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Cross cultural differences in unconscious knowledge

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ABSTRACT

Previous studies have indicated cross cultural differences in conscious processes, such that Asians have a global preference and Westerners a more analytical one. We investigated whether these biases also apply to unconscious knowledge. In Experiment 1, Japanese and UK participants memorized strings of large (global) letters made out of small (local) letters. The strings constituted one sequence of letters at a global level and a different sequence at a local level. Implicit learning occurred at the global and not the local level for the Japanese but equally at both levels for the English. In Experiment 2, the Japanese preference for global over local processing persisted even when structure existed only at the local but not global level. In Experiment 3, Japanese and UK participants were asked to attend to just one of the levels, global or local. Now the cultural groups performed similarly, indicating that the bias largely reflects preference rather than ability (although the data left room for residual ability differences). In Experiment 4, the greater global advantage of Japanese rather English was confirmed for strings made of Japanese kana rather than Roman letters. That is, the cultural difference is not due to familiarity of the sequence elements. In sum, we show for the first time that cultural biases strongly affect the type of unconscious knowledge people acquire.

1. Introduction

Nisbett and colleagues have been arguing for the last couple of decades that one's cultural background can profoundly affect cognitive processes (e.g. for reviews see Nisbett, 2003; Nisbett & Miyamoto, 2005; Nisbett, Peng, Choi, & Norenzayan, 2001). Specifically, Asians compared to Westerners take a more global rather an analytic perspective, being especially sensitive to context in conscious perception, memory, reasoning and social attributions, with Westerners often having the reverse tendency. For example, Masuda and Nisbett (2001) presented Japanese and Americans with underwater scenes. In a subsequent recognition test, Japanese recognized previously seen objects more accurately when they saw them in their original settings rather than in novel settings, whereas this manipulation had relatively little effect on Americans. Japanese tended to pay attention to the scene globally, whereas Americans focused more on foreground objects. Chua, Boland, and Nisbett (2005) found that in viewing natural scenes Americans made more saccades to focal objects than Chinese, and Chinese made more saccades to background objects than did Americans, indicating a fundamental attentional basis to the global-analytic differences between the cultures. Indeed, in ERP studies, Lewis, Goto, and Kong (2008) found in ERP studies that the cross cultural differences in attention emerge as early as 300 ms after stimulus onset.

A wealth of studies have investigated cross cultural differences in conscious processing, showing consistent

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medium to large effects for global/analytic differences. However, the question of whether unconscious processes are affected by culture remains unanswered. When exposed to structure in an environment, we can acquire unconscious knowledge of that structure, a process Reber (1967, 1989) called "implicit learning". Reber argued that some minimal level of attention was needed for implicit learning to occur (cf Jiménez & Méndez, 1999; Rowland & Shanks, 2006; Turk-Browne, Jungé, & Scholl, 2005; Whittlesea & Dorken, 1993). Thus, one might expect different attentional preferences in different cultures to lead to acquiring unconscious knowledge of different types of structures. We will test this claim using the artificial grammar learning paradigm.

Reber (1967) introduced the artificial grammar learning paradigm to investigate implicit learning. In the artificial grammar learning paradigm, people are exposed to strings of letters that, unbeknownst to participants, are generated by an artificial grammar. People are then informed of the existence of a set of rules and asked to classify new strings as rule governed or not. After 5–10 min exposure to grammatical strings people can typically classify new strings about 65% correct on average, showing people have acquired knowledge of the structure of the grammatical strings.

Dienes and Scott (2005) showed that knowledge of the structure of the training strings in artificial grammar learning can be unconscious (though for an alternative perspective see e.g. Shanks, 2005). In the test phase, after each classification, people indicated the basis of their classification judgment: A pure guess, it had no basis; intuition, it had a basis but they had no idea what it was; a rule or rules they could state if asked; or a memory of a training string or strings that the test string was similar to. Unconscious knowledge, on the approach adopted by Dienes and Scott, is knowledge one is not aware of; i.e. the conscious-unconscious distinction is taken to be a meta-cognitive one (as per the higher order theories of Dienes, 2008; Rosenthal, 2005, or Cleeremans, 2008). Thus, to establish the conscious status of knowledge, one has to determine the person's ability not just to say how the world is (e.g. whether a stimulus is present, whether a string is grammatical), but the person's ability to determine what mental state they are in. For the guess and intuition attributions, people are not aware of the structural knowledge underlying the judgment, so structural knowledge is on the face of it unconscious; for the rules and memory attributions, structural knowledge is conscious. (Scott & Dienes, 2008, 2010a, 2010b, later separated the memory attribution into familiarity, i.e. the string feels overall familiar or unfamiliar for reasons one does not know: unconscious structural knowledge, from recollection: conscious structural knowledge). Dienes and Scott (2005) showed that people largely gave guess and intuition attributions, and when they did so, they classified at above baseline levels. That is, the artificial grammar learning paradigm apparently involves the acquisition of largely unconscious knowledge. But of course, participants may not give attributions in a way that reflects underling knowledge types. Crucially, when structural knowledge was separated into conscious (rules and memory) and unconscious (guess and intuition), searching for rules and dividing attention at test affected the accuracy of conscious structural knowledge but not unconscious structural knowledge, providing evidence for the validity of the attributions for determining the conscious status of structural knowledge. That is, the attribution method appears to identify a real divide in nature, separating out knowledge qualitatively different in ways expected based on theory- an outcome that could not be guaranteed just based on the face validity of the measures nor ruled out just based on their subjective nature (see e.g. Dienes, 2008, 2012, for other evidence and discussion).

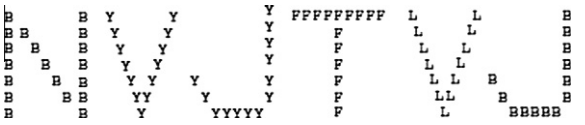

Fig. 1. An example of GLOCAL strings.

Tanaka, Kiyokawa, Yamada, Dienes, and Shigemasu (2008) showed how global vs local attention could be separated in the artificial grammar learning paradigm. They used "GLOCAL" strings (an example is shown in Fig. 1) which are chains of compound letters (Navon, 1977, 2003). A compound letter represents one large letter (i.e., a global letter) composed of a set of small letters (i.e., local letters). A critical feature of this stimulus is that while a GLOCAL string can be read as one string at the global level (NVJTVJ in Fig. 1), it can also be read as another string at the local level (BYYFLB in Fig. 1). Tanaka et al. used GLOCAL strings to investigate the role of selective attention in implicit learning. They found that when people were instructed to attend at one particular level (global or local), they learned the grammar at that level, but not at the unattended level, confirming Reber's claim of a minimal amount of attention needed for implicit learning (cf Eitam, Schul, & Hassin, 2009). Here we use GLOCAL strings for a different purpose: To explore cross cultural differences in implicit learning. Because selective attention plays an important role in implicit learning, we hypothesized that cultural differences in attention would thus affect implicit learning: Asians would learn from the global more than the local level, whereas Westerners would show a reverse or neutral bias. To determine the conscious status of the knowledge people acquired, we used the structural knowledge attributions of Scott and Dienes (2008, 2010a, 2010b).

2. Experiment 1

We modified the instructions used by Tanaka et al. (2008) in the learning session. In Tanaka et al., attention was directed to a particular level by asking the participants to write down the string at the global or local level during presentation. In the present study we wanted cultural biases to determine where attention was directed, so participants were not asked to attend to any particular level. In Experiment 3 we directed attention to just one level.