The Journal of Mind-Body Regulation

commentary

Metacognition and Cold Control in Hypnosis

Commentary: The Contrasting Role of Higher Order Awareness in Hypnosis and Meditation

Devin Blair Terhune, PhD*

July 2012

The hallmark phenomenological property of responding to a hypnotic suggestion is the experience of feeling as if one is not the author of one's response, and this has come to be known as the *classic suggestion effect* (Bowers, 1981; Weitzenhoffer, 1980). Given this marked distortion in volition, it is plausible that higher order thoughts (HOTs), which are characterized by an awareness of one's thoughts, experiences and actions, are somehow involved in hypnotic responding. This idea forms the basis of *cold control theory* (Dienes & Perner, 2007), which proposes that responses to hypnotic suggestions are facilitated by inaccurate HOTs regarding the intentions underlying one's responses.

It is on the basis of this theory that Semmens-Wheeler and Dienes (in press) argue that hypnotic responding differs from meditation, which they believe is characterized by an enhancement in higher order awareness. Here I restrict myself to cold control theory and consider the evidence for this theory and its predictions regarding hypnotic responding.

According to cold control theory, an alteration in metacognition is the primary driving force behind hypnotic responding. Responses to hypnotic suggestions are produced by unconscious intentions and are experienced as involuntary because of the concurrent formation of inaccurate HOTs characterized by the absence of awareness that one is the author of the intention. For example, an individual performs an action or modifies a percept or representation (e.g., suppresses a memory from breaching awareness) but forms inaccurate HOTs regarding her or his role in producing the response (e.g., "I'm not suppressing the memory"). In turn, the individual exhibits a reduction in awareness of the intention to respond and displays the suggested response. The idea that hypnotic responding is facilitated by a reduction in self-reflective thought has precedence in earlier hypotheses (e.g., Miller, Galanter, & Pribram, 1960) and most notably Hilgard's (1986) *neo-dissociation theory*, according to which hypnotic responding is facilitated by a disruption of executive monitoring functions enabled by an amnestic barrier. However, cold control theory provides a more appealing and testable explanation of hypnotic responding because it is easily reconciled with contemporary research in cognitive neuroscience and it circumvents many of the metaphorical pitfalls of neo-dissociation theory.

Semmens-Wheeler and Dienes (this issue) describe two studies that sought to test cold control theory. On the basis of a previous study showing that metacognition depends on the dorsolateral prefrontal cortex (dlPFC) (Rounis, Maniscalco, Rothwell, Passingham, & Lau, 2010), Semmens-Wheeler and Dienes argue that disrupting activity in this region should reduce metacognition and thus increase hypnotic responding. In the separate studies, the authors used alcohol consumption and repetitive transcranial magnetic stimulation (rTMS) to reduce frontal functioning and found that both manipulations augmented the experiential concomitants of hypnotic responses, but not the behavioural responses.

These results are consistent with cold control theory but do not convincingly tie hypnotic responding to metacognition. The

* Department of Experimental Psychology
University of Oxford
South Parks Road
Oxford,
OX1 3UD
United Kingdom

e-mail: devin.terhune@psy.ox.ac.uk

dlPFC is recruited during a wide range of cognitive functions including cognitive control, decision making, and working memory (Stuss & Knight, 2002) and the experimental manipulations likely modulated a whole host of cognitive functions. For example, both manipulations may have reduced attentional effort. Insofar as expending effort during a task facilitates self-agency attributions (Johnson, Hashtroudi, & Lindsay, 1993), reduced effort should augment the extra-volitional phenomenology of hypnotic responding, which is exactly what the authors observed (for similar ideas, see Barnier, Dienes, & Mitchell, 2008). In particular, attributing rTMS effects on hypnotic responding to a change in metacognition amounts to reverse inference, which is valuable in certain contexts but has important limitations in cases where no behavioural measure of the respective cognitive function is administered, as was the case in these studies.

Similarly, whilst the results described by Semmens-Wheeler and Dienes (this issue) are consistent with cold control theory, they do not provide preferential support for this account. As the authors acknowledge, a number of theories of hypnosis, most notably *dissociated control* and *second-order dissociated control theory* (Woody & Sadler, 2008), predict that disruption of neural activity in dlPFC will produce an increase in hypnotic suggestibility. Insofar as extensive meditation practice is associated with greater white matter integrity in prefrontal regions (e.g., Kang et al., 2012), dissociation theories would also predict that such practice would reduce hypnotic suggestibility, which is consistent with Semmens-Wheeler and Dienes' report of lower hypnotic suggestibility in meditators. Given this level of overlap with the predictions of dissociation theories, a crucial step for the future development of cold control theory will be the derivation of predictions that diverge from other theories of hypnosis. Toward this end, I will delve deeper into the assumptions and predictions of cold control theory with a view to identifying viable avenues for further research on this theory.

A crucial step for future research is to more clearly elucidate how a reduction in frontal functioning augments hypnotic responding. The inclusion of behavioural and self-report measures of metacognition during hypnotic responding will allow for a clearer assessment of the proposal that a reduction in metacognition mediates the increase in hypnotic suggestibility following the disruption of activity in the prefrontal cortex. In turn, this will provide less equivocal evidence regarding whether metacognition is involved in hypnotic responding and will move us closer to the goal of discriminating between cold control theory and dissociation theories.

At present, it remains unclear whether the prefrontal cortex contributes to both behavioural and experiential hypnotic responding and this represents an important test of cold control and dissociated control theories. Both theories assume that a reduction in activity in the prefrontal cortex will increase both dimensions of hypnotic responding whereas the results of the two studies described by Semmens-Wheeler and Dienes (this issue) only found effects with experiential measures. There seem to be three possible explanations for these results: 1) the prefrontal cortex weakened metacognition (or another cognitive function) but this change only modulated the experiential concomitants of hypnotic responses; 2) the experimental manipulations did not disrupt frontal functioning to a sufficient degree to effect an increase in behavioural responding; or 3) the measures of hypnotic responding used were not sensitive enough to detect an enhancement.

The first explanation raises an important question about cold control theory. That is, how will the formation of inaccurate HOTs about the intentions underlying one's responses actually improve the likelihood of those intentions giving rise to a particular hypnotic response? There are two distinct, but inter-related, variables at play here: the efficacy of an intention in producing an action or experience and the awareness of the intention. Cold control theory places the bulk of the causal influence on the latter, whereas the former may actually be more fundamental in producing the experience. Accordingly, it may be that inaccurate HOTs only produce the *involuntariness* of the experience—the misattribution of agency to a source other than oneself—and not the experience *per se*, which is what the authors observed.

To take this idea further, it needs to be acknowledged that, independently of HOTs regarding an intention, the efficacy of the intention in producing a response still depends on a cognitive ability that enables the particular action, percept or representation. For motor suggestions (e.g., paralysis), this is very simple because such responses are easily implemented (I can easily intend to hold my arm as if it were paralyzed). This is not the case for cognitive (e.g., suppressing a memory) and perceptual (e.g., generating an auditory percept) suggestions. To a greater extent than for the implementation of the motor intention, there are individual differences in the intentional generation of cognitive and perceptual states and for some individuals implementing these intentions may not actually be possible (e.g., Levy & Anderson, 2008). Whilst necessary for producing the extra-volitional phenomenology of hypnotic responding, intending to suppress a memory and forming HOTs that one is not intending are not sufficient for hypnotic responding—one has to actually be able to suppress the memory, which implies an ability or set of abilities involving the manipulation of representations (for a related discussion of the role of rogue representations in hypnotic responding, see Brown & Oakley, 2004). At present, this ability is not specified and it will be important for cold control theorists to more clearly explicate how percepts and representations are generated and manipulated in the production of hypnotic responses.

The second and third explanations for the lack of an increase in behavioural hypnotic responding with experimental manipulations that reduce frontal activity concern the methodology of these experiments. The second explanation—that the experimental manipulations did not disrupt frontal functioning enough to increase behavioural responding—will need to be investigated using other techniques that interrupt frontal functioning to a greater degree. However, it is striking that alcohol intoxication impaired performance on executive functioning tasks but did not influence behavioural hypnotic responding. This again may suggest that the frontal effect is purely at the level of the experiential concomitants of hypnotic responses. I find the third possibility—that the measures of behavioural hypnotic responding were not sufficiently sensitive to detect an effect—to be very likely and I think it stresses the need for researchers to move away from traditional measures of hypnotic responding toward chronometric, psychophysical, and physiological measures, which will undoubtedly be far more sensitive and reliable (Terhune & Cohen Kadosh, 2012). Optimizing measures of hypnotic responding in this way will undoubtedly strengthen the chances of discriminating between these explanations.

The idea that the efficacy of intentions in the production of hypnotic responses will depend on one or more abilities and is not solely determined by the formation of inaccurate HOTs also has implications for Semmens-Wheeler and Dienes' central thesis regarding the relationship between meditation and hypnosis. Their argument that hypnosis and meditation are wholly dissimilar phenomena is based on the position that a reduction in metacognition is the primary determinant of hypnotic responding. In contrast, responses to suggestions may be facilitated by multiple orthogonal, or only weakly related, componential abilities (Woody & McConkey, 2003; see also Laurence, Beaulieu-Prévost, & du Chéné, 2008), some of which may be recruited during meditation. For example, both advanced meditators (Luders et al., 2012) and highly suggestible individuals (Horton, Crawford, Harrington, & Downs, 2004) display greater structural density in the corpus callosum than controls. The specific regions are adjacent but not overlapping and the methodologies of these studies greatly differ (for a methodological critique of the latter study, see Lynn, Kirsch, Knox, Fassler, & Lilienfeld, 2007). However this structural difference may point to a shared mechanism underlying certain componential abilities recruited during hypnosis and meditation. Notwithstanding this point, although I am sympathetic to Semmens-Wheeler and Dienes' position, I think that comparisons between hypnosis and meditation are rather limited because empirical studies have not as yet circumvented a number of confounding variables that differentially contribute to the mechanisms underlying these phenomena, such as individual differences and training effects, thus tempering the weight of any contrasts (see Grant, this issue).

Cold control theory offers a parsimonious and testable explanation of hypnotic responding. It also suggests a novel research focus—higher order awareness—that has received only scant attention in the hypnosis literature yet is likely to yield insights into the mechanisms underlying hypnotic responding. It also provides a framework within which hypnosis can be contrasted with, and perhaps discriminated from, meditation. Considering the ability to form inaccurate HOTs as a determinant of hypnotic responding may also advance our understanding of individual differences in hypnotic suggestibility (Laurence et al., 2008). Despite these strengths, there are important challenges ahead for this theory—most notably the need to derive predictions that distinguish it from other theories of hypnosis. The research that this theory has inspired to date has already provided fascinating results that can inform the neural basis of hypnosis, irrespective of their implications for cold control theory.

Acknowledgements

The author is supported by the Cogito Foundation.

References

Barnier, A. J., Dienes, Z., & Mitchell, C. J. (2008). How hypnosis happens: New cognitive theories of hypnotic responding. In M. Nash & A. Barnier (Eds.), *The Oxford handbook of hypnosis* (pp. 141–178). Oxford, England: Oxford University Press.

Bowers, K. S. (1981). Do the Stanford Scales tap the "classic suggestion effect"? *International Journal of Clinical and Experimental Hypnosis, 29*, 42–53.

Brown, R. J., & Oakley, D. A. (2004). An integrative theory of hypnosis and high hypnotizability. In M. Heap, R. J. Brown, & D. A. Oakley (Eds.), *The highly hypnotizable person: Theoretical, experimental and clinical issues* (pp. 152–186). New York, NY: Routledge.

Dienes, Z., & Perner, J. (2007). Executive control without conscious awareness: The cold control theory of hypnosis. In G. A. Jamieson (Ed.), *Hypnosis and conscious states: The cognitive neuroscience perspective* (pp. 293–314). Oxford, England: Oxford University Press.

Grant, J. A. (this issue). Towards a more meaningful comparison of meditation and hypnosis. *Journal of Mind–Body Regulation, 2*(1), 71–74.

Hilgard, E. R. (1986). *Divided consciousness: Multiple controls in human thought and action (Rev. ed.)*. New York, NY: Wiley.

Horton, J. E., Crawford, H. J., Harrington, G., & Downs, J. H., 3rd. (2004). Increased anterior corpus callosum size associated positively with hypnotizability and the ability to control pain. *Brain, 127*, 1741–1747. doi: 10.1093/brain/awh196

Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychological Bulletin, 114*, 3–28.

Kang, D. H., Jo, H. J., Jung, W. H., Kim, S. H., Jung, Y. H., Choi, C. H., . . . Kwon, J. S. (in press). The effect of meditation on brain structure: Cortical thickness mapping and diffusion tensor imaging. *Social Cognitive and Affective Neuroscience*. doi: 10.1093/scan/nss056

Laurence, J.-R., Beaulieu-Prévost, D., & du Chéné, T. (2008). Measuring and understanding individual differences in hypnotizability. In M. R. Nash & A. Barnier (Eds.), *The Oxford handbook of hypnosis* (pp. 225–253). Oxford, England: Oxford University Press.

Levy, B. J., & Anderson, M. C. (2008). Individual differences in the suppression of unwanted memories: The executive deficit hypothesis. *Acta Psychologica, 127*, 623–635. doi: 10.1016/j.actpsy.2007.12.004

Luders, E., Phillips, O. R., Clark, K., Kurth, F., Toga, A. W., & Narr, K. L. (2012). Bridging the hemispheres in meditation: Thicker callosal regions and enhanced fractional anisotropy (FA) in long-term practitioners. *Neuroimage, 61*, 181–187. doi: 10.1016/j.neuroimage.2012.02.026

Lynn, S. J., Kirsch, I., Knox, J., Fassler, O., & Lilienfeld, S. O. (2007). Hypnosis and neuroscience: Implications for the altered state debate. In G. A. Jamieson (Ed.), *Hypnosis and conscious states: The cognitive neuroscience perspective* (pp. 145–165). Oxford, Engand: Oxford University Press.

Miller, G. A., Galanter, E., & Pribram, K. H. (1960). *Plans and the structure of behavior*. New York, NY: Henry Holt & Co.

Rounis, E., Maniscalco, B., Rothwell, J., Passingham, R. E., & Lau, H. (2010). Theta-burst transcranial magnetic stimulation to the prefrontal cortex impairs metacognitive visual awareness. *Cognitive Neuroscience, 1*, 165–175. doi: 10.1080/17588921003632529

Semmens-Wheeler, R., & Dienes, Z. (this issue). The contrasting role of higher order awareness in hypnosis and meditation. *Journal of Mind-Body Regulation, 2*(1), pp–pp.

Stuss, D. T., & Knight, R. T. (2002). *Principles of frontal lobe function*. Oxford, England: Oxford University Press.

Terhune, D. B., & Cohen Kadosh, R. (2012). The emerging neuroscience of hypnosis. *Cortex, 48*, 382–386. doi: 10.1016/j.cortex.2011.08.007

Weitzenhoffer, A. M. (1980). Hypnotic susceptibility revisited. *American Journal of Clinical Hypnosis, 22*, 130–146.

Woody, E. Z., & McConkey, K. M. (2003). What we don't know about the brain and hypnosis, but need to: A view from the Buckhorn Inn. *International Journal of Clinical and Experimental Hypnosis, 51*, 309–338.

Woody, E. Z., & Sadler, P. (2008). Dissociation theories of hypnosis. In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: Theory, research and practice* (pp. 81–110). Oxford, England: Oxford University Press.