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# Cross-cultural differences in the neural correlates of specific and general recognition



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## ABSTRACT

Research suggests that culture influences how people perceive the world, which extends to memory specificity, or how much perceptual detail is remembered. The present study investigated cross-cultural differences (Americans vs East Asians) at the time of encoding in the neural correlates of specific versus general memory formation. Participants encoded photos of everyday items in the scanner and 48 h later completed a surprise recognition test. The recognition test consisted of same (i.e., previously seen in scanner), similar (i.e., same name, different features), or new photos (i.e., items not previously seen in scanner). For Americans compared to East Asians, we predicted greater activation in the hippocampus and right fusiform for specific memory at recognition, as these regions were implicated previously in encoding perceptual details. Results revealed that East Asians activated the left fusiform and left hippocampus more than Americans for specific versus general memory. Follow-up analyses ruled out alternative explanations of retrieval difficulty and familiarity for this pattern of cross-cultural differences at encoding. Results overall suggest that culture should be considered as another individual difference that affects memory specificity and modulates neural regions underlying these processes.

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## 1. Introduction

Although social differences across cultures have been well-established in the literature (e.g., Markus & Kitayama, 1991), more recent work indicates that culture can also pervade cognitive processes. Whether those differences solely result from social processes, such as nuances in self-concept as either a unique individual or as one tightly interconnected with others, or reflect other differences in attention and information processing is unknown. The present study

investigates how East Asians and Americans engage perceptual and memory systems during the encoding of detailed memories.

Cross-cultural cognitive research has converged around differences in perceptual processing, specifically that there are cross-cultural differences in object versus context processing. When viewing an image of a scene, Westerners typically engage more analytical processes (Nisbett, Peng, Choi, & Norenzayan, 2001), focusing on salient object information and details (Masuda & Nisbett, 2001), and engaging

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neural regions associated with object processing (Gutchess, Welsh, Boduroğlu, & Park, 2006) more than Easterners. On the other hand, Easterners typically favor field and contextual information, also known as holistic processing (Masuda & Nisbett, 2001). East Asians have been shown to allocate more attention to configural information than Americans (Miyamoto, Yoshikawa, & Kitayama, 2011), and this increases East Asians' awareness of changes when a configuration is expanded but slows their detection when a configuration is contracted (Boduroglu, Shah, & Nisbett, 2009). In contrast, Americans modulate object-processing regions more, consistent with analytical or local processing (Goh et al., 2007; Gutchess et al., 2006). As a result, East Asians typically use global information, such as overall resemblance when matching exemplars, rather than matching on the basis of particular features, and use spatial configuration of features (e.g., the space between eyes) more than Americans (Miyamoto et al., 2011).

Though research on the contribution of culture to memory is still a relatively new area of study (e.g., Chua, Chen, & Park, 2006; Gutchess et al., 2006; Wang, 2009; Yang, Chen, Ng, & Fu, 2013), one line of work that holds promise to advance our understanding is that of memory specificity, or the extent to which specific features of past experiences are retained in memory (Schacter, Gutchess, & Kensinger, 2009). Analyzing the details encoded into memory, as is also the case for source memory, goes beyond item memory in allowing for the identification of precise processes that are instantiated in encoding and retrieving information, rather than merely assessing differences in familiarity or memory strength. Thus, studying specific details in memory offers a window into how individuals from different cultures prioritize distinct aspects of their environments, shaping how they represent the world around them. For example, because Americans focus on objects and visual details, consistent with analytical processing (Masuda & Nisbett, 2001), they are better at remembering specific object features relative to other background information compared to East Asians (Millar, Serbun, Vadalía, & Gutchess, 2013). On the other hand, because East Asians focus on contextual information, consistent with holistic processing (Masuda & Nisbett, 2001), they do not recognize focal object details as well as Americans when objects are presented alone or in context against a background (Millar et al., 2013). East Asians produce more information-rich products, thus making the specific details less salient (Wang, Masuda, Ito, & Rashid, 2012). Although it may not be surprising that cultural identity can impact areas like self-relevant or autobiographical memory (see Huff, Ligouri, & Gutchess, 2015, for a review; Wang, 2006, 2009), this research suggests that culture could also shape how we remember seemingly objective information that is not explicitly related to our self-identity (Gutchess & Huff, 2016). In turn, culture can influence the ways in which we construct events and narratives. This would suggest that culture pervades memory at basic levels, having profound implications for how individuals may, as a function of culture, reconstruct highly distinct memories of complex events.

In a previous exploration of cross-cultural differences in memory specificity, Millar et al. (2013) used photo images of objects in a behavioral paradigm. Across 2 studies,

participants viewed familiar purchasable objects at encoding, with the item presented by itself on a blank background (Experiment 1) or against a meaningful background context (Experiment 2). Items were drawn from pairs that shared the same verbal label (e.g., ice cream cone) but differed in visual details (e.g., size, shape, number, orientation, etc.). After a 48-h delay, participants were tested on objects and asked to respond whether items were the “same” (exactly the same as an object previously seen), “similar” (similar to an object previously seen but slightly different), or “new” (a completely new object). Results revealed a significant culture by memory type interaction, driven by the fact that Americans performed better than East Asians at specific memory both when objects were presented alone and when they were presented in context against a background. Further, there were no group differences in general memory. This research suggests that, although general memory is equivalent across cultures, cross-cultural differences in feature analysis impact specific memory. Americans remember more specific focal object details than East Asians, which reflects a discrepancy in what type of information is prioritized in information processing across cultures. Previously, quantities of memory have largely been a focus of memory research across cultures. The present line of work, building on the findings by Millar et al. (2013), investigates the qualities of memories, or the richness of the details represented in memory, reflecting cultural differences in processes invoked during the episodic encoding of complex information.

Given the dearth of cross-cultural research on memory, particularly studies using neuroimaging methods, there is still a large gap in the literature regarding which neural regions underlie cross-cultural differences in specific and general memory. There are 2 ways in which fMRI can help to advance understanding on this issue. First, it is difficult to isolate encoding from retrieval processes using behavioral methods. Whereas it has been assumed that cultural differences in what information is attended to at encoding may lead to differences in memory specificity (Millar et al., 2013), this possibility can be tested by examining the neural regions engaged at the time of encoding that lead to the successful formation of detailed memories. Second, fMRI can help to identify which processes are affected by culture. It is largely unknown whether culture affects the engagement of both perceptual and memory regions as implicated in the memory literature (e.g., Ritchey, Wing, LaBar, & Cabeza, 2012; Slotnick & Schacter, 2006). Specific candidate regions that may be affected by culture include the hippocampus and fusiform gyrus, as prior work has established their role in forming detailed memories. The hippocampus has been shown to contribute to actively binding feature information and details during encoding (e.g., Davachi, Mitchell, & Wagner, 2003; Kensinger & Schacter, 2006; Mitchell, Johnson, Raye, & D'Esposito, 2000). The more details or information to be remembered, the more the hippocampus is engaged at encoding (e.g., Gutchess & Schacter, 2012). Extant research has shown that the fusiform generally responds to perceptually complex stimuli and shows an attenuated neural response when the same item is re-presented (Joseph & Gathers, 2003). It has also been suggested that the left and right fusiform may differ in their roles during encoding of visual stimuli, and that

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