

MEMORY AND DEPTH OF PROCESSING IN ‘HYPNOTIZED’ AND NON-HYPNOTIZED’ SUBJECTS

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ABSTRACT

Two groups of subjects were compared for their free recall and recognition memory of 40 words, half of which they had processed at the ‘deep’ level and half at the ‘shallow’ level. Prior to testing recall and recognition, one group received a standard hypnotic induction and deepening routine and the other group listened to a ‘dummy’ induction, which consisted of instructions to keep their eyes closed but remain oriented to their immediate situation. Both groups were given identical suggestions for hypermnesia before testing their recall and their recognition. As expected, deeply processed words were recalled and recognized better than shallowly processed ones, but unlike the findings of Shields and Knox (1986), the hypnotic group did not show improved recall and recognition for deeply processed words. In fact the non-hypnotic group had significantly higher recall scores overall than the hypnotic group. Measures of time estimation, awareness of external reality, and relaxation did not discriminate the two groups, indicating that, at least in terms of these experiences, the hypnotic and dummy inductions had no differential effects. *Ad hoc* analysis revealed a significant modest correlation between ratings of unawareness of the real world and deep-shallow processing differences in recall. Some tentative implications for claims of hypnotic hypermnesia are suggested.

INTRODUCTION

In an experiment that tested memory (free recall and recognition) for a list of words, Shields and Knox (1986) found that hypnotized, highly susceptible subjects (Ss) were superior to ‘relaxed/motivated’ high susceptibles and simulating low susceptibles for words processed at the ‘deep’ but not the ‘shallow’ level. Deeply processed words are those for which Ss have to make an immediate semantic decision (e.g., how pleasant or unpleasant they rate it), whereas shallow processing requires a decision based on a structural attribute (e.g., whether there is a letter ‘e’ in the word). Although Ss are not informed that their memory for these words is to be tested later, deeply processed words are generally remembered better than shallowly processed ones (Craik & Tulving, 1975).

Wagstaff and Mercer (1993) failed to replicate the findings of Shields and Knox (1986). Their experiment differed from the latter in a number of respects, notably that their groups were not selected on the basis of susceptibility, but they believe that the crucial difference was not informing Ss that they were participating in an investigation of hypnosis. They believed that otherwise, the demands and expectations (fulfilled and unfulfilled) of the experiment may themselves lead to underperforming by the un hypnotized group. (See Gregg (1993) and Wagstaff(1993) for a further discussion of this.)

The present experiment is a partial replication of the above studies, but it also attempts to address certain logical and methodological problems inherent in many laboratory studies of hypnosis. These are concerned with how one defines whether Ss are 'hypnotized' or 'unhypnotized'.

METHOD

Ss were 40 unpaid volunteers; all were university students from various disciplines (age range 18–23 years). They were randomly allocated to two groups of 20, one 'hypnotic' the other 'non-hypnotic'.

Procedure

It was originally intended not to mention hypnosis at all in this experiment (cf. Wagstaff & Mercer, 1993) but to use appropriate descriptions, namely 'relaxation', 'suggestion', and 'imagination'. However, the experiment was undertaken at a time when allegations of the harmful effects of hypnosis were appearing in the media. Accordingly it was felt desirable to say to *all Ss* that they would be listening to instructions that some people would describe as 'hypnotic suggestions' but their purpose was to help them feel calm and relaxed and at all times they would be completely in control.

The experimental task

Ss heard a list of 40 common words. Prior to each word they heard either the words 'one, two or three' or the words 'positive, negative or neutral'. On hearing the target word they had to say either if it had one, two or three syllables (shallow processing), or if they felt positive, negative or neutral about it (deep processing). The two types of decision occurred in a random binary sequence, 20 of one sort and 20 of the other, and the time interval for making the decision was 3 seconds. A second list was prepared using the same 40 words but for each word in this list the opposite decision was required. Half of the treatment group and half of the control group heard the first list, the rest heard the second list. No instructions were given prior to presenting these lists that Ss would be required to recall the words.

The hypnotic group

S was given preliminary instructions orally by E and a tape recorder was then switched on, with E sitting behind S.

1. The list of 40 words was played and E recorded S's responses.
2. Then followed a 9-minute standard hypnotic induction and deepening routine, starting with the Spiegel eye-roll technique (Spiegel & Spiegel, 1978), then a relaxed breathing procedure, a quick progressive muscular relaxation method, visualization of either a beach or a garden (S was allowed to choose), the idea of a special, safe place on the beach or in the garden, and a 1–10 count with suggestions of deepening relaxation.
3. Following this, S was given a series of suggestions to the effect that he or she would shortly be asked to recall as many of the previous words as he or she was able to remember. It was suggested that S go back in time just a few minutes to when the words were being presented and he or she would be able to recall them clearly, vividly and accurately. These suggestions were repeated firmly several times.

4. There was then a 2-minute silence on the tape, occasionally punctuated by instructions such as 'That's fine, keep recalling as many words as you can — clearly, vividly and accurately.'
5. A short booster induction followed, then further instructions and suggestions of enhanced memory.
6. Forty pairs of words were then presented, only one of each pair having been on the previous list, and S was instructed to say which one this was.
- 7 An alerting procedure followed and the tape was switched off.

The non-hypnotic group

The procedure for the control group was exactly the same except that the induction and deepening phase and the booster induction were replaced by a dummy induction of the same duration. This procedure contained instructions intended to match what would happen if S was simply sitting with eyes closed but remaining alert and attentive to his or her immediate situation. Accordingly he or she was instructed to remain relaxed and comfortable, but alert to what he or she was doing, what was going on in the immediate environment, any external noises, on-going bodily sensations, the time of day, what he or she had been doing immediately prior to coming to the experiment, where he or she intended going afterwards, and so on. At the beginning of this, S was asked to open his or her eyes for a few seconds, look around, then close them again, thus matching the eye-roll procedure of the hypnotic group.

The rationale for using this procedure as a dummy induction was as follows. A common interpretation of the 'trance' component of hypnosis is that S's awareness of his or her immediate environment is attenuated by attending to and being absorbed by inner processes, notably feelings, ideas and imagery. The hypnotic induction and deepening routine may be defined as a series of suggestions intended to encourage S to assume this state of inner absorption (Heap, 1995). Therefore, a control for an induction procedure would be one in which S was given suggestions to remain constantly alert to his or her immediate realities and concerns.

Measures for validating the hypnotic induction and dummy induction

After S was alerted and the tape switched off, he or she was asked the following:

1. How much time in minutes elapsed between closing your eyes at the start and opening them just now?
2. To what extent were you either aware of the real world around you — that is where you were in time and space, your immediate surroundings, the passage of time, and so on — or absorbed in what you were doing and able to set aside your awareness of the real world?
Ss registered their responses on an 11-point scale (0 = 'completely aware of the real world', 10 = 'completely unaware of the real world') for: (1) listening to the word list; (2) during the 'induction'; (3) during free recall; (4) during the recognition task; and (5) at this moment.
3. How relaxed were you? Again an 11 point scale was used ('not at all relaxed' to 'extremely relaxed') for each of the five parts of the experiment.

A time estimation was performed in view of the findings of Von Kirchheim & Persinger (1991) that a hypnotized group of Ss underestimated the passage of time more than a relaxed group. Therefore, time estimation could provide a measure of

the validity of the assumed different effects of the hypnotic and dummy induction procedures.

From the definition of an hypnotic induction given earlier, one would expect that the ratings of *unawareness* of the real world would be higher during the hypnotic induction and afterwards (in the recall and recognition stages) than during and after the dummy induction. This method was chosen in preference to the common practice of asking S 'How hypnotized are/were you?' (Tart, 1970, see also Wagstaff & Mercer, 1993) for a number of reasons, one being that the definition of being 'hypnotized' is largely left to S, making it unclear what the scale is actually measuring.

Likewise, because the hypnotic induction was replete with suggestions of relaxation, the hypnotic group should rate themselves higher than the non-hypnotic group during the induction and the recall and recognition stages (and possibly on alerting).

After these measures were taken, all Ss listened to an audio tape of the Barber Suggestibility Scale (BSS) (Barber, 1965). This was chosen for its brevity, which enabled the experiment to be undertaken comfortably in one session. The prediction is that the more suggestible Ss in the hypnotic group will tend to recall and recognize more deeply processed words (but not more shallowly processed ones) than the less suggestible ones.

RESULTS

Recall and recognition scores

Table 1 gives the number of correct words (1) recalled and (2) recognized by the hypnotic and non-hypnotic groups according to depth of processing (deep or shallow). Both recall and recognition scores were analysed by a 2×2 ANOVA (Group × Processing).

Table 1. Means and standard deviations of recall and recognition scores for the hypnotic and non-hypnotic groups (N = 20 per group) for words processed at the shallow and deep level.

	Recall		Recognition	
	Shallow	Deep	Shallow	Deep
Hypnotic				
mean	2.55	5.65	13.55	18.15
s.d.	1.43	2.30	2.63	1.46
Non-hypnotic				
mean	2.55	7.00	14.60	18.65
s.d.	1.39	1.92	4.10	1.09

As predicted, significantly more deeply processed words were both recalled ($F_{1,38} = 57.80, P < 0.0001$) and recognized ($F_{1,38} = 59.02, P < 0.0001$) than shallowly processed words. It was also predicted that more of the deeply processed, but not the shallowly processed, words would be recalled and recognized by the hypnotic group. Contrary to this prediction, more words were recalled by the non-hypnotic group ($F_{1,38} = 5.86, P < 0.05$), and although it appears that this group's superiority was only for deeply processed words, the Group × Processing interaction was not statistically significant ($F_{1,38} = 1.85, P > 0.1$).

There was no difference in the number of words correctly recognized by the two groups ($F_{1,38} = 1.68$, $P > 0.05$), nor was there the expected significant Group \times Processing interaction ($F_{1,38} = 0.24$, $P > 0.1$).

The effect of suggestibility

It was predicted that the hypnotic Ss' BSS scores (objective and subjective) would correlate positively with the recall and recognition of deeply processed words. For recall, the correlation for objective scores was -0.12 ($t = 1.62$) and for subjective scores, -0.01 ($t = 0.049$), in neither case significant at the 0.05 level. The equivalent correlations for recognition were -0.32 ($t = 1.41$) and 0.01 ($t = 0.04$) respectively, again insignificant. Therefore, the predicted positive correlations did not materialize.

No correlation was predictable between the hypnotic Ss' BSS scores and the recall and recognition of *shallowly* processed words. For recall, the correlation for objective scores was 0.43 ($t = 2.02$) and for subjective scores, -0.08 ($t = 0.36$), in neither case significant at the 0.05 level, though the correlation for the objective score approaches this at $P = 0.06$. (That is there was a near-significant tendency for higher BSS objective scores to be associated with the recall of more shallowly processed words.) The equivalent correlations for recognition were -0.12 ($t = 0.50$) and -0.25 ($t = 1.07$) respectively, again insignificant.

Validation measures

The hypnotic group was predicted to underestimate the passage of time to a greater degree than the non-hypnotic group. The respective mean estimates were 18.15 and 19.25 minutes. The difference is in the predicted direction, but is non-significant ($t = 0.51$, $df = 38$, $P > 0.6$). The actual duration was 23 minutes.

The hypnotic group was predicted to be 'less aware of the real world' during their induction and the recall and recognition stages than the non-hypnotic group. The results in Table 2 show that if anything the opposite was true. There was a slight tendency at all five stages, even before the induction (while listening to the word list) and after alerting, for the non-hypnotic group to rate themselves higher on this scale (i.e., less aware). However, none of the differences was significant using t-tests.

Table 2. Means and standard deviations of awareness and relaxation ratings for the hypnotic and non-hypnotic groups (N = 20 per group): (1) during presentation of the word list; (2) during 'induction', (3) during recall; (4) during recognition; (5) after alerting

		(1)	(2)	(3)	(4)	(5)
<i>Awareness:</i>	Hypnotic					
	mean	3.15	5.88	5.25	5.88	1.45
	s.d.	2.22	2.40	2.55	1.92	1.98
	Non-hypnotic					
mean	4.45	6.30	5.88	6.53	1.73	
s.d.	1.66	1.39	1.97	1.71	2.35	
<i>Relaxation:</i>	Hypnotic					
	mean	4.15	6.75	5.82	6.95	6.35
	s.d.	2.24	1.52	1.60	1.58	1.66
	Non-hypnotic					
mean	5.10	7.12	5.45	6.45	6.95	
s.d.	2.42	1.72	2.01	1.23	2.06	

The hypnotic group was predicted to rate themselves as more relaxed during their induction and the recall and recognition stages than the non-hypnotic group (Table 2). Again, however, there was no significant difference at any stage.

DISCUSSION

This experiment replicated the finding that material designated as having been 'deeply processed' is better remembered than when the same material has been processed at the shallow level (Craik & Tulving, 1975). However, it failed to replicate the findings of Shields and Knox (1986) who obtained better recall and recognition by hypnotized as opposed to non-hypnotized Ss for deeply processed words only. Wagstaff and Mercer (1993) also failed to replicate this finding. Their instructions to Ss did not refer to hypnosis and ours made minimal reference. Another feature of the Shields and Knox study, unlike Wagstaff and Mercer's and ours, was that they used highly susceptible Ss in their hypnotic group, so one possibility is that the effect is only noticeable at higher levels of hypnotic responsiveness. A related argument is that selection of high hypnotizables provides some guarantee that Ss in the 'hypnotized' group are indeed hypnotized. A problem with this, however, is that there is no control for the effect of other non-hypnotic factors on inter-group differences when one selects Ss in this way. This criticism is to some extent answered in the Shields and Knox study by their control group of high hypnotizables but Wagstaff and Mercer (1993, see also Wagstaff, 1993) feel that there are problems here of fulfilled and unfulfilled expectations which may differentially affect Ss' performance. Whatever the case, we might at least have expected some positive correlation between recall and recognition of deeply processed words and scores on the BSS, but these did not materialize.

Another procedural difference between our study and Shields and Knox (1993) was that the material was auditory as opposed to visual, allowing much of the experiment to be automated with the experimenter out of view of S during the processing and recall tasks. As Wagstaff and Mercer (1993) remark in support of their own study, this minimizes inadvertent experimenter influences.

An unpredictable result in our study was the superior recall of the non-hypnotic group. The anomalous nature of this finding is moderated somewhat by the results of the three validation measures (time estimation, awareness of reality, and relaxation), none of which indicated that the hypnotic induction and the dummy induction had the required differential effects according to the understanding of hypnosis presented earlier. Some light may be thrown on this by referring to comments about the two procedures made by a number of Ss. Some of the hypnotic Ss made negative remarks about the induction, saying that they felt they were being 'told what to do'. On the other hand, occasional positive comments were made about their 'induction' by the non-hypnotic Ss, some of whom described it as very relaxing and one S even asked for a copy of the tape. These anecdotal observations lend weight to the impression that the two procedures were really not all that different in their ultimate effects on Ss, but that perhaps the dummy induction was a more agreeable experience for some. (Fellows and Richardson (1993) found that even 'passive-alert' and 'active alert' inductions promoted relaxation in their Ss, though not to the same extent as the 'passive-relaxed' procedure. We do not, incidentally, regard our 'dummy induction' as being equivalent to an alert induction procedure for it contained no direct suggestions that S was becoming more alert, merely instructions to maintain a normal state of awareness to his or her immediate situation.)

Another plausible reason for the superior recall under the latter conditions is that the content of the hypnotic induction procedure, particularly the imagery, may have interfered retroactively with Ss' memory of the original word list. Also, the dummy procedure may have allowed more opportunity for Ss to reflect on the task that they had just done; that is, to rehearse some of the material.

The absence of any differences between the two groups in terms of the criteria for 'hypnosis' is consistent with the evidence and hypotheses concerning hypnotic phenomena which suggest that the role of the hypnotic induction is not to 'put S into an hypnotic state' (this being, in a rather weaker sense, the interpretation adopted for this experiment) but rather to promote an attentional and expectational set that enhances S's responsiveness to the demands of the hypnotist. Thus, as well as traditional direct induction methods, we have indirect approaches (e.g., see Yapko, 1990), alert-active methods (Bányai & Hilgard, 1976), alert-passive methods (Vingoe, 1973), 'task-motivational' instructions (Barber & Calverley, 1962), and 'placebo' inductions such as the inhalation or swallowing of an 'hypnotic' gas (actually air) or pill (Baker & Kirsch, 1993; Glass & Barber, 1961), all of which seem to have a very similar effect in terms of responsiveness to suggestion. It is surprising, nonetheless that, given the explicitness of the suggestions, the 'awareness of reality' ratings during the two 'inductions' did not differ. It may be that there are certain ambiguities in how the scale is to be interpreted and there may be difficulties having to give such ratings retrospectively. This is a detail that requires attention for any future research.

Notwithstanding these doubts, however, inspection of some of the correlations between awareness ratings and recall and recognition scores raised the suspicion of some interesting relationships and a further analysis was conducted. The *ad hoc*, though reasonable, hypothesis was made that if focus of awareness is a salient component of what we agree is meant by 'being hypnotized' then we might expect from Shields and Knox (1986) that 'unawareness of reality' is related to superior memory for deeply processed words. That is, the deep-shallow difference will increase with a more internal focus of awareness (a higher rating on the awareness scale). Inspection of the various correlations between recall and recognition scores and awareness ratings for each level of processing reveals a rather confusing picture. To simplify things, a crude measure of the depth-of processing effect was taken by subtracting each S's scores for shallow processed words from those for deep processed words. Collapsing the two groups (justified on the basis that their validation indices did not differ significantly at any time), we find a positive correlation between awareness ratings during recall and deep-minus-shallow recall scores ($r = 0.34$, $P < 0.03$). The correlation for the recognition task fell short of significance ($r = 0.29$, $P = 0.07$). (The equivalent correlations for *total* recall and recognition scores were both insignificant at 0.04 ($P = 0.78$) and -0.21 ($P = 0.19$) respectively.)

If this were a replicable trend then it would suggest that an inner focus of awareness promotes the retrieval of deeply processed over shallowly processed material. Because we are basing these speculations on somewhat flimsy evidence we do not wish to make any more assertions without the benefit of further research. However, we might make the general inference that the occasionally reported facilitation of information retrieval by hypnosis (as in the Shields & Knox (1986) study) may arise from mundane properties of hypnosis such as internal focus of awareness, and these could be investigated outside of the hypnotic context.

REFERENCES

- Baker, S.L. & Kirsch, I. (1993). Hypnotic and placebo analgesia: order effects and the placebo label. *Contemporary Hypnosis* **10**, 117–126.
- Bányai, E.I. & Hilgard, E.R. (1970). A comparison of active alert hypnotic induction and traditional relaxation induction. *Journal of Abnormal Psychology* **85**, 218–224.
- Barber, T.X. (1965). Measuring 'hypnotic-like suggestibility with and without 'hypnotic induction', psychometric properties, norms and variables influencing response to the Barber Suggestibility Scale (BSS). *Psychological Reports* **16**, 809–844.
- Craik, F.I.M. & Tulving, E. (1975). Depth of processing and the retention of words in episodic memory. *Journal of Experimental Psychology: General* **104**, 268–294.
- Fellows, B.F. & Richardson, J.R. (1993). Relaxed and alert hypnosis: an experiential comparison. *Contemporary Hypnosis* **10**, 49–54.
- Glass, L.B. & Barber, T.X. (1961). A note on hypnotic behaviour, the definition of the situation, and the placebo effect. *Journal of Nervous and Mental Diseases* **132**, 539–541.
- Gregg, V.H. (1993). Hypnosis and memory performance: striking a balance between type I and type II errors. *Contemporary Hypnosis* **10**, 67–69.
- Heap, M. (1995). Hypnosis: applications in general medicine. *British Journal of Therapy & Rehabilitation* **2**, 649–654.
- Shields, I.W. & Knox, J. (1986). Level of processing as a determinant of hypnotic hypermnesia. *Journal of Abnormal Psychology* **95**, 358–364.
- Spiegel, H. & Spiegel, D. (1978). *Trance and Treatment: Clinical Uses of Hypnosis*. New York: Basic Books.
- Tart, C.T. (1970). Self report scales of hypnotic depth. *International Journal of Clinical and Experimental Hypnosis* **18**, 105–125.
- Vingoe, F. (1973). Comparison of the Harvard Group Scale of Hypnotic Susceptibility, Form A and the Group Alert Trance Scale in a university population. *International Journal of Clinical and Experimental Hypnosis* **21**, 169–179.
- Von Kirchenheim, C. & Persinger, M.A. Time distortion: A comparison of hypnotic induction and progressive relaxation procedures. *International Journal of Clinical and Experimental Hypnosis* **39**, 63–66.
- Wagstaff, G.F. (1993). Hypnotic hypermnesia or experimental demands? In search of an explanation. *Contemporary Hypnosis* **10**, 70–71.
- Wagstaff, G.F. & Mercer, K. (1993). Does hypnosis facilitate memory for deep processed stimuli? *Contemporary Hypnosis* **10**, 59–66.
- Yapko, M. (1990). *Trancework: An Introduction to the Practice of Clinical Hypnosis*. New York: Brunner/Mazel.

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