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Commentary

Hypnosis and the control of attention: Where to from here? ☆

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ABSTRACT

Can suggestion, particularly hypnotic suggestion, influence cognition? Addressing this intriguing question experimentally is on the rise in cognitive research, nowhere more prevalently than in the domain of cognitive control and attention. This may well rest on the intuitive connection between hypnotic suggestion and attention, where the hypnotist controls the subject's attention. Particularly impressive has been the work of Raz and his colleagues demonstrating the modulation and even the complete elimination of classic Stroop color–word interference when subjects are given a posthypnotic suggestion that words are meaningless. Overriding a highly practiced, possibly even automatic response like reading is testament to the attentional control that can be exerted under (post)hypnotic suggestion. What else do we need to know—in the Stroop context and more broadly—to obtain a clear picture of how suggestion can orchestrate attention?

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1. Introduction

More than any other cognitive process, attention seems to behave like a classic resource. We make decisions about how to allocate attention, whether spatially to different regions of our environment or by way of selective concentration on one task versus others. Different individuals have differing amounts of attention—and presumably different allocation policies. Indeed, no doubt taking the analogy too far, we routinely talk about “paying” attention and even about “withdrawing” attention! Not surprisingly, then, theories have been proposed that treat attention as an economic resource (e.g., Navon & Gopher, 1979), although this framework has also been sharply criticized (e.g., Logan & Zbrodoff, 1999).

Central, though, to any conception of attention is our ability to use it to control what we process and how we process it. The emphasis on cognitive control that is now so prevalent throughout the study of cognition invariably features attention and the activity of prefrontal cortex (e.g., van Veen & Carter, 2006; Wendelken & Shastri, 2005). It therefore makes sense to ask questions about how that control is achieved and about the factors that modulate that control. And if hypnosis is viewed as a kind of “attention contract” in which the subject surrenders attentional control to the hypnotist (see, e.g., Karlin, 1979, for an attentional perspective), then hypnotic suggestion as a means of controlling attention becomes an important domain of study, as has recently been argued (see Cox & Bryant, 2008; Oakley & Halligan, *in press*, for reviews).

In a series of articles culminating in the one to which this commentary is directed (Raz & Campbell, 2011), Raz and his colleagues (Raz, 2004; Raz et al., 2003; Raz, Fan, & Posner, 2005; Raz, Kirsch, Pollard, & Nitkin-Kaner, 2006; Raz, Moreno-Íñiguez, Martin, & Zhu, 2007; Raz, Shapiro, Fan, & Posner, 2002) have applied posthypnotic suggestion to the best known of all attention paradigms, the Stroop effect (Stroop, 1935; for a review, see MacLeod, 1991). Ordinarily, the naming of the print color of a word is dramatically slowed when the word designates a different color (e.g., the word red in green,

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say “green”—the incongruent condition) relative to when the word designates the same color (e.g., the word green in green, say “green”—the congruent condition). The goal of their research has been to show that posthypnotic suggestion can control attention sufficiently that a highly overlearned and possibly automatic skill can be overridden: told that the words will appear as “meaningless symbols . . . like characters of a foreign language,” subjects’ color naming times show sharply reduced interference or even no interference at all from the incongruent words. Given the notorious difficulty of eliminating Stroop interference (e.g., MacLeod, 1998), this would certainly appear to be impressive testament to the attentional power of a posthypnotic suggestion.

But where should we go from here? To show that hypnosis can possibly influence a single attentional task is only a start. In this brief commentary, I wish to consider a minimalist research agenda for what else should be done to clarify the impact of hypnotic/posthypnotic suggestion on attention both within the Stroop task and beyond it.

2. Stroop interference and attentional control

Raz and his colleagues have shown that, in highly susceptible individuals, posthypnotic suggestion can reduce or even eradicate Stroop interference. Particularly impressively, they have done so without overall response slowing. For if interference is reduced by the congruent condition slowing to meet the incongruent condition, and not by the incongruent condition speeding to meet the congruent condition, then it is much harder to argue for a true reduction in interference. Indeed, in their original study, Raz et al. (2002) even included a neutral control condition (e.g., the word ship in green, say “green”) and showed that, under a posthypnotic suggestion intended to strip the meaning from words, both facilitation in the congruent condition and interference in the incongruent condition vanished for highly susceptible individuals (see MacLeod & Sheehan, 2003, for a similar result). That this occurred without the control condition moving between the suggestion and no-suggestion conditions is indeed a compelling demonstration of the attentional control wielded by suggestion.

The beauty of such a manipulation and its corresponding results is that they lead to a vast array of follow-up questions. Why does a posthypnotic suggestion that the subject cannot read not work?¹ Why does the manipulation not work with individuals low in susceptibility to hypnosis? How long can such a suggestion stay effectively in place? Is the effect reliable within the same individual over different sessions? What I would like to see is the suggestion itself varied systematically to help us understand precisely what is going on at the level of cognitive processes. I will offer two illustrations. First, imagine a subject being given the suggestion that the words red and blue are meaningful but the words yellow and green are not. Would interference then be restricted to incongruent trials involving the words red and blue? This manipulation would address the degree of specificity possible in a suggestion. Second, imagine a subject being given a suggestion that the word red actually designates the color blue, the word blue actually designates the color red, and so on. Would we now see interference in the formerly congruent condition and facilitation in the formerly incongruent condition? This manipulation would address the semantic underpinning of interference. The recent demonstration by Cohen Kadosh, Henik, Catena, Walsh, and Fuentes (2009) of synaesthesia in nonsynaesthetes under posthypnotic suggestion makes such an approach seem quite feasible.

I would also like to see the effect generalized to other versions of the Stroop task, such as the number–word task (e.g., how many characters are there here? 444) and particularly the picture–word task (e.g., a picture of a dog containing the to-be-ignored word table); for descriptions of these and other tasks, see MacLeod (1991). The picture–word task is potentially a very rich testing ground for two reasons. First, many trials can be carried out without repeating any stimuli, unlike the very small repeated stimulus set of the Stroop task. Can suggestion conquer meaningful processing of more than a few words? Second, in the picture–word paradigm, suggestion could be tailored to make meaningless only certain subsets of the interfering words (e.g., a suggestion that only furniture words are meaningless), again speaking to the specificity of the phenomenon. Discrimination and generalization both will be crucial to our eventual deeper understanding of the effects of suggestion on interference.

3. And on to negative priming

Raz and Campbell (2011) carried out an exploratory post hoc analysis on their newest Stroop data in search of negative priming. This is entirely appropriate, given that negative priming was born in the Stroop task (Dalrymple-Alford & Budayr, 1966), where naming the color of an item on a given trial is slower if the color of that item had been the word just ignored on the preceding trial (e.g., the word red in blue, say “blue”, followed by the word green in red, say “red”). It would make a great deal of sense to expect that if Stroop interference diminishes following a suggestion that words are now meaningless, then so should negative priming. But this is not what Raz and Campbell found: negative priming was still present and did not change as a function of suggestibility in a way that nicely corresponded to the change in Stroop interference.

If subjects truly were not processing word meaning—or were doing so less effectively than usual—following the suggestion, then any drop in Stroop interference would logically seem to demand an accompanying drop in negative priming, so their observed outcome is somewhat troubling. Of course, it may be that the limited amount of negative priming data in their

¹ In personal communications, Raz has noted that a posthypnotic suggestion that the subject would not be able to read did not work. Instead, he developed the “words are meaningless gibberish” suggestion, which did work, and which he has continued to use. One important direction for research, then, will be to ascertain why certain suggestions can exert control over attention but other apparently closely related suggestions cannot.

analyses is the problem: that their quite large effects were not significant implies a power problem. What is needed is a more concerted attack on negative priming, ideally in the more well controlled standard procedure (see Tipper, 2001, for a review) where two words are presented on each trial and subjects must ignore one of them. Could suggestion of an inability to process words for meaning significantly reduce negative priming? It would also be intriguing to test the same subjects under both the Stroop and negative priming procedures and then to examine the correlation in the reductions of the effects given the suggestion. Reliability and stability of suggestion effects on attention will go a long way to making their impact on research stronger.

4. The world of attention beyond Stroop

There are other interference tasks which should be explored and which will provide new insights as well as replication and generalization. An obvious candidate is the flanker task (see Eriksen, 1995, for a review), wherein subjects search on each trial for a central target (e.g., either H or S) when adjacent distracters are present. Congruent trials (i.e., HHH or SSS) are faster than incongruent trials (e.g., HSH or SHS). Here, the suggestion might be that a subject narrow attention to just be able to see the central target, or that the flankers be seen as characters from another, unfamiliar alphabet. The Simon task (see Lu & Proctor, 1995, for a review) would also be a good candidate for examining spatial rather than identity conflict (e.g., respond with a left key press to the word left even when it appears on the right side of the screen). Can suggestion control allocation of attention—and of responding—spatially and even into the motor response?

Can words be stripped of their meaning by suggestion, yet still be responded to as words? This question opens up the whole domain of semantic priming (for a review, see Neely, 1991). Several decades of research have shown that processing a related word before a critical target word, even when unexpected, speeds processing of the target word. Much of this work has been done using lexical decision, where the task is to determine whether each letter string is a word (e.g., nurse) or not (e.g., mantly). Having just decided that bread is a word makes it faster to then decide that butter is a word because of semantic priming. But could a posthypnotic suggestion be given that the subject knows words from nonwords but does not know what the words mean? If so, semantic priming should diminish or even vanish in lexical decision.

I have thus far focused on specificity and especially on meaning, but there are other dimensions of attentional tasks that also would be informative to examine. Consider, as just one example, the inhibition of return task, where an initially beneficial nonpredictive cue subsequently becomes detrimental (see Lupiáñez, Klein, & Bartolomeo, 2006, for a brief review). It is well established that cues that point to a target location, despite not actually being correlated with the appearance of the target, still facilitate its processing. But in inhibition of return, after about 300 ms, the cue to the spatial location of the target no longer helps, but actually hurts performance. Could suggestion—for example that the cue does not signify anything—cause both components of the time course to vanish? By virtue of wiping out both the facilitation and the interference in the same task, like the original Raz et al. (2002) Stroop study, this would be a compelling demonstration of the control of attention by hypnosis.

5. Conclusion

Led by the work of Raz and his colleagues, new research in the domain of cognition is putting to the test the idea that suggestion, and particularly posthypnotic suggestion, can substantially modulate attentional control. In a time where the study of cognition has greatly broadened to admit many new approaches—from neuroscientific to social and beyond—the addition of hypnotic suggestion to the set of available tools could be very important. Although it is still “early days,” an exciting beginning has been made and there are a great many interesting directions in which to go. Hypnosis has more than its share of detractors, but this new work, if it continues to mature, also has the potential to give them pause: if hypnosis really does nothing, as they claim, how can it control attention in ways that almost nothing else can?

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