

A CRITICAL EVALUATION OF THE RELATIONSHIP BETWEEN SUSTAINED ATTENTIONAL ABILITIES AND HYPNOTIC SUSCEPTIBILITY

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Abstract

During hypnosis, highly susceptible individuals report a loss of awareness of their surroundings and a narrowing of their awareness to the events suggested by the hypnotist. These individuals also report more frequent occurrences of deeply involving experiences in daily life. It has been widely theorized that the ability to strongly maintain the focus of attention underlies hypnotic susceptibility (Crawford, 1994). Studies making use of a range of behavioural measures are widely cited as supporting this view. However, lack of replication and uncertainty about the nature of the measures makes interpretation difficult. The present study uses a factor analytic design ($n = 182$) to explore the structure of the relationship between hypnotic susceptibility, imagery, absorption and a range of behavioural measures said in the hypnosis literature to correlate with susceptibility and to index sustained attentional abilities. If the general claims are correct, similar relationships should be found here. Further, an identifiable sustained attention factor should emerge from the covariance structure, including a substantial loading from susceptibility. These predictions were not supported. Results showed that only absorption correlated significantly with susceptibility. A sustained attention factor did emerge but was independent of the hypnosis absorption factor. Linkages between susceptibility and sustained attention remain undemonstrated.

Key words: correlates of hypnosis, hypnotic susceptibility, sustained attention

Introduction

During hypnosis, highly susceptible individuals typically report loss of awareness of their surroundings and a narrowing of their focus of attention to those events being suggested by the hypnotist (Shor, 1959). In their daily lives these same individuals tend to report bouts of deeply engaged attention where the object of their awareness seems amplified, even to the extent of losing their sense of being a separate self (Tellegen and Atkinson, 1974). These observations lie at the heart of Crawford's (1994) influential proposal that high hypnotic susceptibility is an expression of special abilities for attending exclusively to suggested events (and by implication for disattending to non-suggested events).

There are three key propositions which may be discerned in Crawford's (1994) model of hypnosis as strongly focused attention. First, highly susceptible individuals have superior abilities to sustain the focus of attention compared to those with low hypnotic susceptibility. Second, this has an identifiable neurological basis. That is, highly susceptible individuals possess more efficient far frontal attentional control systems than do individuals with low hypnotic susceptibility. Third, characteristic hypnotic phenomena (for example, hypnotic analgesia) involve the use of highly susceptible individuals' superior attentional and disattentional skills. The present study seeks specifically to test evidence claimed in the hypnosis literature to support the first proposition of the influential model above. It will critically examine the claim that greater sustained attentional abilities among highly susceptible individuals may be inferred from the correlates of hypnotic susceptibility.

A number of earlier studies are repeatedly cited in support of this proposition. Van Nuys (1973), for instance, found the number of intrusive thoughts reported during 15-minute periods of concentrative meditation on a candle and on one's own breathing correlated significantly and negatively ($r = -0.32$ and $r = -0.42$, respectively), with susceptibility as measured by the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A; Shor and Orne, 1962). Van Nuys (1973) concluded that the ability to concentrate attention was a necessary (but not sufficient) precondition for high hypnotic susceptibility.

Wallace, Knight and Garratt (1976) examined the frequency of reported reversals of rotary illusions (the Necker cube (Figure 1) and the Schroeder staircase (Figure 2)) in both highly susceptible and subjects with low hypnotic susceptibility. Significantly more reversals were reported by highly susceptible subjects than by subjects with low hypnotic susceptibility in each instance. Wallace et al. (1976) speculated that highly susceptible individuals are better able to attend to salient cues in the visual display required to experience these optical illusions. The positive relationship between hypnotic susceptibility and the capacity to experience perceptual illusions has been consistently reported by a number of authors employing a wide variety of tasks (Wallace, Garrett and Anstadt, 1974; Miller, 1975; Wallace et al., 1976; Wallace, 1986; Spanos, Deon, Pawlak, Mah and Ritchie, 1989; Crawford, Brown and Moon, 1993).

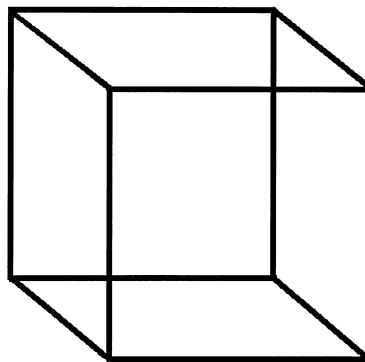


Figure 1: The Necker cube.

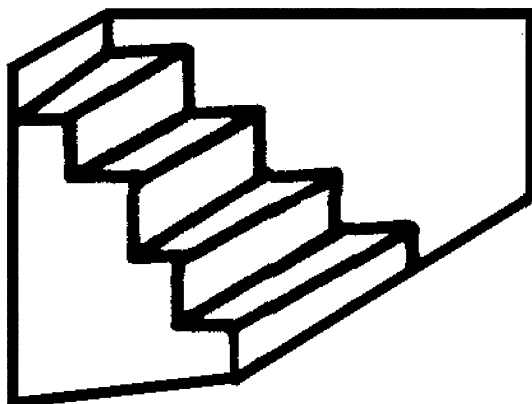


Figure 2: The Schroeder staircase.

Karlin (1979) played participants two stories recorded simultaneously and narrated in the same voice over a single loudspeaker. Later, participants answered questions about the target story to which they had been instructed to attend. Highly susceptible subjects performed significantly better than those with low hypnotic susceptibility. An attempt at rigorous replications of Karlin's findings has been unsuccessful, however (Crawford et al., 1993). Sigman, Phillips and Clifford (1985) did find a positive relationship between a conceptually similar but more objectively scored dual listening task (binaural word pairs) and both performance on the Creative Imagination Scale (CIS; Wilson and Barber, 1978) and on absorption (Tellegen and Atkinson, 1974). As each of the latter measures is a known correlate of standard measures of susceptibility (De Groh, 1989), the binaural word pairs task may be an objective correlate of susceptibility. This finding may lend some support to Karlin's result but requires further investigation.

Though Van Nuys (1973), Wallace et al. (1976) and Karlin (1979) have interpreted their findings in terms of attentional processes it must be recognized that none of their respective tasks are accepted within the cognitive psychological literature as measures of attentional performance. Even behaviourally simple tasks may be cognitively complex and multifaceted. Therefore, interpreting what any task is measuring in a particular context is far from straightforward. For example, though referred to as dichotic listening Karlin's task is quite different from selective attention dichotic listening paradigms. The latter usually deploy at least two, simple, physically distinct auditory stimuli. In Karlin's paradigm the distinction is between two, complex, semantically distinct but physically ambiguous spoken narratives. The relationship of ambiguous figure reversals to attention is simply unknown in the absence of specific research.

Although idiosyncratic and unstudied, the task above with the greatest functional claim as a measure of sustained attention is perhaps Van Nuys's (1973) meditation task. Participants are instructed to sustain their attention continuously for a lengthy period on a single perceptual focus and to report distractions or interruptions in their awareness of the attended percept. Unfortunately, further work using Van Nuys's (1973) meditation task or similar measures has not appeared in the hypnosis literature.

The absence of published replication, quasi-replication or extension of previous findings should be considered as a serious issue by those wishing to understand the relationship between hypnotic phenomena and attentional processes. The establishment of robust findings in this area has yet to be demonstrated. The present study was designed as an initial step in that process.

Should it be the case that several objective performance measures are found to be related to susceptibility, as has been suggested, it will then be important to identify which (if any) aspects of attentional performance are actually indexed by these tasks. Previous arguments (see Crawford et al., 1993; Crawford, 1994) imply that these tasks reflect a single underlying attribute (sustained attentional and disattentional ability) which is related to susceptibility. This implies that a single dimension will underlie the structure of these variables and their relationship to hypnotic susceptibility.

Van Nuys's (1973) meditation instructions call for sustained non-analytic, non-striving attention focused exclusively on a particular content (that is, a candle and breathing). Tellegen (1981), on the other hand, makes a distinction between two different styles of attending: the instrumental and experiential mental sets. The former is characterized by reality-orientated, effortful and goal-directed striving (Roche and McConkey, 1990). The experiential set is defined, in part, as the relinquishing of an 'instrumental set' (Tellegen, 1981). Thus, it is effortless, non-striving and non-volitional in nature. Tellegen (1981) defines the trait of absorption as the tendency to set aside the instrumental set and to adopt an experiential set where circumstances safely allow. In view of the 'entranced' quality of absorption it might be expected to correlate with fewer reported intrusions during a Van Nuys-type task.

One finding of potential relevance comes from an unlikely source. Antrobus, Coleman and Singer (1967) report the findings that high versus low frequency daydreamers had significantly more task-irrelevant thoughts during a rapid rate auditory signal detection task. This study employed a measure of mind wandering or distraction during a task demanding sustained attention performance. At a conceptual level this bears important similarities to Van Nuys's (1973) task. Daydreaming frequency the variable manipulated by Antrobus et al. (1967) is likely to reflect, at least in part, hypnotic susceptibility. Wilson and Barber (1983) coined the term 'fantasy prone personality' to describe this frequent characteristic of many highly and medium-high hypnotically susceptible individuals. On this interpretation this finding appears to contradict that of Van Nuys. Clarification of the relationship between the two measures would assist then, in interpreting Van Nuys's result.

The present study is a factor analytic investigation of the structure of cognitive abilities reportedly surrounding hypnotic susceptibility. Along with tests of susceptibility, objective behavioural responses to experimental tasks are also included. Specifically, intrusions during music meditation and signal detection, with reversals of ambiguous figures and binaural word pairs task are examined in their relationship to susceptibility for a large sample of subjects. Questionnaire measures of absorption (Tellegen and Atkinson, 1974), imagery vividness (the shortened Betts QMI; Sheehan, 1967) and attentional control (distractibility) in everyday life (the attentional control scale of the Short Imaginal Processes Inventory (or SIPI); Huber, Singer, Aneshensel and Antrobus, 1982) were also included. This was to further clarify the relationship of attentional variables with imaginal abilities already associated with hypnotic susceptibility. If Crawford's position is correct, it is predicted that a sustained attentional ability factor will emerge, which includes hypnotic susceptibility.

Method

Participants

A total of 182 first year psychology students at a large Australian university participated in what was advertised as a 'cognitive psychology' experiment in exchange for course credit. The only requirement stated to participants was that they had previously participated in the group hypnotic susceptibility screening 'experiment' which had been run earlier that semester by separate investigators. Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A; Shor and Orne, 1962) scores were later found for 163 of those participants from the records of the group screening experiment.

Measures

Attentional control (SIPI; Huber et al., 1982)

This is a 15-item questionnaire that asks participants to rate self-descriptive statements about attentional control on a five-point Likert scale, ranging from 5 ('very true or strongly characteristic of me') to 1 ('definitely untrue or strongly uncharacteristic of me'). Item content included 'tendencies towards mind wandering and drifting thoughts; easily loses interest; tends to become bored; cannot work at something for a long time; easily distracted by telephone, television set or talking' (Huber et al., 1982, p. 1). Seven items are reverse scored (that is, the higher the score the poorer the level of attentional control).

Binaural Word Pairs Test (BWPT; Sigman et al., 1985)

Twenty-five pairs of short (four letters), familiar, monosyllabic words having dissimilar endings were presented at the rate of one pair every 16 seconds. Both words were presented simultaneously and monophonically over earphones for each trial. Both words were recorded at equal intensities. Participants attempted to record both words in each trial with pen and paper. A score of 1 is given for each word correctly identified allowing a maximum score of 50.

Mental imagery

The vividness of mental imagery across all sensory modalities was assessed by the shortened form of the Betts QMI (Sheehan, 1967). Participants rated the vividness of 35 suggested images on a seven-point Likert scale ranging from 1 ('perfectly clear and vivid') to 7 ('no image present at all').

Absorption

Jamieson's (1987) modified form of the Tellegen Absorption Scale (TAS; Tellegen and Atkinson, 1974) uses a five-point Likert scaled response format and was adopted to assess the self-reported frequency of episodes of 'absorbed' awareness. Each of 34 items was rated on a frequency scale from 0 ('never') to 4 ('very often'). The modified form has superior psychometric properties to the original dichotomous response format (Jamieson, 1987).

Music meditation intrusions

Participants received instructions in 'non-analytic' or 'bare' attending based on Van Nuys (1973). Thought intrusions were defined for participants and they were required to

press a black button connected to an electronic recorder whenever they experienced an intrusive thought during the attentional task. Participants first practised this skill for one minute, focusing their awareness on the perception to the doorknob of the experimental room. Then participants were required to close their eyes and focus their awareness in this way on an engaging piece of classical music (a five-minute pianoforte fugue from Bach's *Brandenburg Concerto Number 5*). The music was played to participants over stereo headphones.

Signal detection intrusions

Participants listened over headphones to randomly ordered 0.5 s pulses of either 1000 Hz or 400 Hz tones of equal volume. Tones were presented against a background of white noise at the rate of one per second, in blocks of 15. There were 25 blocks in all, with a 5 s gap between each block. Volume setting was constant across all subjects but the equipment used did not permit the decibel level to be recorded. Participants were instructed to press a white button whenever they heard the lower frequency tone. Overall, 40% of tones were the low tone. Task-irrelevant thoughts (intrusions) were defined and participants were instructed to press a black button (attached to an electronic counter) in the break after each block of trials if they had experienced a task-irrelevant thought during the preceding block of trials.

Reversible figures

Two figure foreground reversible images — the Necker Cube and the Schroeder Staircase (see figures 1 and 2 shown earlier; based on Wallace et al., 1976) were projected alternately onto a blank wall in front of each participant. Participants viewed each image until they had observed one figure foreground reversal. They then viewed each image continuously for four blocks of one minute each. Order of presentation was Necker cube, Schroeder staircase, Necker cube and Schroeder staircase. Participants pressed a black button connected to an electronic counter to signal the occurrence of each figure foreground reversal during each of the above periods. The total number of reversals was recorded.

Hypnotic susceptibility

This was assessed independently in a separate experiment by use of the Harvard Group Scale of Hypnotic Susceptibility, Form A (Shor and Orne, 1962).

Procedure

Participants were tested individually, facing the door of the experimental room. The experimenter sat to the left rear of each participant, out of view during the objective tasks. On arrival, participants were administered (in the following order) the attentional control questionnaire, then the BWPT, signal detection intrusions, the Betts QMI, the modified TAS, music meditation intrusions and, finally, reversible figures. The experimenter was blind to participants' susceptibility scores.

Previous hypnotic susceptibility testing was conducted by independent personnel in a room physically distant from the room in which the remainder of the tests were applied. Susceptibility measurement was advertised to participants as an independent experiment, which was separated by distance, time (weeks or months earlier) and experimenters from the remainder of the tests. Although the researchers sought to minimize contextual overlap participants must clearly have been aware of some link between the two testing sessions.

Results

Basic distributional data for each of the variables measured in this study are summarized in Table 1. Intercorrelations were calculated among all variables measured and are reported in Table 2. Table 2 shows only absorption correlated significantly with hypnotic susceptibility.

Table 1. Basic descriptive statistics for variables

Variable	Mean	Standard deviation	Number of cases
Attentional control (SIPI)	32.76	8.53	182
BWPT	15.08	3.63	178
Betts QMI	95.26	29.11	182
Absorption (TAS)	66.85	22.54	182
Music meditation (intrusions)	11.49	8.09	179
Signal detection (intrusions)	10.97	9.11	182
Figure reversals	45.26	35.98	182
HGSHS:A	6.31	2.83	163

SIPI – Short Imaginal Process Inventory; BWPT – Binaural Word Pairs Test; TAS – Tellegen Absorption Scale; HGSHS:A – Harvard Group Scale of Hypnotic Susceptibility; Form A.

The correlation matrix in Table 2 was subjected to factor analysis in order to identify the underlying abilities indexed by the various measures. Three factors were selected, both by Cattell's (1966) skree test and Kaiser's criterion of eigenvalues greater than or equal to one (Child, 1970). An oblique promax rotation was selected to allow any relationships among the underlying factors to emerge in the analysis. The factor pattern matrix of this solution is presented in Table 3. Only loadings greater than 0.30 have been included for ease of interpretation.

Factor 1 has high loadings for music meditation intrusions and signal detection intrusions. Accordingly, it was identified as a distractibility (external focus) factor. Hypnosis and absorption most clearly load on Factor 2. Figure foreground reversals have a loading of 0.28 narrowly miss the cut-off for inclusion in this factor. Factor 2 has been identified as a hypnosis/absorption factor. Factor 3 has loadings from attentional control, the BWPT and the Betts QMI and has been identified as a distractibility (internal focus) factor. The oblique rotation allows factors to become correlated to an extent necessary to maximize simple structure. Thus the distractibility (external focus) factor has a correlation of 0.20 with the hypnosis/absorption factor. Distractibility (external focus) correlates 0.52 with the distractibility (internal focus) factor. Distractibility (internal focus) correlates 0.23 with the hypnosis/absorption factor.

Discussion

No evidence was found that performance on a range of standardized tasks was related to hypnotic susceptibility for any experimental tasks included in the present study. By

Table 2. Correlations between variables

Variable	BWPT	Betts QMI	Absorption (TAS)	Music meditation	Signal detection	Figure reversals	HGSHS:A
Attentional control	0.29*	0.24*	0.10	0.32*	0.24*	0.06	0.11
BWPT	–	0.19*	0.13	0.15	0.13	0.14	0.11
Betts QMI	–	–	–0.19*	0.16*	0.07	–0.04	0.04
Absorption (TAS)	–	–	–	–0.04	–0.04	0.24*	0.32*
Music meditation	–	–	–	–	0.34*	0.14	–0.02
Signal detection	–	–	–	–	–	0.08	0.04
Figure reversals	–	–	–	–	–	–	0.08

* $p < 0.05$

BWPT – Binaural Word Pairs Test; TAS – Tellegen Absorption Scale; HGSHS:A – Harvard Group scale of hypnotic susceptibility; Form A.

Table 3. Patter matrix of three factor solution

Variable	Factor		
	1	2	3
SIPI attentional control	—	—	0.44
BWPT	—	—	0.40
Betts QMI	—	—	0.62
Absorption	—	0.90	—
Music meditation	0.73	—	—
Signal detection	0.48	—	—
Reversible figures	—	—	—
HGSHS:A	—	0.36	—

SIPI – Short Imaginal Process Inventory; BWPT – Binaural Word Pairs Test; HGSHS:A – Harvard Group Scale of Hypnotic Susceptibility; Form A.

examining the correlations in the rightmost column of Table 2, it may be seen that from the range of measures included, only absorption was significantly correlated with susceptibility.

Imagery vividness has been reported to correlate with susceptibility in some studies but not in others (Sheehan and Robertson, 1996). The present findings add to that chequered pattern in that scores on the Betts did not correlate significantly with susceptibility. This result may make sense in light of the reported curvilinear relationship of the Betts with susceptibility (Sutcliffe, Perry and Sheehan, 1970). A linear correlation coefficient may not be an appropriate statistic to capture the relationship, even though significant findings are often reported. Previous findings of a significant relationship between imagery vividness and absorption (Spanos, McPeake and Churchill, 1976; Hilgard, Sheehan, Monteiro and MacDonald, 1981; Crawford, 1982) were replicated, however.

Reversible figures also failed to correlate with susceptibility despite previous positive findings (Wallace et al., 1976; Spanos et al., 1989; Crawford et al., 1993). The present study used a much larger sample size than any of the previous studies. In view of this, further clarification of the relationship of reversible figures with susceptibility may well be required. Figure reversals were found to be significantly related to absorption in this study, however. Of considerable interest is the observed independence of intrusions in the music meditation task with susceptibility. Whilst this is not a strict replication of Van Nuys (1973) who used candle and breathing meditation, one would clearly have expected positive findings in this extension of his work. Moreover, intrusions during music meditation correlated significantly with both intrusions during signal detection and the SIPI attention control scale, which adds support to their interpretation as measures of distractibility, that is of failures of sustained attention. This is reinforced by the fact that, though all three measures were significantly intercorrelated, none was significantly correlated with susceptibility.

The underlying structure of the variable set used in the present study may help identify common processes indexed by the variety of measures. Looking at the pattern matrix for the accepted three factor solution (Table 3), simple structure is apparent

adopting the common cut-off value of 0.30 for a meaningful pattern coefficient (Child, 1970).

Factor 1 is closely identified with the music meditation intrusion and signal detection intrusion measures. Both have in common the number of reported distractions experienced whilst directing sustained attention to externally generated (that is, perceptual) stimuli. Factor 1 can be reasonably interpreted as a sustained attentional ability factor, with high scorers less able to ignore (disattend to) distractions over time.

Factor 2 is identified with the absorption and susceptibility variables. This is the factor upon which the attentional measures should load if they are relevant; however, none do. Only figure reversals come close, with a pattern coefficient of 0.28.

Factor 3 is more clearly identified with a high Betts score (that is, poor imagery), poor attentional control (SIPI attentional control scale) and a high score on the BWPT task. The BWPT task is a novel task that, at face value, indexes the ability to discriminate between two words presented simultaneously in the same voice. Poor imagery and poor attentional control, in conjunction, may indicate a poor ability to sustain attention on imaginal events (as distinct from the outer generated events indexed by Factor 1). For reasons not yet clear, the development of superior verbal processing abilities may be incompatible with attending to imaginal representations. Factor 3 is tentatively identified here as indexing the ability to sustain attention on internally generated imaginal events.

Turning to the factor correlations we find that 5% of the variance in the hypnosis/absorption factor is accounted for by the distractibility (internal focus) factor (given by the squared correlation between the factors). The distractibility (external focus) factor accounts for only 4% of the variance in hypnosis/absorption. However, the distractibility (external focus) factor accounts for 27% of the variance in the distractibility (internal focus) factor. Sustained attentional ability is thus suggested to occur in two distinct but related modes, directed to either perceptually generated or self-generated experiences. Neither of these factors was substantially related to the absorption/susceptibility factor.

The only measure found to correlate significantly with hypnotic susceptibility in the present study was absorption. Absorption was measured by a self-report questionnaire of personal experiences in daily life. This is not a behavioural measure selecting performance on standardized objective tasks. Further, an ongoing debate exists as to the proper interpretation of this empirical relationship. Council, Kirsch and Hafner (1986) argued that the relationship between absorption and hypnotic susceptibility is mediated by absorption responses creating response expectancies for hypnotic performance, which is usually tested later in the same context. Though later studies have claimed that this relationship remains significant even when context effects are controlled for (Nadon, Hoyt, Register and Kihlstrom, 1991; Zachariae, Jorgensen and Christensen, 2000) it is clear that context effects are potent contributors to its magnitude. Presumably, response expectancies effecting hypnotic susceptibility (the causal mechanism proposed by Council et al., 1986) cannot be generated by absorption testing carried out weeks to months after hypnosis testing, as occurred in the present study. However, some other sort of context effect cannot be ruled out in the present result.

A replicable finding of even one clearly identifiable, objective sustained attentional ability measure has not been established, either in this study or in the earlier literature. Claims that superior sustained attentional abilities underpin differences in hypnotic susceptibility are, at best, unproven and receive no support from the present results. Whilst the absorption scale has been interpreted as indexing sustained attention skills by

Crawford et al. (1993), this was based on its correlation with their own extremely focused attentional scale measuring self-reported loss of awareness of environmental surroundings. Self-reports of experiences in daily life may perhaps tap attentional phenomena but in themselves are not evidence for superior attentional abilities.

Crawford (1994) reviews neurophysiological studies interpreted as suggesting differences in attentional processes between hypnotized and non-hypnotized conditions. In the absence of reliable differences in behavioural performance measures, however, such findings alone are not sufficient to establish superior sustained attentional abilities in highly susceptible individuals. The neurophysiological and phenomenological self-report findings do imply some role for attentional processes in hypnosis and thus in hypnotic susceptibility. However the nature of that relationship remains to be elucidated.

The time is ripe for a conceptual and empirical re-evaluation of the role of attentional processes in hypnosis. Attention is a multifaceted construct both within cognitive psychology and neuroscience. The future investigation of attention and hypnosis will need to take much greater cognizance of theories and methodologies within these disciplines if progress is to be made toward an integrated scientific understanding of this topic. For example, cognitive psychological researchers David, King and Borkardt (2001) recently argued that negative priming rather than sustained attention underlies a positive relationship between susceptibility and attentional mechanisms. Jamieson and Sheehan (submitted) use the Stroop paradigm to support the very different model of Woody and Bowers (1994) of diminished anterior attentional control in hypnosis.

Future studies must seek to specify which types of attentional processes are involved in hypnosis and how their operation differs between highly susceptible and individuals of low hypnotic susceptibility in and out of hypnosis. In particular, an adequate account should explain the characteristic phenomenological self-reports of highly susceptible individuals, both in the hypnotic condition (Shor, 1979) and in daily life (Tellegen and Atkinson, 1974). What is required is a renaissance not an abandonment of the scientific investigation of attention and hypnosis. However, future research must consider wider possibilities than the initial hypothesis that a high level of hypnotic susceptibility is positively related to sustained attentional ability.

References

- Antrobus, J.S., Coleman, R., Singer J.L. (1967) Signal-detection performance by subjects differing in predisposition to daydreaming. *Journal of Consulting Psychology* 31: 487–91.
- Cattell, R.B. (1966) The meaning and strategic use of factor analysis. In: Cattell, R.B. (Ed.), *Handbook of Multivariate Experimental Psychology*. Chicago, IL: Rand McNally; 174–243.
- Child, D. (1970) *The Essentials of Factor Analysis*. London: Holt, Rinehart & Winston.
- Council, J.R., Kirsch, I., Hafner, L.P. (1986) Expectancy versus absorption in the prediction of hypnotic responding. *Journal of Personality and Social Psychology* 50: 182–9.
- Crawford, H.J. (1982) Hypnotizability, daydreaming styles, imagery vividness and absorption: a multidimensional study. *Journal of Personality and Social Psychology* 42: 915–216.
- Crawford, H.J. (1994). Brain dynamics and hypnosis: attentional and disattentional processes. *International Journal of Clinical and Experimental Hypnosis* 42: 204–32.
- Crawford, H.J., Brown, A., Moon, C. (1993) Sustained attentional and disattentional abilities: differences between low and high hypnotizable persons. *Journal of Abnormal Psychology* 102: 534–43.
- David, D., King, B.J., Borkardt, J.J. (2001) Is the capacity for negative priming correlated with hypnotizability?: a preliminary study. *International Journal of Clinical and Experimental Hypnosis* 49: 30–7.

- De Groh, M. (1989) Correlates of hypnotic susceptibility. In: Spanos, N.P., Chaves, J.F. (eds), *Hypnosis: The Cognitive Behavioural Perspective*. Buffalo, NY: Prometheus Books; 32–63.
- Hilgard, E.R., Sheehan, P.W., Monteiro, K.P., MacDonald, H. (1981) Factorial structure of the Creative Imagination Scale as a measure of hypnotic responsiveness: an international comparative study. *International Journal of Clinical and Experimental Hypnosis* 29: 66–76.
- Jamieson, G.A. (1987) *The Structure and Meaning of Absorption*. Unpublished MSc thesis. University of Queensland, Australia.
- Jamieson, G.A., Sheehan, P.W. (submitted). An empirical test of Woody and Bowers dissociated control theory of hypnosis. *International Journal of Clinical and Experimental Hypnosis*.
- Karlin, R.A. (1979) Hypnotizability and attention. *Journal of Abnormal Psychology* 88: 92–5.
- Miller, R.J. (1975) Response to the Ponzo illusion as a reflection of hypnotic susceptibility. *International Journal of Clinical and Experimental Hypnosis* 23: 148–57.
- Nadon, R., Hoyt, I.P., Register, P.A., Kihlstrom, J.F. (1991) Absorption and hypnotizability: context effects reexamined. *Journal of Personality and Social Psychology* 60: 144–53.
- Roche, S.M., McConkey, K.M. (1990) Absorption: nature, assessment and correlates. *Journal of Personality and Social Psychology* 59: 91–101.
- Sheehan, P.W. (1967) A shortened form of Betts' questionnaire upon mental imagery. *Journal of Clinical Psychology* 23: 386–9.
- Sheehan, P.W., Robertson, R. (1996) Imagination and hypnosis: trends and patterning. In: Kuzendorf, R.G., Spanos, N.P., Wallace, B. (eds), *Hypnosis and Imagination*. Amityville, NY: Baywood Publishing Company; 1–17.
- Shor, R.E. (1959) Hypnosis and the concept of generalized reality orientation. *American Journal of Psychotherapy* 13: 582–602.
- Shor, R.E. (1979) A phenomenological method for the measurement of variables important to an understanding of the nature of hypnosis. In: Fromm, E., Shor, R.E. (eds), *Hypnosis: Developments in Research and New Perspectives* (revised second edition). New York, NY: Aldine; 105–35.
- Shor, R.E., Orne, E.C. (1962) *The Harvard Group Scale of Hypnotic Susceptibility, Form A*. Palo Alto, CA: Consulting Psychologists Press.
- Sigman, A., Phillips, K.C., Clifford, B. (1985) Attentional concomitants of hypnotic susceptibility. *British Journal of Experimental and Clinical Hypnosis* 2: 69–75.
- Spanos, N.P., McPeake, J.D., Churchill, N. (1976) Relationship between imaginative ability variables and the Barber Suggestibility Scale. *American Journal of Clinical Hypnosis* 19: 39–46.
- Spanos, N.P., Déon, J.L., Pawlak, A.E., Mah, C.D., Ritchie, G. (1989). A multivariate study of hypnotic susceptibility. *Imagination, Cognition and Personality* 9: 33–48.
- Sutcliffe, J.P., Perry, C.W., Sheehan, P.W. (1970) Relation of some aspects of imagery and fantasy to hypnotic susceptibility. *Journal of Abnormal Psychology* 76: 279–87.
- Tellegen, A. (1981) Practicing the two disciplines for relaxation and enlightenment: comment on 'Role of the feedback signal in electromyograph biofeedback: the relevance of attention' by Qualls and Sheehan. *Journal of Experimental Psychology: General* 110: 217–26.
- Tellegen, A., Atkinson, G. (1974) Openness to absorbing and self-altering experiences: absorption, a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology* 83: 268–77.
- Van Nuys, D. (1973) Meditation, attention, and hypnotic susceptibility: a correlational study. *International Journal of Clinical and Experimental Hypnosis* 21: 56–69.
- Wallace, B. (1986) Latency and frequency reports to the Necker cube illusion: effects of hypnotic susceptibility and mental arithmetic. *Journal of General Psychology* 113: 187–94.
- Wallace, B., Garrett, J., Anstadt, S.P. (1974) Hypnotic susceptibility, suggestion, and reports of autokinetic movement. *American Journal of Psychology* 87: 117–23.
- Wallace, B., Knight, T.A., Garrett, J.B. (1976) Hypnotic susceptibility and frequency reports to illusory stimuli. *Journal of Abnormal Psychology* 85: 558–63.
- Wilson, S.C., Barber, T.X. (1978) The creative imagination scale as a measure of hypnotic responsiveness. *American Journal of Clinical Hypnosis* 20: 235–49.

- Wilson, S.C., Barber, T.X. (1983) The fantasy-prone personality: implications for understanding imagery, hypnosis, and parapsychological phenomena. In: Sheik, A.A. (Ed.), *Imagery: Current Theory, Research, and Application*. New York, NY: Wiley; 340–78.
- Woody, E., Bowers, K. (194) A frontal assault on dissociated control. In: Lynn, S.J., Rhue, J.N. (eds) *Dissociation: Clinical and Theoretical Perspective*. New York, NY: Guilford; 52–79.
- Zachariae, R., Jorgensen, M.M., Christensen, S. (2000) Hypnotizability and absorption in a Danish sample: testing the influence of context. *International Journal of Clinical and Experimental Hypnosis* 48: 306–14.

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