

The Limits and Possibilities of Unconscious Processing

Eva Van den Bussche (Eva.Vandenbussche@kuleuven-kortrijk.be)

Bert Reynvoet (Bert.Reynvoet@kuleuven-kortrijk.be)

Department of Psychology, University of Leuven

Belgium

Keywords: unconscious processing; masked priming; cognitive control

The existence of unconscious perception is largely acknowledged. However, the limits and possibilities of unconscious processing remain unclear. We used two different approaches to clarify this. First, we conducted a large-scale meta-analysis of masked priming studies to examine the depth of unconscious processing. Second, we contrasted a manipulation on a conscious versus an unconscious level in order to shed light on whether unconscious processing extends to high cognitive levels, similar to conscious processing.

The Depth of Unconscious Processing

Dehaene and colleagues (1998) asked participants to classify numbers as smaller or larger than 5. Using a *masked priming paradigm* they observed that congruent trials, where prime and target evoke the same response (e.g. 1-3) were responded to faster than incongruent trials, where prime and target evoke different responses (e.g. 1-8). Moreover, the primes elicited neural activity in the motor cortex. The authors concluded that unconscious primes are semantically processed. Ever since then, the depth of subliminal priming has been topic of heavy debate and several authors have proposed competing non-semantic (where unconscious information is thought to be processed non-semantically) and semantic (where unconscious information is thought to be processed semantically) accounts. In order to shed light on whether subliminal primes can be processed up to a semantic level, we (Van den Bussche, Van den Noortgate & Reynvoet, in press) conducted a meta-analysis where published and unpublished masked priming studies were statistically combined. We found strong support for the claim that unconscious information can be processed semantically: masked priming was significant even when non-semantic influences were minimized or eliminated. However, our results also showed that non-semantic processing of subliminal information can additionally boost priming effects.

Conscious versus Unconscious Processing

One way to study the limits and possibilities of unconscious processing is to contrast the effects of a manipulation introduced on a conscious versus an unconscious level (Van den Bussche, Segers & Reynvoet, 2008). Accumulating evidence shows that unconscious information is susceptible to several conscious top-down modulations. However, it

remains unclear whether unconscious information is able to exert cognitive control itself. A context factor (the proportion of Arabic numbers versus number words) was manipulated within a masked priming paradigm either consciously (at the target level) or unconsciously (at the prime level). The results indicated that the conscious manipulation could be used strategically to enhance task performance. However, the unconscious manipulation did not directly modulate the priming effects. Still, even though our results suggested that an unconscious stimulus was unable to exert *direct* cognitive control, it seemed to be able to induce *indirect* control, through metacognitive processes.

Conclusion

Accumulating evidence shows that unconscious information can be processed up to a high semantic level, it is susceptible to several conscious top-down modulations and seems able to exert (indirect) control on some cognitive processes. This suggests that unconscious processing extends to a sophisticated cognitive level.

References

- Dehaene, S., Naccache, L., Le Clec'H, G., Koechlin, E., Mueller, M., Dehaene-Lambertz, G., van de Moortele, P. F., & Le Bihan, D. (1998). Imaging unconscious semantic priming. *Nature*, 395, 597-600.
- Van den Bussche, E., Notebaert, K. & Reynvoet, B. (in press). Masked primes can be genuinely semantically processed: A picture prime study. *Experimental Psychology*.
- Van den Bussche, E., & Reynvoet, B. (2007). Masked priming effects in semantic categorization are independent of category size. *Experimental Psychology*, 54, 225-235.
- Van den Bussche, E., & Reynvoet, B. (2008). The asymmetry between top-down effects and unconscious cognition: Additional issues. *Consciousness and Cognition*, 17, 1361-1363.
- Van den Bussche, E., & Reynvoet, B. (in press). The mechanisms of subliminal semantic priming: A state of the art. In E.B. Hartonek (Ed.), *Experimental Psychology Research Trends*. New York: Nova Science Publishers.
- Van den Bussche, E., Segers, G., & Reynvoet, B. (2008). Conscious and unconscious proportion effects in masked priming. *Consciousness and Cognition*, 17, 1345-1358.
- Van den Bussche, E., Van den Noortgate W., & Reynvoet, B. (in press). Mechanisms of masked priming: A meta-analysis. *Psychological Bulletin*.