



Unconscious manipulation of free choice in humans [☆]

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Abstract

Previous research has shown that subliminally presented stimuli accelerate or delay responses afforded by supraliminally presented stimuli. Our experiments extend these findings by showing that unconscious stimuli even affect free choices between responses. Thus, actions that are phenomenally experienced as freely chosen are influenced without the actor becoming aware of the manipulation. However, the unconscious influence is limited to a response bias, as participants chose the primed response only in up to 60% of the trials. LRP data in free choice trials indicate that the prime was not ineffective in trials in which participants chose the non-primed response as then it delayed performance of the incongruently primed response.

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1. Introduction

It is a lively debated issue, whether or not stimuli we are not aware of might influence our behavior. A famous example of such an unconscious effect on behavior that has almost become part of folk psychology is the so-called “drink coke/eat popcorn”-study by James Vicary, an advertising expert, in the late 1950s (Pratkanis, 1992). He claimed to have inserted the words “drink coke” or “eat popcorn” for about 1/3 ms every 5 s into films his “participants” saw at a movie theater. Allegedly, over the course of 6 weeks a substantial increase in soft drink and popcorn consumption ensued. The “study,” however, was never reported in a scientific journal and although several attempts were made, the findings could never be replicated. Some years later, Vicary himself confessed in an interview that he had made up the whole story to revive his failing advertising business (Pratkanis, 1992). Despite this, the “drink coke/eat popcorn”-study continues to haunt public opinion like other urban myths.

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2. Subliminal priming

In the scientific community a lively debate about the standards for the investigation of unconscious manipulation has evolved (cf. Holender, 1986; Reingold & Merikle, 1993; Shanks & John, 1994). Recently, the method of subliminal priming has become an often used and well-established method to investigate the influence of unconsciously seen stimuli (Damian, 2001; Dehaene et al., 1998; Dell'Acqua & Grainger, 1999; Greenwald, Draine, & Abrams, 1996; Klotz & Neumann, 1999; Kunde, Kiesel, & Hoffmann, 2003; Neumann & Klotz, 1994). In subliminal priming experiments, participants usually perform a forced choice reaction time task with two response alternatives according to a supraliminally presented target. Prior to the target another stimulus, the so-called prime, is presented subliminally. Reaction times are decreased if the prime affords the same response as the target stimulus to which participants respond (congruent prime). In contrast, reaction times are increased if the prime is incongruent, i.e., if it affords another response than the target. To ensure that prime presentation is indeed subliminal, presentation time is very short, say 29 ms, and additionally the primes are masked so that the retinal afterimage is erased. Furthermore, the visibility of the primes is tested in an additional discrimination task often performed at the end of the experiment.

So far there is compelling evidence that subliminal primes affect target-elicited response production. The present study was conducted to extend current findings by investigating whether unconscious stimuli may also affect response selection from scratch (i.e., in the absence of a response-eliciting target stimulus). There is already some evidence in the literature that let us expect that subliminal primes may influence human's free choices. First, when participants perform a forced choice task, the prime congruency effect is quite often mirrored in the error rates, that means error rates are higher for incongruent compared to congruent primes (e.g., Damian, 2001; Kunde et al., 2003). Subliminal primes may cause participants to perform the prime-associated response that is incorrect in case of incongruent primes. Further on, Klapp and Hinkley (2002, Exp. 5, see also Klapp & Haas, 2005) reported priming effects in free choice trials. However, in this study the visibility of the primes was not checked (as in the studies of Klapp & Haas, 2005) and in another experiment with similar prime presentation, participants were able to identify the prime above chance-level leading to the suspicion that priming has not been subliminal.

The most compelling evidence for a biasing impact of subliminal stimuli for freely chosen actions so far comes from a study by Schlaghecken and Eimer (2004). In this study, double arrows (e.g., \gg) were subliminally presented and masked by random line patterns. In instructed trials, a target (e.g., \gg) followed and afforded a prescribed response. In other trials, a free choice signal was presented ($\langle \rangle$) and it was up to the participants which response to carry out.

Participants responded faster to prime-congruent targets than to prime-incongruent targets in instructed trials, and they preferred prime-congruent over prime-incongruent responses in free choice trials when the stimulus onset asynchrony (SOA) between primes and target was short (16 ms). By contrast responding to prime-incongruent targets was faster and prime-incongruent responses were preferred when the SOA was long (166 ms).

Recently, however, the functional mediation of priming effects with this particular stimulus material has become an issue of controversial debate. In particular it has been suggested that the untypical reversal of congruency effects with longer SOAs (superior performance in incongruent rather than congruent trials) might reflect interactions between prime-related and mask-related perceptual processes that are specific to the type of stimuli employed (Lleras & Enns, 2004; Verleger, Jaskowski, Aydemir, van der Lubbe, & Groen, 2004). Given the suspected special status of priming effects with this paradigm it seems warranted to clarify if the biasing impact of subliminal stimuli on 'freely' chosen responses holds for other types of stimulus material and masking procedure as well. Our first purpose was to obtain a positive bias on free choices with a rather long SOA between prime and target of 100 ms, which usually leads to negative priming effects for the stimulus material of Schlaghecken and Eimer (2004, see Schlaghecken & Eimer, 2002). This purpose was pursued in Experiment 1. To anticipate the main result, we indeed found such a positive bias effect. In Experiment 2 we confirmed the impact of subliminal primes on free choices by replicating the biasing effect in behavioral data and by demonstrating their impact on event-related brain potentials (ERP).

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