

## **Heterogeneity in high hypnotic suggestibility and the neurophysiology of hypnosis**

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Considerable progress has been made regarding the neural basis of hypnosis and a diverse range of studies attest to its utility as an experimental technique for modulating psychological phenomena in the laboratory and to its clinical efficacy. Against this backdrop, we read with great interest Vanhaudenhuyse et al.'s recent review on the neurophysiology of hypnosis [8], in which they succinctly, but comprehensively, review advancements in this nascent research domain. Here we aim to supplement their review by correcting a mistake concerning heterogeneity in high hypnotic suggestibility and by highlighting the significance of heterogeneity for the neurophysiology of hypnosis.

The extent to which executive cognitive processes are altered in individuals who exhibit high hypnotic suggestibility has important consequences as such alterations may lend insights into atypical frontal or parietal functioning in this population. In reviewing the relationship between hypnotic suggestibility and conversion and dissociative symptoms, Vanhaudenhuyse et al. [8] implied that we found that highly suggestible participants displayed greater responsiveness to hallucination suggestions, greater involuntariness during hypnotic responding, impaired working memory capacity, and greater pathological dissociation and fantasy-proneness than low suggestible participants [5]. Contrary to what they wrote, these differences were only observed in *high dissociative* highly suggestible participants, *relative* to both *low dissociative* highly suggestible and low suggestible participants. The latter two groups exhibited comparable cognitive profiles despite their differences in hypnotic suggestibility. Evidence of heterogeneity within the population of high suggestible individuals helps to illuminate nuances in hypnotic responding that are of profound importance to the neurophysiology of hypnosis.

Multiple studies have presented evidence that is consistent with the proposal that highly suggestible individuals are comprised of discrete subtypes. In addition to the differences described above, low and high dissociative highly suggestible participants have been shown to markedly differ in their responsiveness to particular hypnotic suggestions [4, 5], the impact of a hypnotic induction on selective and sustained attention [3, 6], and the cognitive resources required to respond to hypnotic suggestions [2]. These differences may further help to explain heterogeneous patterns of strategy utilization during responses to hypnotic suggestions [1, 9]. Another study found that the two subtypes uniformly displayed

lower frontal-parietal EEG phase synchrony in the upper alpha frequency band than low suggestible participants following a hypnotic induction, but did not differ from one another [7]. This suggests that differences between these subtypes may be difficult to observe in resting state studies. An outstanding question is whether highly suggestible individuals are indeed comprised of distinct subtypes or whether dissociative tendencies mediate individual differences in cognition and hypnotic responding in this population [10]. Irrespective of whether heterogeneity in this population is better explained by a typological or an individual differences model, heterogeneity is of critical significance for a nascent neurophysiology of hypnosis because it suggests that highly suggestible participants do not experience hypnotic suggestions through uniform mechanisms, and thereby places important constraints on theories of hypnosis that assume homogeneity in this population. Future research and theorizing on the neurophysiology of hypnosis will be greatly strengthened by considering the characteristics of such heterogeneity and the mechanisms that underlie it.

## References

- [1] Galea, V, Woody, EZ, Szechtman, H, Pierrynowski, MR Motion in response to the hypnotic suggestion of arm rigidity: A window on underlying mechanisms *Int. J. Clin. Exp. Hypn.* 2010;58(3):251-268.
- [2] King, BJ, Council, JR Intentionality during hypnosis: An ironic process analysis *Int. J. Clin. Exp. Hypn.* 1998;46(295-313).
- [3] Marcusson-Clavertz, D, Terhune, DB, Cardeña, E Individual differences and state effects on mind-wandering: Hypnotizability, dissociation, and sensory homogenization *Conscious. Cogn.* 2012;21(3):1097-1108.
- [4] Terhune, DB, Brugger, P Doing better by getting worse: Posthypnotic amnesia improves random number generation *PLoS One* 2011;6(e29206).
- [5] Terhune, DB, Cardeña, E, Lindgren, M Dissociative tendencies and individual differences in high hypnotic suggestibility *Cogn Neuropsychiatry* 2011;16(113-135).
- [6] Terhune, DB, Cardeña, E, Lindgren, M Dissociated control as a signature of typological variability in high hypnotic suggestibility *Conscious. Cogn.* 2011;20(3):727-736.

- [7] Terhune, DB, Cardeña, E, Lindgren, M Differential frontal-parietal phase synchrony during hypnosis as a function of hypnotic suggestibility *Psychophysiology* 2011;48(10):1444-1447.
- [8] Vanhaudenhuyse, A, Laureys, S, Faymonville, M-E Neurophysiology of hypnosis *Neurophysiologie Clinique/Clinical Neurophysiology* 2014;
- [9] Winkel, JD, Younger, JW, Tomcik, N, Borckardt, JJ, Nash, MR Anatomy of a hypnotic response: Self-report estimates, actual behavior, and physiological response to the hypnotic suggestion for arm rigidity *Int. J. Clin. Exp. Hypn.* 2006;54(2):186-205.
- [10] Woody, EZ, McConkey, KM What we don't know about the brain and hypnosis, but need to: A view from the Buckhorn Inn *Int. J. Clin. Exp. Hypn.* 2003;51(3):309-338.