IS CONSCIOUSNESS NECESSARY FOR COGNITIVE CONTROL?

Eva Van den Bussche, Wim Gevers, Gethin Hughes, Florian Waszak & Bert Reynvoet
Faculty of Psychology, Vrije Universiteit Brussel, Belgium; Unité de recherche en Neurosciences Cognitives, Université Libre de Bruxelles, Belgium; Laboratoire Psychologie de la Perception, Université Paris Descartes, France; Faculty of Psychology, University of Leuven, Belgium.

INTRODUCTION

The limits and possibilities of unconscious processing remain unclear. For example, can unconscious stimuli induce cognitive control? Kunde (2003) studied this by examining the Gratton effect: If on trial n-1 subjects experience a cognitive conflict because prime and target do not correspond, then on trial n the correspondence effect (i.e. benefit when prime and target correspond and cost when they do not) is reduced. Kunde observed that this Gratton effect could only be induced by a conscious conflict on trial n–1. However, he defined the correspondence effect as the difference in RTs on incongruent and congruent trials (see also Van Gaal et al., in press). The problem here is that you can’t discover the nature of the observed effects: they can be due to facilitation, interference or both. We therefore examined the Gratton effect in a conscious and unconscious condition, using only incongruent and neutral trials.

EXPERIMENT

METHOD

Subjects

31 volunteers had to categorize target numbers as 1 or 9 as fast as possible.

Procedure

Participants first received an unconscious (masked) block and then a conscious (unmasked) block. Numbers 1 and 9 were used as targets and primes; the symbol “X” was used as a neutral prime. Using these stimuli, neutral (e.g. X–9) and incongruent (e.g. 1–9) trials were created. After each block, the subjects received a posttest to assess prime awareness. d’ did not differ from 0 for masked trials (d’ = −0.06, p = .36) and significantly differed from zero for unmasked trials (d’ = 1.84, p < .001).

RESULTS

Correspondence effects (CE) were calculated by subtracting RTs on neutral trials from RTs on incongruent trials. We then checked whether the correspondence on trial n–1 (neutral or incongruent) modulated these CEs on trial n. The top half of the Figure shows that the CE decreased when the previous trial was an incongruent trial in the masked condition (t(30) = 2.78, p = .009). In the unmasked condition this decrease did not reach significance (t(30) = 1.20, p = .24).

Thus, we observe the complete opposite results pattern as the one obtained by Kunde (2003). However, when we only take into account the neutral and incongruent trials of Kunde’s experiment 1 (disregarding the congruent trials), his pattern of results becomes highly similar as the one we observe (see lower half of the Figure).

CONCLUSIONS

When defining the correspondence effect in terms of congruent and incongruent trials, Kunde (2003) only observed a Gratton effect in a conscious condition. Contrarily, when defining the correspondence effect in terms of neutral and incongruent trials, we and Kunde (2003) only observed a Gratton effect in an unconscious condition. This seems to indicate that unconscious stimuli can exert cognitive control in a very flexible, trial–by–trial way. Still, the interplay between the congruent, incongruent and neutral trials seems to play an important role in deciding when conscious and unconscious stimuli can exert cognitive control, which warrants further research!