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Reply

Converging evidence for de-automatization as a function of suggestion ☆,☆☆

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At least for some individuals, suggestion seems capable of easing certain automatic processes back into the purview of control. Unrelated to hypnosis and suggestion, a number of accounts have challenged the automaticity of the Stroop effect, demonstrating reduction of Stroop interference (Besner, 2001; Besner and Stolz, 1999a, 1999b, 1999c; Besner, Stolz & Boutilier, 1997; Dishon-Berkovits & Algom, 2000; Kuhl and Kazén, 1999; Long and Prat, 2002; Melara and Algom, 2003; Pansky and Algom, 2002). Furthermore, as Kihlstrom (2011) acknowledges and as we expound on elsewhere in this issue (Lifshitz, Campbell & Raz, 2012), findings from meditative practices coincide with the effects of suggestion on Stroop performance. In this paper we review converging evidence from multiple independent groups of researchers replicating the removal of Stroop interference as a function of suggestion, and expound on nuances of nomenclature regarding suggestibility (Kihlstrom, 2011).

In line with our own results using a classic Stroop paradigm (Raz, 2004; Raz & Campbell, 2011; Raz, Fan, & Posner, 2005; Raz, Moreno-Iniguez, Martin, & Zhu, 2007; Raz, Shapiro, Fan, & Posner, 2002; Raz et al., 2003), several research groups have independently reported reduced Stroop interference following suggestion. Casiglia et al. (2010), for example, reproduced our findings showing that a posthypnotic suggestion for "alexia" diminished the word-color Stroop interference effect in highly suggestible individuals (HSIs). Furthermore, research groups from Italy (Augustinova & Ferrand, 2012) and England (Parris, Dienes, & Hodgson, 2012) have recently reported data demonstrating improved performance on standard Stroop tasks as a function of suggestion, although the improvement did not appear to generalize to a "semantic" variant of the task (Augustinova & Ferrand, 2012). In addition to these contemporary accounts, an esoteric report by Sun (1994), written in Chinese, examined the influence of suggestion on Stroop interference. Following a hypnotic induction, HSIs and LSIs performed a Stroop task with and without the following suggestion:

> *You are now focusing on the monitor before you. When you see the colored stimulus, do not pay attention to the whole stimulus; focus your vision and attention to the bottom right corner. At this moment, you will only be seeing one color stimulus. Try to identify the color you see as quickly and as accurately as possible. You will definitely be able to complete this task. Are you ready? Alright, let's begin.*

Although the above suggestion differs substantially from the instructions we have typically employed in our own work on these topics (e.g., Raz et al., 2002), Sun (1994) anticipated our findings by documenting that the suggestion significantly reduced the Stroop interference effect for HSIs but not for LSIs. In normal waking consciousness, however, suggestion brought about a difference between HSIs and LSIs neither in the Stroop effect (incongruent minus congruent) nor in Stroop interference (incongruent minus neutral). Such findings contrast with reports, including from an independent group of researchers at the University of Connecticut (Raz, Kirsch, Pollard, & Nitkin-Kaner, 2006) and from an as yet unpublished account (Parris &

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☆☆ We dedicate this collection of responses to the memory of Bill Banks, founding coeditor of *Consciousness and Cognition*. This project was the last professional interaction we had with him before his untimely parting.

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Dienes, unpublished), indicating that suggestion reduces the Stroop effect in HSIs even in a non-hypnotic context. Thus, although the specific role of the hypnotic induction remains unclear, numerous independent reports converge on the notion that suggestion can reduce the Stroop effect in HSIs.

Single-case studies and anecdotal accounts further support the removal of Stroop interference at the individual level. Although multi-participant experiments provide the gold standard for psychological and medical research, single-case reports may serve to elucidate individual nuances and custom tailor cognitive and therapeutic interventions (Gabler, Duan, Vohra, & Kravitz, 2011; Kravitz et al., 2009). One study investigating a single highly suggestible face-color synaesthete, for example, demonstrated reduced involuntary perceptual integration along with alterations in event-related brain potentials as a function of posthypnotic suggestion (Terhune, Cardeña, & Lindgren, 2010). In addition, anecdotal clinical case-studies (Schatzman, 1980), N-of-1 experimental accounts (MacLeod & Sheehan, 2003), and informal unpublished reports (e.g., Thalia Wheatley, personal communication, November, 2002) corroborate the removal of Stroop interference as a function of suggestion.

Beyond the Stroop paradigm, other studies using posthypnotic suggestion demonstrate how putatively automatic processes are amenable to cognitive control. Examples include overriding the flanker compatibility effect (Iani, Ricci, Gherri, & Rubichi, 2006) and the Simon interference effect (Iani, Ricci, Baroni, & Rubichi, 2009). Unpublished data from our laboratory, moreover, indicate that such de-automatization may extend to cross-modal perceptual integration in the McGurk illusion (McGurk & MacDonald, 1976), and that particular suggestions may allow specific individuals to shift automaticity in the opposite direction – rendering difficult tasks more effortless without practice. Collectively, therefore, such converging findings highlight the presence of a robust empirical effect and pave the road to further experimental and clinical applications.

In his commentary, Kihlstrom (2011) points out that while we screened participants using the Harvard Group Scale of Hypnotic Susceptibility (HGSHS:A) (Shor & Orne, 1962) – an index traditionally used to sort individuals into high and low "hypnotizable" categories – we label our participants instead as highly- and less- "suggestible" individuals. In light of the various subtypes of suggestibility (e.g. primary, secondary, placebo), Kihlstrom suggests that we refrain from implying that a singular subtype underlies the observed effects and encourages us to employ the standard label of "hypnotizability". Whereas we acknowledge the importance of clarifying the notion of suggestibility, the term hypnotizability may carry its own set of problems. These difficulties stem from the operational definition of hypnosis as the administration of an initial suggestion to enter hypnosis (i.e., an "induction" ritual). Although hypnotizability traditionally refers to responsiveness to suggestion following an induction, this definition is problematic given that responses to suggestions in a hypnotic context correlate strongly with responses to the same suggestions outside of hypnosis (Kirsch & Braffman, 2001). Furthermore, induction procedures appear to only slightly enhance response to suggestions (Kirsch et al., 2011). Thus, because hypnotizability scales do not compare responses to suggestions within and outside of a hypnotic context, they may provide a better index of response to suggestion in general than response to hypnotic induction in particular (Weitzenhoffer, 1980). In light of such caveats, some researchers propose that we should reserve the term "hypnotizability" for labeling the degree to which hypnotic induction influences individual responsiveness to suggestions (Braffman & Kirsch, 1999). According to this perspective, the term "hypnotic suggestibility" most accurately designates responsiveness to suggestions following a hypnotic induction.

While terminological debates persist and researchers actively strive to iron out useful operational definitions of hypnotizability and suggestibility (Kirsch et al., 2011), dwelling on such nomenclature may represent a nuanced discussion within the purview of but a few specialists. In our writings we often use these terms interchangeably because we feel that for the larger community of non-experts, such refined shades of meaning may obfuscate more than explain (Raz, 2007). As researchers interested in advancing the science of suggestion and attention, it would behoove us to focus our efforts on clarifying empirical questions and refining experimental paradigms. In this spirit, independent replications of our Stroop findings and related de-automatization effects provide converging evidence for a robust phenomenon worthy of future investigation.

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