



Conscious and unconscious thought in artificial grammar learning

Andy David Mealor^{*}, Zoltan Dienes

School of Psychology, University of Sussex, Falmer, Brighton BN1 9QH, UK

Sackler Centre for Consciousness Science, University of Sussex, Falmer, Brighton BN1 9QH, UK

ARTICLE INFO

Article history:

Received 28 September 2011

Available online 1 April 2012

Keywords:

Implicit learning

Unconscious thought

Subjective measures

Artificial grammar learning

ABSTRACT

Unconscious Thought Theory posits that a period of distraction after information acquisition leads to unconscious processing which enhances decision making relative to conscious deliberation or immediate choice (Dijksterhuis, 2004). Support thus far has been mixed. In the present study, artificial grammar learning was used in order to produce measurable amounts of conscious and unconscious knowledge. Intermediate phases were introduced between training and testing. Participants engaged in conscious deliberation of grammar rules, were distracted for the same period of time, or progressed immediately from training to testing. No differences in accuracy were found between intermediate phase groups acting on decisions made with meta-cognitive awareness (either feeling-based intuitive responding or conscious rule- or recollection-based responding). However, the accuracy of guess responses was significantly higher after distraction relative to immediate progression or conscious deliberation. The results suggest any beneficial effects of ‘unconscious thought’ may not always transfer to conscious awareness.

© 2012 Elsevier Inc. All rights reserved.

1. Introduction

A number of recent studies by Dijksterhuis and colleagues have focused on Unconscious Thought Theory (UTT; e.g.: Bos, Dijksterhuis, & van Baaren, 2008, 2011; Dijksterhuis, 2004; Dijksterhuis, Bos, Nordgren, & van Baaren, 2006; Dijksterhuis & van Olden, 2006; Nordgren, Bos, & Dijksterhuis, 2011; Strick, Dijksterhuis, & van Baaren, 2010; see also Ham & van den Bos, 2010, 2011; Ham, van den Bos, & van Doorn, 2009; Handley & Runnion, 2011; Lerouge, 2009; Usher, Russo, Weyers, Brauner, & Zakay, 2011). UTT presents the counterintuitive yet appealing notion that unconscious processing leads to improved performance in complex decision making tasks compared to immediate choice or rigorous conscious deliberation (the deliberation without attention hypothesis; Dijksterhuis & Nordgren, 2006). In a standard deliberation without attention UTT study, participants are required to choose the most desirable alternative from a number of options. For example, Dijksterhuis (2004, experiment 1) asked participants to choose the most desirable of four apartments. Each was described by 48 pieces of information with differing numbers of positive and negative attributes. Participants then were asked to think carefully about their decision (“conscious thought”), were given a distracter task for the same period of time (“unconscious thought”), or made an immediate choice. It was found that people in the distraction condition were more likely to choose, or rate as most desirable, the apartment with most positive attributes than those in the other conditions. Furthermore, people in the distraction condition were more likely to attribute their decision to a ‘global’ judgement whereas careful deliberation thinkers based their decision on ‘one or two specific attributes’.

In a meta-analysis of 92 studies, Strick, Dijksterhuis, Bos, van Sjoerdsma, and Baaren (2011) argued that as these decision making tasks are complex, unconscious thought leads to superior decision making quality than conscious thought. According

^{*} Corresponding author at: School of Psychology, University of Sussex, Falmer, Brighton BN1 9QH, UK. Fax: +44 1273 678058.

E-mail address: a.d.mealor@sussex.ac.uk (A.D. Mealor).

to the deliberation without attention hypothesis, unconscious consolidation of stimuli occurs during the distraction period between information acquisition and decision making. This weights salient aspects of the stimuli in a 'naturalistic' manner. Immediate decision making does not give enough time for this unconscious processing to occur. Due to its precision, conscious deliberation leads to the most effective decision making when the amount of information to account for is relatively small and its efficacy deteriorates with increasing complexity as capacity becomes overloaded. However, the UTT conclusion remains controversial. For example, Waroquier, Marchiori, Klein, & Cleeremans, 2009 conducted impression formation experiments using the UTT paradigm and found (with high statistical power) that immediate deciders and distracted participants made the same quality of decision, implying the decision had been made during information acquisition. That is, there was no evidence of unconscious deliberation without attention during distraction. Furthermore, they concluded that too much conscious rumination deteriorates the quality of an initial decision. A number of other studies have also failed to replicate any beneficial effect of deliberation without attention or have offered alternative explanations of the phenomenon, including the notion that a small amount of conscious processing (allowed for in the distraction condition) is better than more, or excessive, conscious processing (e.g.: Aczel, Lukacs, Komlos, & Aitken, 2011; Calvillo & Penaloza, 2009; Lassiter, Lindberg, Gonzalez-Vallejo, Bellezza, & Phillips, 2009; Newell, Wong, Cheung, & Rakow, 2009; Payne, Samper, Bettman, & Luce, 2009; Queen & Hess, 2010; Thorsteinson & Withrow, 2009; Waroquier, Marchiori, Klein, & Cleeremans, 2010; Waroquier et al., 2009; see also Gonzalez-Vallejo, Lassiter, Bellezza, & Lindberg, 2008 for a critical review of UTT. Contrast, however, Strick et al., 2011, who respond to some of these criticisms).

While the theory of unconscious thought might be appealing, replication has been sporadic even in high powered studies (and even taking into account the moderators identified by Strick et al., 2011). Dijksterhuis and Nordgren (2006) propose that intuition may be the product of unconscious thought and there is a broad consensus that intuition is based on unconscious processes or knowledge which, according to dual-process accounts, differs qualitatively from conscious, deliberative thinking (for recent reviews see Dienes & Seth, 2010; Evans, 2008; Evans, 2010; Dienes, 2012; Glöckner & Witteman, 2010; see also Dienes & Scott, 2005). But it has not been shown that standard UTT tasks necessarily use unconscious knowledge anyway. As of yet there have not been any studies conducted of unconscious thought that use a paradigm demonstrably eliciting both conscious and unconscious knowledge of the acquired information. If there is a true benefit of distraction in allowing unconscious thought, one may expect this to be reflected in decisions based on unconscious knowledge more so than conscious knowledge. Furthermore, Acker (2008) suggests the possibility that "[the standard UTT] experimental approach is not very suitable to demonstrate the unconscious thought effect reliably" (p. 301; see also Gonzalez-Vallejo et al., 2008; Waroquier et al., 2009). To this end, we employ artificial grammar learning (AGL; Reber, 1967) to investigate possible advantages of distraction in decision making with a clear unconscious component.

Artificial grammar learning is the task used by Reber (1967) when he coined the term "implicit learning" to refer to the incidental acquisition of unconscious knowledge. Artificial grammars generate strings of letters according to a finite-state rule system (Knowlton & Squire, 1994) and typically AGL involves a training phase and a testing phase. In the training phase of the experiment, participants are exposed to strings of letters generated, unbeknownst to the participants, by the grammar in question. They are then informed of the existence of rules governing the strings before proceeding to the testing phase where they classify novel strings as grammatical (obey the rules) or ungrammatical (violate the rules). During initial exposure to the training set of strings, some knowledge of the rules underlying the grammar is thought to be acquired unconsciously as performance is often reliably above chance yet participants typically have difficulty articulating rules of the grammar (e.g.: Reber, 1969; Reber & Allen, 1978). A large body of evidence using various subjective methods to assess awareness suggests both conscious and unconscious knowledge of grammar structure is acquired during AGL (e.g.: Dienes, Altmann, Kwan, & Goode, 1995; Dienes & Scott, 2005; Dienes & Seth, 2010; Mealor & Dienes, 2012; Persaud, McLeod, & Cowey, 2007; Scott & Dienes, 2008; Scott & Dienes, 2010a; Scott & Dienes, 2010b; Scott & Dienes, 2010c; Topolinski & Strack, 2009; Tunney & Shanks, 2003; see also Dienes, 2004, 2008a for a review of subjective measures of awareness in implicit learning studies).

Dienes and Scott (2005) identify two types of knowledge used to guide string classification in AGL: structural knowledge and judgment knowledge. Structural knowledge refers to (conscious or unconscious) knowledge of the grammar acquired during the training phase. This may encompass aspects of the grammar such as whole items (represented as exemplars of the grammar), fragments of items (e.g.: permissible bigrams or trigrams), patterns of connection weights or other rules. Judgment knowledge is the (conscious or unconscious) knowledge constituted by such a judgment and leads a person to classify a string as grammatical or ungrammatical. That is, judgment knowledge is the knowledge that the string is grammatical or ungrammatical. When both types of knowledge are conscious, participants engage in conscious hypothesis testing of their held rules or use their conscious recollections of (parts of) exemplars encountered during training to guide their grammaticality judgments (e.g.: "I have (not) encountered ZTP before, therefore the string is (not) grammatical"). When structural knowledge is unconscious but the judgment of that knowledge is conscious, participants use feelings of intuition or familiarity to guide their judgments (e.g. "I know I'm correct but I don't know why") (Norman, Price, & Duff, 2006; Norman, Price, Duff, & Mentzoni, 2007). When both types of knowledge are unconscious, grammar decisions are mere guesses and no conscious preference for grammaticality is shown (i.e.: these decisions are made in the absence of meta-cognitive awareness). Structural knowledge attributions have shown themselves to be a useful tool to researchers investigating implicit learning and unconscious knowledge by discriminating between knowledge types in ways consistent with theory (e.g.: Chen et al., 2011; Dienes & Scott, 2005; Guo et al., 2011; Rebuschat & Williams, 2009; Scott & Dienes, 2008;

Download English Version:

<https://daneshyari.com/en/article/10458643>

Download Persian Version:

<https://daneshyari.com/article/10458643>

[Daneshyari.com](https://daneshyari.com)