach and argues that cues that will provide access to a pre-stored memory that meets the task requirements are produced during generative retrieval (Uzer & Brown, under review). In other words, direct retrieval and generative retrieval represent a continuum of a single retrieval process by which one of the pre-stored event representations are accessed with (i.e., generative retrieval) or without (i.e., direct retrieval) extra effort.[1]

Constructive approach, on the other hand, is different from the cue generation approach. Constructive view states that "autobiographical memories are not stored in long-term memory, but rather are constructed on the basis of knowledge sampled from the autobiographical knowledge base". According to constructive retrieval model, memories are "temporary or transitory mental representations that only exist in the context of some specific processing episode" (Conway, 1996, p. 76). On this view, "a specific autobiographical memory is a pattern of activation across the indexes of the autobiographical knowledge base conjoined with the retrieval model used to shape that pattern" (Conway & Pleydell-Pearce, 2000, p. 274). The indexes used to create the event representation and the ones retrieved during the extended search process are considered identical in this model. In other words, constructive approach defines an autobiographical memory as "all the knowledge accessed in a whole set of retrieval cycles" (Conway, 1996, p. 77). During these retrieval cycles, knowledge is accessed hierarchically from the autobiographical knowledge base which contains information at three levels of specificity (i.e., life-time periods, general events and event-specific knowledge (ESK); Conway & Pleydell-Pearce, 2000). In other words, when a cue is provided, it creates a pattern of activation which starts from a life-time period and ends in the associated ESK. Once this pattern of activation is established and meets the task demands, the target memory has been constructed.

The present study tested whether RT differences between memories cued by emotion versus object cues reflect not only the fact that object cues directly retrieve more memories (Uzer et al., 2012), but also differences in memory generation between responses to emotions and objects. Based on the *directed search model*, we argue that directing memory search based on affective features requires more steps than directing memory search based on other features (e.g. features associated with objects). This is because emotion indirectly refers to an action,

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[1] Note, some other retrieval models (e.g., directed search model, retrieval model proposed by Williams and Hollan) take cue generation approach and proposes that memory retrieval is more like a cue generation process in which people generate additional cues that provide contextual information to recall the target event rather than an event construction where memories are reconstructed by retrieving information from a hierarchically organized autobiographical knowledge base. Different from the dual-strategies account, these retrieval models do not acknowledge the existence of direct retrieval but assumes that memories are always generated on several cycles.