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Hypnotic and non-hypnotic suggestion to ignore pre-cues decreases space-valence congruency effects in highly hypnotizable individuals

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ABSTRACT

Previous studies have shown that the speed of identifying emotional words is affected by pre-cues of up or down arrows, called the space-valence congruency effect (Zhang, Hu, Zhang, & Wang, 2015). In the present study, we investigate whether this effect is influenced by hypnotic or non-hypnotic suggestions to ignore pre-cues in highly hypnotizable individuals (HHIs). In all conditions, target words (including positive words, negative words and neutral words) primed by up or down arrows were presented to pre-screened HHIs. They were asked to identify whether the target words had emotional valence. Behavioral results showed that the space-valence congruency effect was absent in the hypnotic and non-hypnotic suggestion groups, but present in the non-suggestion control group. Consistently, the amplitudes of P2 components elicited by negative words were significantly larger when primed by down than by up arrows in the non-suggestion control group, and this P2 effect was absent in the hypnotic and non-hypnotic suggestion groups. Moreover, the amplitudes of the late positive components (LPC) showed no significant arrow-priming difference for positive targets in the hypnotic-suggestion and control groups. However, in the non-hypnotic suggestion group, the amplitudes of LPC were significantly larger when primed by down than up arrows for positive targets. Our results showed that suggestions, even without a hypnotic induction, can de-automatize embodied emotional recognition processes and modulate early attentional processing.

1. Introduction

In the past twenty years, hypnotic suggestion had been used as a research tool to explore automatic cognitive processes (Oakley & Halligan, 2013). Automatic cognitive processes are said to be involuntary and not requiring conscious control (Shiffrin & Schneider, 1977). By using hypnotic suggestions, that is suggestions provided in a hypnotic state, automatic cognitive process such as the Stroop Interference Effect (SIE) and attentional conflict in flanker tasks, can be reduced particularly for highly hypnotizable individuals (HHIs) (e.g., Lani, Ricci, Gherri, & Rubichi, 2006; Raz, Shapiro, Fan, & Posner, 2002).

Raz, Fan, and Posner (2005) attributed this to the effect of hypnotic suggestion, which, on this account, narrows attentional focus to modulate the processing of input words in HHIs. Thus, in a standard Stroop task, HHIs, under these suggestions, responded only to

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the word color of an incompatible word (e.g., the word "RED" with green color); the interference between incompatible word color and word meaning was decreased (Parris, Dienes, & Hodgson, 2012; Raz & Campbell, 2011).

However, other studies have found that hypnotic suggestion did not reduce performance on the semantic Stroop effect (e.g., a color-associated word such as "sky" printed in incompatible color "green") (e.g., Augustinova, Flaudias, & Ferrand, 2010; Augustinova & Ferrand, 2012). These studies have provided possible evidence that semantic activation in a Stroop task is automatic, however, hypnotic suggestion may not de-automatize word reading, as is commonly claimed by Raz and his colleagues (e.g., Raz & Campbell, 2011; Raz et al., 2005), but affect response competition.

Because of the unsolved controversy, some studies have used other paradigms, arguably involving more automatic processes than the Stroop task, such as the McGurk effect (auditory speech perception influenced by visual lip movements) and synesthesia (a secondary perceptual experience activated by information from a distinct sensory channel), to test whether HHIs can override automatic perceptual integration. These results have shown that hypnotic suggestion in HHIs could de-automatize ballistic audiovisual processing (e.g., Dery, Campbell, Lifshitz, & Raz, 2014; Lifshitz, Bonn, Fischer, Kashem, & Raz, 2013) as well as disrupt face-color associator synesthesia (Terhune, Cardena, & Lindgren, 2010).

In short, whether hypnotic suggestion can modulate automatic processing beyond the classic Stroop effect as well as the underlying mechanism of such effects remains unclear; it is important to explore other well-established automatic paradigms to identify the mechanism of de-automatization by suggestion.

Recent studies on the space-valence congruency effect, which refers to faster judgment when discriminating the valence of positive words presented in the upper half of the screen and of negative words presented in the lower half of the screen (Meier & Robinson, 2004), have provided hints on how to explore the process of hypnotic suggestion from the perspective of high-level cognitive processes. A recent study found that arrows with congruent space information (e.g., up arrow with positive word or down arrow with negative word) could increase the speed of valence judgment for emotional words presented after the arrows (Zhang, Hu, Zhang, & Wang, 2015). Based on the view of embodied cognition, that the meaning of a word is grounded in sensory or sensorimotor representations, such as "happy is UP, sad is Down" (e.g., Ansorge, Khalid, & Konig, 2013; Glenberg & Kaschak, 2002), the association between the space information and emotional valence of a word is automatic and strong and is already embedded in the meaning of the word (Meier & Robinson, 2004). The question arises whether hypnotic suggestion can control or manipulate this *space-valence congruency effect*. If hypnotic suggestion can reduce the robust association between valence and space, then we may guide HHIs to override other automatic processes using suitably-structured suggestion techniques. Specifically in non-suggestion control groups, participants might be expected to judge the emotional valence faster when primed by congruent pre-cues than incongruent pre-cues (such as judging "happy" faster when primed by up arrows than down arrows); however, this effect might be expected to decrease or even vanish in the hypnotic suggestion (suggestions delivered in a hypnotic context) and/or non-hypnotic suggestion (suggestions delivered in a waking context) groups.

Furthermore, by including event-related potentials (ERPs) as dependent variables, we moved forward to explore the cognitive processes underlying the behavioral effects in HHIs. According to Duncan's et al. (2009) guideline for ERPs in clinical research, we mainly focused on the P2 component and the late positive component (LPC); P2 is enhanced when attention is instructed to emotional meaning and does not necessarily represent automatic processing of emotional words (e.g., Bernat, Bunce, & Shevrin, 2001). The LPC, in similar paradigms, is a signature of attention directed to visual stimuli that are motivationally relevant (Ohara et al., 2008). Previous studies have found enhanced P2 and LPC amplitudes when target words were primed by congruent spatial information than incongruent spatial information (see Zhang et al., 2015). Thus, if hypnotic suggestion or non-hypnotic suggestion can affect focused attention or motivated attention of the spatial pre-cues, we expected reduced or no difference between the speed of identifying congruent and incongruent stimuli as well as decreased amplitudes of P2 or LPC effect when target words were primed by congruent spatial information in the condition of hypnotic suggestion or non-hypnotic suggestion.

Moreover, previous studies on how hypnotic suggestion influences automatic cognitive process mostly utilized hypnotic suggestion (e.g., Augustinova et al., 2010; Dery et al., 2014; Raz et al., 2005). It is known that subject responsiveness to suggestions without hypnosis can effectively predict their responsiveness to hypnotic suggestions (Mazzoni, Venneri, Mcgeown, & Kirsch, 2013); meanwhile, researchers have found that suggestion alone (without hypnosis) could reduce the incongruent Stroop effect in HHIs (see Raz, Kirsch, Pollard, & Nitkin-Kaner, 2006). Therefore, the present study sought to expand upon the earlier work by attempting to distinguish hypnotic suggestion from non-hypnotic suggestion in terms of their influence on space-valence congruency effects in HHIs.

2. Method

2.1. Participants

Behavioral and event-related potential (ERP) data were collected from 36 highly-suggestible undergraduate students with 12 participants in the hypnotic suggestion group, 12 participants in the non-hypnotic suggestion group, and 12 participants in the non-suggestion control group. They were all right-handed and native Chinese speakers with age between 20 and 25 years (M_{age} = 22.5 years; 14 men and 23 women). Before the task proceeding, participants were informed that the experiment aimed to explore the influence of suggestion on cognitive performance. After the procedure explanation, participants signed a written informed consent form. Each participant received approximately 10 USD compensation for participating. This study was approved by the university committee on human research protections of East China Normal University (HR-008-2017).