



Research report

Learning and using knowledge about what other people do and don't know despite amnesia



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ABSTRACT

Successful communication requires keeping track of what other people do and do not know, and how this differs from our own knowledge. Here we ask how knowledge of what others know is stored in memory. We take a neuropsychological approach, comparing healthy adults to patients with severe declarative memory impairment (amnesia). We evaluate whether this memory impairment disrupts the ability to successfully acquire and use knowledge about what other people know when communicating with them. We tested participants in a referential communication task in which the participants described a series of abstract “tangram” images for a partner. Participants then repeated the task with the same partner or a new partner. Findings show that much like healthy individuals, individuals with amnesia successfully tailored their communicative language to the knowledge shared with their conversational partner—their common ground. They produced brief descriptions of the tangram images for the familiar partner and provided more descriptive, longer expressions for the new partner. These findings demonstrate remarkable sparing in amnesia of the acquisition and use of partner-specific knowledge that underlies common ground, and have important implications for understanding the memory systems that support conversational language.

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Successful communication requires keeping track of what other people do and do not know, and how this differs from our own knowledge. In conversation, we store memorial representations of what information we know and that we know our conversational partner also knows. This mutually known information is termed *common ground*. For

communication to be successful we must distinguish what is common ground from information that we know but that our partner does not (Clark, 1992). Everyday language use relies on this distinction. For example, we tailor our language, providing more (to a colleague: *My favorite aunt Annie is here!*) or less background information (to my brother: *Annie's here!*),

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depending on how much common ground is held with one's communication partner (Brennan & Clark, 1996; Wilkes-Gibbs & Clark, 1992). Critically, what is common ground with one person may not be common ground with another person. Thus common ground must be bound in memory to specific partners.

Previous studies demonstrate that healthy young adults are sensitive to their current conversational partner's knowledge state and, when speaking, design utterances accordingly (Schober & Clark, 1989; Wilkes-Gibbs & Clark, 1992). A standard paradigm for examining these *audience design* processes (Clark & Murphy, 1982) is the referential communication task (Krauss & Weinheimer, 1966) in which a speaker describes a series of abstract images to a partner multiple times across a series of trials. The classic finding is that with repeated reference to the same images—and, critically, with the same partner—the speaker's referring expressions used to describe these images become more concise. These brief referring expressions are considered to be part of the communication partners' common ground. When talking to a new partner, speakers use longer, more descriptive expressions to accommodate the new partner's lack of knowledge. While this ability to bind common ground to specific conversational partners is well attested in healthy young adults (Brennan & Clark, 1996; Wilkes-Gibbs & Clark, 1992), little is known about how common ground is represented in memory (Brown-Schmidt & Duff, 2016). According to classic theories of language use, *episodic* (declarative) memory plays a central role in theories of common ground, as it allows us to query memory for events that we shared with specific individuals (Clark & Marshall, 1978). Here we describe the first direct test of the hypothesis that episodic memory underlies representations of partner-specific common ground by comparing healthy adults to adults with bilateral hippocampal damage and severe episodic memory impairment (amnesia). We evaluate whether amnesia precludes the ability to successfully form and use common ground when communicating.

Individuals with amnesia show dramatic impairment in acquisition of new episodic/declarative memories, including severe impairments in acquiring new knowledge of major events and details of their personal lives (Eichenbaum & Cohen, 2001). Notable are failures in acquiring novel arbitrary relations (e.g., stimulus and its location on screen; Konkel, Warren, Duff, Tranel, & Cohen, 2008) or orthographic word form and conceptual meaning; (Gabrieli, Cohen, & Corkin, 1988). Yet, remarkably, individuals with amnesia can

acquire novel referential labels in a communicative task where they describe abstract “tangram” images for a partner (Duff, Hengst, Tranel, & Cohen, 2006; Duff, Gupta, Hengst, Tranel, & Cohen, 2011; Duff, Hengst, Tranel, & Cohen, 2008; see Fig. 1 for example images). Thus, when supported by the infrastructure of a communicative task, and when the descriptions are self-generated and non-arbitrary (‘siesta man’ for image that looks like a person reclining), individuals with amnesia can acquire novel mappings between images and referential labels.

While Duff and colleagues interpreted these findings as evidence for formation of common ground, an alternative interpretation of this remarkable sparing of learning must be considered. The challenge is this: there is no direct evidence that individuals with amnesia did, in fact, form common ground with their partners. Instead, it is possible they acquired image-label mappings, but failed to associate the mappings as common ground with a specific partner. That is, for this learning to be considered common ground, the individuals with amnesia would need to also encode that the image-label mappings were associated with a specific communication partner. One reason to seriously consider this alternative interpretation comes from an analysis of *referential form* (Duff et al., 2011). Healthy comparison participants frequently used *definite* expressions like “the camel” after describing the same image several times with the same partner, whereas individuals with amnesia were significantly more likely to use *indefinite* expressions like “a camel”. This might have come about if the spared learning in amnesia reflected a change in how they viewed the image, as if it now looks like “a camel”. If so, this would reflect a very different type of representation than the one that allows a healthy person to know that both they and their discourse partner know the name of this particular image. Critically, while an impressive feat of learning for individuals with amnesia, a change in how the person with amnesia viewed the objects that was not bound in memory with the discourse partner would not constitute common ground.

Here we ask if common ground can be formed in the absence of episodic memory for newly experienced events. In the experiment, participants described a series of abstract tangram images multiple times with one partner, establishing brief referential labels for each image, e.g. “camel”, “ballet dancer”, et cetera. Then, participants continued the task for several more rounds with either the same partner, or a new partner. If individuals with amnesia can establish

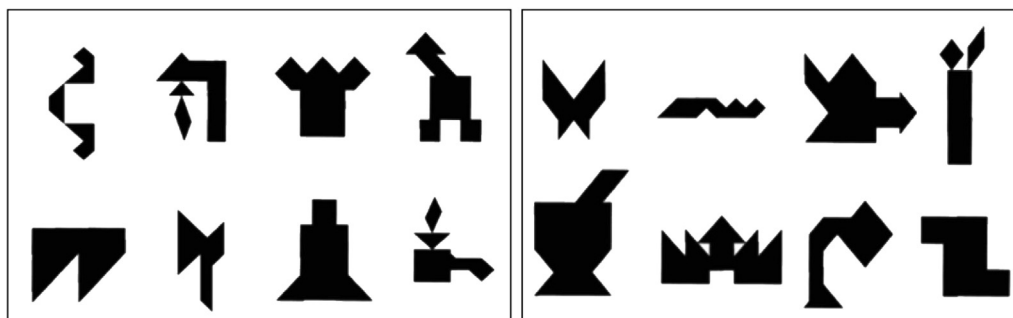


Fig. 1 – Example tangrams.

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