TRANCEFORMATION AND HYPNOTIZABILITY: HYPNOTIC INDUCTION AS A DEDUCTION

DAVID SPIEGEL, MD

Stanford University School of Medicine

ABSTRACT

Through a personalized historical account of hypnosis, it is argued that brief testing of hypnotizability is of value to patients and clinicians alike. Recent research shows that hypnotizability is a function of predisposing brain behaviour, and this in turn appears to have a genetic component. These findings support the assertion that hypnosis is not imposed upon a person; it is a skill that some may learn and exercise voluntarily. The wording of the Hypnotic Induction Profile test of hypnotizability (Spiegel et al., 1976) is similarly couched in terms that acknowledge the patient's autonomy.

Key words: fMRI, genetics, Hypnotic Induction Profile, hypnotizability

Hypnosis is about transformation—transforming mental states, focusing attention, restructuring one's understanding of a problem, altering perception of pain, managing stress. It is a capacity, an ability to narrow the focus of concentration, and in so doing put outside of conscious awareness things that would ordinarily be consciousness—dissociation. Hypnosis is not something done to a person. Rather it is a mobilization of their hypnotic abilities. This means that a hypnotic induction is really an occasion to utilize and assess a person's ability to mobilize the hypnotic state—a deduction as well.

In my early psychiatric training, I was puzzled by the fact that many of my psychoanalytically oriented supervisors had experience with hypnosis but had given it up. I made it a practice to ask them why. Some gave me the standard answer that since Sigmund Freud had given it up, who were they to utilize it? Others who had tried it reported one of two types of experience. Either they tried to hypnotize a patient who simply did not respond, and they took it as a personal failure—a narcissistic injury—or they attempted hypnosis with someone who had an extreme response which they found frightening—they wondered what they had done to the patient. The research literature was full of studies using measures of hypnotizability (e.g. Hilgard, 1965), and yet measuring hypnotic responsiveness was not a part of clinical practice.

In fact, evidence was accumulating that hypnotizability is an extremely stable trait. One study retested former Stanford students after a 25-year interval, and found a 0.7 test-retest correlation with their undergraduate scores (Piccione et al., 1989). This is more stable than IQ over such an interval. The finding indicates that in adult life, hypnotizability is an extremely stable trait. Children tend to be more hypnotizable than adults (Morgan & Hilgard, 1972). Indeed, most eight-year-olds are in trances most of the time. They live in their imaginations, and play and work are little differentiated for them.

My father, the late Dr Herbert Spiegel, was teaching a hypnosis course at Columbia University, and started to develop a clinical measure of hypnotizability, the Hypnotic Induction Profile (HIP), which was created initially to teach medical students and residents how to both induce a hypnotic state and measure hypnotic responsiveness. The test was designed to be both brief and suitable for the clinical setting. The standard research scales required 45–50 minutes to administer (Hilgard, 1965) and included items like anosmia (the inability to perceive odour) to ammonia that were both awkward to apply and inappropriate to use with patients. By contrast, the HIP was well suited to the initiation of the clinical encounter. It taught the patient about his or her hypnotic ability, gave them a taste of hypnotic experience, and allowed the clinician to assess the patient's hypnotic ability, all in less than five minutes. This is much shorter than most standard hypnotic inductions.

It had the additional advantage of reducing performance pressure on the clinician, since the goal was transformed from getting the patient into a trance to assessing the patient's ability to experience hypnosis (Spiegel & Spiegel, 1978, 2004). This also decreased the potential for struggle between the patient and the clinician, reducing resistance to perceived pressure from the clinician to perform hypnotically. It also brought the hypnotic experience, often shrouded in mysticism, into the realm of ordinary medical and psychological testing.

I estimate that in my career I have utilized the HIP with about 8,000 patients and research subjects. It is my standard means for introducing patients to the hypnotic experience. I have found it uniformly helpful to patients, and also to me in planning hypnotic interventions. In the roughly one-quarter of cases in which the hypnotic response is so low that subjects are just not hypnotizable, I tell patients that I can be of more help to them by utilizing other approaches, ranging from progressive muscle relaxation to cognitive restructuring without hypnosis to psychotropic medication. There are not many treatments for which we can make accurate predictions of response with a five-minute test.

The HIP induction score has a range from 0 to 10 (Spiegel & Spiegel, 2004). It involves a single structured hypnotic induction assessing both subjective and behavioural response to hypnotic suggestion of: (1) dissociation (the left hand feeling not as much a part of the body as the right); (2) levitation of the hand following its being lowered by the clinician after the eyes have opened; (3) a sense of involuntariness during the elevation of the hand; (4) response to the signal ending the instruction for a sensation of lightness and upward movement; and (5) a sensory alteration of floating, lightness, or buoyancy.

The HIP is a reliable and valid measure. Inter-rater reliability ranges from 0.68–0.76 (Spiegel et al., 1976, 1982; Stern et al., 1978). Scores on the HIP are moderately and significantly correlated with the Stanford Hypnotic Susceptibility Scale (SHSS) at the same level that any one item on the SHSS is with the overall score (Orne et al., 1979; Frischholz et al., 1980, 1981). The HIP is sensitive to clinical diagnostic differences. HIP scores are significantly higher among those with post-traumatic stress disorder (Spiegel et al., 1988; DuHamel et al., 2002; Keuroghlian et al., 2010;) and pseudoepilepsy (Barry et al., 2000), and significantly lower among those with schizophrenia (Spiegel et al., 1982; Pettinati et al., 1990; Frischholz et al., 1992). Higher hypnotizability on the HIP is positively associated with the trait of absorption, a tendency for spontaneous self-altering attention such as getting absorbed in a movie or a novel (Frischholz et al., 1987). Also, scores on the HIP predict outcome of treatment involving hypnosis for smoking control (Spiegel et al., 1993) and flying phobia (Spiegel et al., 1981).

We are learning more about factors that affect the trait of hypnotizability. Our research group has recently shown a reliable difference in functional connectivity of brain regions using resting state functional magnetic resonance imaging (fMRI) (Hoeft et al., 2012). We used the HIP to select matched groups of 12 healthy high-hypnotizable and 12 low-hypnotizable individuals. We examined brain regions previously identified as being associated with the default-mode, salience, and executive-control resting state networks (Seeley et al., 2007; Sridharan et al., 2008).

The default-mode network is active when subjects are completely at rest but awake, not engaged in any particular task. It seems to involve episodic memory retrieval, self-reflection, mental imagery, and stream-of-consciousness processing (Raichle et al., 2001; Greicius et al., 2003; Buckner et al., 2005; Habas et al., 2009). It involves the posterior cingulate cortex/precuneus, medial prefrontal/pregenual cingulate cortices, temporoparietal regions, and medial temporal lobes. The salience network involves monitoring and anxiety, and is involved in detecting, integrating, and filtering relevant somatic, autonomic, and emotional information (Seeley et al., 2007; Habas et al., 2009). It includes the dorsal anterior cingulate cortex (dACC), frontoinsular cortices, and limbic structures involved in emotion and memory. The executive-control network is utilized in completing tasks involving the selection and maintenance in working memory of relevant information necessary for action preparation (Seeley et al., 2007; Habas et al., 2009). It involves the dorsolateral prefrontal cortex (DLPFC) and lateral parietal cortices.

We found greater functional connectivity between the left DLPFC, an executive-control region of the brain, and the salience network composed of dACC, anterior insula, amygdala, and ventral striatum, among high compared to low hypnotizables. This would suggest that the type of attentional focus and cognitive control experienced by highly hypnotizable individuals is related to coordinated conflict detection—absorption in a given task coupled with dissociation of other competing tasks. Such absorbing experiences are also related to a reduced awareness of personal agency during them, which has been referred to as 'self-altering attention' (Tellegen & Atkinson, 1974). Thus we now have a resting state brain signature of high versus low hypnotizability.

There are genetic and neurotransmitter data that support this finding that the DLPFC and dACC play an important role in hypnotizability. These brain regions are rich in dopamine-mediated synapses by virtue of their connections to the mesocortical dopamine system (Raz, 2005). Hypnotizability has been shown to be correlated with levels of homovanillic acid, a dopamine metabolite, in the cerebrospinal fluid (Spiegel & King, 1992). Catechol-O-methyl transferase (COMT), a gene that affects dopamine metabolism, influences prefrontal executive cognition (Goldberg & Weinberger, 2004). An association between a COMT polymorphism and hypnotizability has been shown (Lichtenberg et al., 2000, 2004; Raz, 2005; Szekely et al., 2010). The val/met heterozygous variant is associated with higher hypnotizability than that of homozygotes for valine or methionine, except in one study in which those with the val/val polymorphism were even higher in hypnotizability (Szekely et al., 2010). These polymorphisms are associated with differences in figure/ground attention and attentional control. There are a few known developmental antecedents of higher hypnotizability in adult life. These include positive experiences of imaginative involvements in childhood, such as mutual storytelling or shared reading with parents (Hilgard, 1970). Interestingly, another rather different antecedent

noted by Dr Josephine Hilgard was physical punishment, suggesting that hypnotic-like states are used to establish distance from unpleasant realities (Spiegel & Cardena, 1991).

Thus there is growing evidence that there are neurobiologically meaningful differences among people in hypnotizability that can be reliably measured with straightforward and brief clinical tests. The dACC and lateral prefrontal cortex (PFC) may contribute to hypnotizability and the associated ability to induce sensory control. High-hypnotizable individuals, in contrast to low-hypnotizable individuals, show altered activation in the dACC (Szechtman et al., 1998; Maquet et al., 1999; Rainville et al., 1999, 2002; Faymonville et al., 2000; Derbyshire et al., 2004; Schulz-Stubner et al., 2004; Egner et al., 2005; Raij et al., 2005; Raz et al., 2005) and PFC (Maquet et al., 1999; Rainville et al., 1999; Derbyshire et al., 2004; Raz, 2005) when modulating pain perception, reducing Stroop colour-word naming interference, and at rest when they are in versus out of hypnotic states (McGeown et al., 2009). This suggests that these two brain regions are also involved in top-down modulation of perception during hypnosis.

Hypnosis is the oldest Western conception of psychotherapy, and a powerful means of altering pain, anxiety, and various somatic functions, even under highly stressful circumstances such as during interventional radiology procedures and breast cancer surgery (Colgan et al., 1988; Lang et al., 2000; Lang et al., 2006; Lee et al., 2007; Montgomery et al., 2007). There is a widespread misperception that hypnosis constitutes loss of control, acting like a robot, losing choice. Hypnosis is actually an opportunity to enhance control—over stress, pain, muscle tension, perception, memories, shifts among mental states, emotion. The ability to enter hypnotic-like states is encoded in our brains (or at least some of our brains) for a reason. It is not something one person does to another; it is rather an ability that one person can identify and teach to another. The utilization of hypnotizability testing in the clinical setting reinforces this perspective. We are moving from hypnotic induction to neurohypnotic deduction.

REFERENCES

Barry JJ, Atzman O, Morrell MJ (2000). Discriminating between epileptic and nonepileptic events: the utility of hypnotic seizure induction. *Epilepsia* 41(1): 81–84.

Buckner RL, Snyder AZ, Shannon BJ, LaRossa G, Sachs R, Fotenos AF, Sheline YI, Klunk WE, Mathis CA, Morris JC, Mintun MA (2005). Molecular, structural, and functional characterization of Alzheimer's disease: evidence for a relationship between default activity, amyloid, and memory. *Journal of Neuroscience* 25(34): 7709–7717.

Colgan SM, Faragher EB, Whorwell PJ (1988). Controlled trial of hypnotherapy in relapse prevention of duodenal ulceration. *The Lancet* 331: 1299–1300.

Derbyshire SW, Whalley MG, Stenger VA, Oakley DA (2004). Cerebral activation during hypnotically induced and imagined pain. *Neuroimage* 23(1): 392–401.

DuHamel KN, Difede J, Foley F, Greenleaf M (2002). Hypnotizability and trauma symptoms after burn injury. *International Journal of Clinical and Experimental Hypnosis* 50(1): 33–50.

Egner T, Jamieson G, Gruzelier JH (2005). Hypnosis decouples cognitive control from conflict monitoring processes of the frontal lobe. *Neuroimage* 27(4): 969–978.

Faymonville ME, Laureys S, Degueldre C, DelFiore G, Luxen A, Franck G, Lamy M, Maquet P (2000). Neural mechanisms of antinociceptive effects of hypnosis. *Anesthesiology* 92(5): 1257–1267.

Frischholz EJ, Lipman LS, Braun BG, Sachs RG (1992). Psychopathology, hypnotizability, and dissociation. *American Journal of Psychiatry* 149(11): 1521–1525.

Frischholz EJ, Spiegel D, Trentalange MJ, Spiegel H (1987). The Hypnotic Induction Profile and absorption. *American Journal of Clinical Hypnosis* 30(2): 87–93.

Frishholz EJ, Spiegel H, Tryon WW, Fisher S (1981). The relationship between the Hypnotic Induction Profile and the Stanford Hypnotic Susceptibility Scale, Form C: revisited. *American Journal of Clinical Hypnosis* 24(2): 98–105.

Frischholz EJ, Tryon WW, Fisher S, Maruffi BL, Vellios AT, Spiegel H (1980). The relationship between the Hypnotic Induction Profile and the Stanford Hypnotic Susceptibility Scale, Form C: a replication. *American Journal of Clinical Hypnosis* 22(4): 185–196.

Goldberg TE, Weinberger DR (2004). Genes and the parsing of cognitive processes. *Trends in Cognitive Sciences* 8(7): 325–335.

Greicius MD, Krasnow B, Reiss AL, Menon V (2003). Functional connectivity in the resting brain: a network analysis of the default mode hypothesis. *Proceedings of the National Academy of Sciences of the USA* 100(1): 253–258.

Habas C, Kamdar N, Nguyen D, Prater K, Beckmann CF, Menon V, Greicius MD (2009). Distinct cerebellar contributions to intrinsic connectivity networks. *Journal of Neuroscience* 29(26): 8586–8594.

Hilgard ER (1965). *Hypnotic Susceptibility*. New York: Harcourt, Brace & World.

Hilgard JR (1970). *Personality and Hypnosis: A Study of Imaginative Involvement*. Chicago, IL: University of Chicago Press.

Hoeft F, Gabrieli JD, Whitfield-Gabrieli S, Haas BW, Bammer R, Menon V, Spiegel D (2012). Functional brain basis of hypnotizability. *Archives of General Psychiatry* 69(10): 1064–1072.

Keuroghlian AS, Butler LD, Neri E, Spiegel D (2010). Hypnotizability, posttraumatic stress, and depressive symptoms in metastatic breast cancer. *International Journal of Clinical and Experimental Hypnosis* 58(1): 39–52.

Lang EV, Benotsch EG, Fick LJ, Lutgendorf S, Berbaum ML, Berbaum KS, Logan H, Spiegel D (2000). Adjunctive non-pharmacological analgesia for invasive medical procedures: a randomised trial. *Lancet* 355(9214): 1486–1490.

Lang EV, Berbaum KS, Faintuch S, Hatsiopoulou O, Halsey N, Li X, Berbaum ML, Laser E, Baum J (2006). Adjunctive self-hypnotic relaxation for outpatient medical procedures: a prospective randomized trial with women undergoing large core breast biopsy. *Pain* 126(1–3): 155–164.

Lee JS, Spiegel D, Kim SB, Lee JH, Kim SI, Yang BH, Choi JH, Kho YC, Nam JH (2007). Fractal analysis of EEG in hypnosis and its relationship with hypnotizability. *International Journal of Clinical and Experimental Hypnosis* 55(1): 14–31.

Lichtenberg P, Bachner-Melman R, Ebstein RP, Crawford HJ (2004). Hypnotic susceptibility: multidimensional relationships with Cloninger's Tridimensional Personality Questionnaire, COMT polymorphisms, absorption, and attentional characteristics. *International Journal of Clinical and Experimental Hypnosis* 52(1): 47–72.

Lichtenberg P, Bachner-Melman R, Gritsenko I, Ebstein RP (2000). Exploratory association study between catechol-O-methyltransferase (COMT) high/low enzyme activity polymorphism and hypnotizability. *American Journal of Medical Genetics* 96(6): 771–774.

McGeown WJ, Mazzoni G, Venneri A, Kirsch I (2009). Hypnotic induction decreases anterior default mode activity. *Conscious Cognition* 18(4): 848–855.

Maquet P, Faymonville ME, Degueldre C, Delfiore G, Franck G, Luxen A, Lamy M (1999). Functional neuroanatomy of hypnotic state. *Biological Psychiatry* 45(3): 327–333.

Montgomery GH, Bovbjerg DH, Schnur JB, David D, Goldfarb A, Weltz CR, Schechter C, Graff-Zivin J, Tatrow K, Price DD, Silverstein JH (2007). A randomized clinical trial of a brief hypnosis intervention to control side effects in breast surgery patients. *Journal of the National Cancer Institute* 99(17): 1304–1312.

Morgan AH, Hilgard ER (1972). Age differences in susceptibility to hypnosis. *International Journal of Clinical and Experimental Hypnosis* 21: 78–85.

Orne MT, Hilgard ER, Spiegel H, Spiegel D, Crawford HJ, Evans FJ, Orne EC, Frischholz EJ (1979). The relation between the Hypnotic Induction Profile and the Stanford Hypnotic Susceptibility Scales, forms A and C. *International Journal of Clinical and Experimental Hypnosis* 27(2): 85–102.

Pettinati HM, Kogan LG, Evans FJ, Wade JH, Home L, Staats JM (1990). Hypnotizability of psychiatric inpatients according to two different scales. *American Journal of Psychiatry* 147(1): 69–75.

Piccione C, Hilgard ER, Zimbardo PG (1989). On the degree of stability of measured hypnotizability over a 25-year period. *Journal of Personality and Social Psychology* 56(2): 289–295.

Raichle ME, MacLeod AM, Snyder AZ, Powers WJ, Gusnard DA, Shulman GL (2001). A default mode of brain function. *Proceedings of the National Academy of Sciences of the USA* 98(2): 676–682.

Raij TT, Numminen J, Närvänen S, Hiltunen J, Hari R (2005). Brain correlates of subjective reality of physically and psychologically induced pain. *Proceedings of the National Academy of Sciences of the USA* 102(6): 2147–2151.

Rainville P, Hofbauer RK, Bushnell MC, Duncan GH, Price DD (2002). Hypnosis modulates activity in brain structures involved in the regulation of consciousness. *Journal of Cognitive Neuroscience* 14(6): 887–901.

Rainville P, Hofbauer RK, Paus T, Duncan GH, Bushnell MC, Price DD (1999). Cerebral mechanisms of hypnotic induction and suggestion. *Journal of Cognitive Neuroscience* 11(1): 110–125.

Raz A (2005). Attention and hypnosis: neural substrates and genetic associations of two converging processes. *International Journal of Clinical and Experimental Hypnosis* 53(3): 237–258.

Raz A, Fan J, Posner MI (2005). Hypnotic suggestion reduces conflict in the human brain. *Proceedings of the National Academy of Sciences of the USA* 102(28): 9978–9983.

Schulz-Stubner S, Krings T, Meister I, Rex S, Thron A, Rossaint R (2004). Clinical hypnosis modulates functional magnetic resonance imaging signal intensities and pain perception in a thermal stimulation paradigm. *Regional Anesthesia and Pain Medicine* 29(6): 549–556.

Seeley WW, Menon V, Schatzberg AF, Keller J, Glover GH, Kenna H, Greicius MD (2007). Dissociable intrinsic connectivity networks for salience processing and executive control. *Journal of Neuroscience* 27(9): 2349–2356.

Spiegel D, Cardena E (1991). Disintegrated experience: the dissociative disorders revisited. *Journal of Abnormal Psychology* 100(3): 366–378.

Spiegel D, Detrick D, Frischholz E (1982). Hypnotizability and psychopathology. *American Journal of Psychiatry* 139(4): 431–437.

Spiegel D, Frischholz EJ, Fleiss JL, Spiegel H (1993). Predictors of smoking abstinence following a single-session restructuring intervention with self-hypnosis. *American Journal of Psychiatry* 150(7): 1090–1097.

Spiegel D, Frischholz EJ, Maruffi B, Spiegel H (1981). Hypnotic responsitivity and the treatment of flying phobia. *American Journal of Clinical Hypnosis* 23(4): 239–247.

Spiegel D, Hunt T, Dondershine HE (1988). Dissociation and hypnotizability in posttraumatic stress disorder. *American Journal of Psychiatry* 145(3): 301–305.

Spiegel D, King R (1992). Hypnotizability and CSF HVA levels among psychiatric patients. *Biological Psychiatry* 31(1): 95–98.

Spiegel H, Aronson, Fleiss JL, Haber J (1976). Psychometric analysis of the Hypnotic Induction Profile. *International Journal of Clinical and Experimental Hypnosis* 24(3): 300–315.

Spiegel H, Spiegel D (1978). *Trance and Treatment: Clinical Uses of Hypnosis*. Washington, DC: American Psychiatric Press.

Spiegel H, Spiegel D (2004). *Trance and Treatment: Clinical Uses of Hypnosis*. Washington, DC: American Psychiatric Publishing.

Sridharan D, Levitin DJ, Nenon V (2008). A critical role for the right fronto-insular cortex in switching between central-executive and default-mode networks. *Proceedings of the National Academy of Sciences of the USA* 105(34): 12569–12574.

Stern DB, Spiegel H, Nee JC (1978). The Hypnotic Induction Profile: normative observations, reliability and validity. *American Journal of Clinical Hypnosis* 21(2–3): 109–133.

Szechtman H, Woody E, Bowers KS, Nahmias C (1998). Where the imaginal appears real: a positron emission tomography study of auditory hallucinations. *Proceedings of the National Academy of Sciences of the USA* 95(4): 1956–1960.

Szekely A, Kovacs-Nagy R, Banyai EI, Gosi-Greguss AC, Varga K, Halmai Z, Ronai Z, Sasvari-Szekely M (2010). Association between hypnotizability and the catechol-O-methyltransferase (COMT) polymorphism. *International Journal of Clinical and Experimental Hypnosis* 58(3): 301–315.

Tellegen A, Atkinson G (1974). Openness to absorbing and self-altering experiences (absorption), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology* 83(3): 268–277.

Correspondence to David Spiegel, Willson Professor in the School of Medicine and Associate Chair, Department of Psychiatry and Behavioral Sciences, Stanford University School of Medicine, 401 Quarry Road, Office 2325, Stanford, CA 94305-5718, USA
Email: David Spiegel (dspiegel@stanford.edu)
Website: http://stresshealthcenter.stanford.edu
Phone: +1 650 723 6421
Fax: +1 650 498 6678