

Hypnosis

Current views on the psychophysiology of hypnosis

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At present there is no definition stating the precise nature of hypnosis and excluding all else. Descriptive but nonexclusive definitions currently offered show a considerable consensus (Orne, 1973). With a slight modification of Orne's view it may be said that *hypnosis is an unusual (or altered) state of consciousness in which distortions of perception (possibly including those of place and time) occur as uncritical responses of the subject to notions from an objective source (usually the hypnotist) or a subjective source (his own memory) or both*. For example, the hypnotist may suggest that the patient sees an object not present, hears music in the absence of sound, smells a rose in the absence of any flowers or scent, cannot move his eyelids when his neuromuscular system is intact, or perceives such lightness of his right arm that it floats upwards. If the subject behaves as if he has such experiences, reports that he has them, and (as far as can be ascertained) believes that he has them, he is regarded as in a state of hypnosis.

The development of this state would usually have been preceded by an induction procedure but this is not a necessary precondition for the existence of hypnosis. We are unable, as yet, to state the conditions that are sufficient for the production of hypnosis.

It is important to note a curious paradox: many subjects, especially those in the lighter hypnotic states, not only retain an objective observation of their own inner experience but also think they know quite well that they are voluntarily suspending criticism and that they could refuse a suggestion or come out of the trance (the hypnotic state) if they so wished.

The above definition is, moreover, wider in its implications than the examples show since subjects may accept into their consciousness (without the hypnotist's instruction) memories of events and emotions as if they were current realities.

Such experiences may occur in hypnotist-induced hypnosis when the subject is left to "freewheel" without suggestions. They may take place when the hypnotist instructs the subject to go back to an earlier point in time (for example his eighth birthday when he is, in fact, 32 years old). They may also occur in spontaneously developing hypnotic states.

Hypnotic experiences are much more like (or possibly identical with) those seen in subjects with an unusual capacity for dissociation. Such people can, in good health, discover a knack of switching off pain at will (for instance at the dentist's surgery) or pathologically may exhibit the nonconsciously determined anaesthesiae or pseudoparalyses of hysteria; they may also exhibit fugue states in which behaviour is out of character for hours or days and amnesia for the related events follows. Very rarely, global alternative organization of their awareness, behaviour, and style of response to stimuli occurs

for substantial fractions of their lives, so that the term multiple personality may be applied. Such easily dissociating subjects are usually readily and deeply hypnotizable.

Spontaneously occurring states in which distortion of perception is apparent are commonplace in intervals between full consciousness and sleep and in situations where sensory stimuli are monotonous and rhythmical (such as when a subject is looking from a steadily moving train at evenly placed telegraph poles while the train's motion is itself rhythmical). Ideas, scenes, and situations (even humorous episodes that make him smile) flow easily through his consciousness as if real, yet the subject is awake and immediately aware of the slightest change in the light or movement in the vicinity. It is sometimes possible for another person to introduce verbal suggestions to subjects in this state with the same success as if they had been hypnotized. These common variants in the normal waking state therefore fall within the operational definition of hypnosis.

Induction of hypnosis usually involves visual concentration on a neutral object (for instance a spot on the ceiling) and listening to the hypnotist's voice until the eyelids close, their muscles being fatigued following an instruction or possibly a suggestion from the hypnotist. The subject's predominating perception is now of the hypnotist's voice alone. The hypnotist lowers his voice until it is barely audible, speaks rhythmically, and repeats vague soporific phrases (like "drowsy, dreamy, sleepy"). He may then conjure up images as a deepening procedure (such as "like lying on a beach on a beautiful warm sunny day — without a care in the world — hearing only the distant sound of the waves — lapping against the low rocks — far down on the shore — and, as each wave comes in — going deeper and deeper — as if you were very deeply asleep — listening only to my voice").

Induction may be carried out "by authority". On the order "go to sleep" the very susceptible subject who knows hypnosis is intended will take this to mean "go into a hypnotic state" and will comply immediately.

There are many techniques but the hypnotist is always a facilitator of a natural process available to any individual. The method of induction is varied according to the innate aptitude of the subject for going into hypnosis and his current degree of anxiety.

Individuals differ very widely in their susceptibility to suggestions, some accepting only impressions of relaxation, heaviness, or warmth and others the notion that a limb is immovable or abnormally light and rising upwards (this actually occurs without subjectively experienced effort). Yet others (a minority) accept that they are much younger, for example a 32-year-old may believe he is only 8 years of age and re-experience a birthday party at which he sees his new presents and

describes them in detail (the accuracy of description may sometimes be confirmed later from other sources).

These phenomena of deep relaxation, arm levitation, and age regression are loosely and quite arbitrarily used to describe depths of hypnosis or trance as light, medium, and deep respectively. Some authorities insist that deep trance implies acceptance of posthypnotic suggestions of amnesia for something that occurred during hypnosis (for example being given the instruction "You will ask for a glass of water 2 minutes after returning to normal consciousness and forget I ever gave you this instruction"). They test this by observing the subject complying with the instruction and rationalizing his compliance because he has no recall of the instruction being given (such as "I am sorry — I just felt so thirsty I had to ask for a drink").

The account of hypnosis above has been restricted to the description of a phenomenon that may be observed psychologically (that is in mental and behavioural terms). Some observations are available that make a physiological theory of hypnosis possible although it cannot yet be defined in neurophysiological terms. Therefore, current views on the psychophysiology of hypnosis may loosely be classified under the headings of psychological theories and physiological theories. The separation into psychological and physiological is essential because it is by these two sciences that we look at man in different ways. Psychological phenomena have neurophysiological concomitants and neurophysiological phenomena may have observable psychological concomitants. Notions of the brain influencing the mind in a causal or consecutive sense or the mind influencing the brain or the body are unhelpful. They may lead to attempts to conceive of a "mind-body interface" — impossible in that mind is an abstract concept — and so into a philosophical quagmire.

Psychological views

Psychological views long preceded the physiological ones and remain of current importance. Charcot (1890) regarded the hypnotic state as a "kind of hysteria" that could be induced in constitutionally predisposed subjects. He was wrong in thinking hypnosis to be restricted to the pathologically predisposed. It is conceivable that the depth of hypnotizability may in part be genetically determined or the result of some facilitating experience early in life. However, there is a lack of relevant data.

Bernheim (1891) of Nancy, working with his older colleague, Liébault, regarded hypnosis (with which they achieved great success among the poor) as dependent on suggestion. Nowadays acceptance of suggestion is usually seen as characteristic of the hypnotic state rather than as a notion advancing ideas about the nature or mechanism of hypnosis.

Janet (1919) had long perceived that the essence of hysteria lay in dissociation and regarded the hypnotic state as a dissociation phenomenon. This key concept was rather surprisingly not emphasized by Freud who came to regard the hypnotic state as arising from an intensely loving relationship on the part of the subject towards the hypnotist. This view resulted partly from his experience of a female patient embracing him when awoken from a hypnotic trance. He remarked "I was modest enough not to attribute the event to my own irresistible personal attraction, and I felt I had now grasped the nature of the mysterious element that was at work behind hypnotism" (Mason, 1960). With his brilliantly speculative mind he formulated the concept of transference to the doctor of loving attitudes that really belonged elsewhere and earlier in life. Transference

phenomena are not uncommon in relationships between subjects and hypnotists, although they may largely be avoided if patients are taught autohypnosis very early in the course of treatment.

More recently Barber (1969), an American psychologist, asserted that all hypnotic phenomena are role-playing with strong motivation.

Numerous early experiments demonstrated that strongly motivated subjects (for example university students who were assured that the experimental task had been carried out successfully by all the healthy American students previously tested, that the conductor of the experiment was extremely grateful for their help, and that they would receive a monetary reward for the successful completion of the task) were found to perform the task just as well in terms of numbers of successes as other subjects in matched groups who had been hypnotized and instructed to carry out the same task. Both groups performed very much better than a control group whose members received neither special motivation nor hypnosis prior to attempting the task. In early experiments the tasks were predominantly of a motor nature, for instance holding one arm up in the air at an uncomfortable angle for half an hour. The fact that strong motivation produced the same result as hypnosis did not, of course, logically prove that strong motivation and hypnosis are identical and nor did it disprove the existence of hypnosis — but it did appear to weaken reason for belief in this nebulous entity.

Such experiments may be criticized on a number of grounds. It is quite possible that the highly motivated subject who is extremely anxious to succeed will evade the painful sensations that are likely to make him drop his arm by concentrating his attention elsewhere. This is, in fact, a component of a standard hypnosis-induction procedure. Detailed subjective accounts of the strategies adopted for success by highly motivated subjects do not appear to have been obtained and made available.

It has, moreover, been pointed out by Orne (1973) that it is not unusual feats of motor behaviour (such as being able to lie suspended horizontally by the ankles and the back of the neck between two chairs) that are indicative of a hypnotic state. The important entity is distortion of perception (which may of course, incidentally enable a subject to carry out otherwise extremely painful procedures).

Although numerous surgical operations have been carried out on hypnotized subjects in whom deep hypnosis was possible, there is no evidence of major surgery having been accepted by subjects who were simply highly motivated to do so. While continuing to reject hypnosis as an entity Barber (1969) has more recently appeared to accept the notion of suggestibility — a quality varying considerably between one individual and another. Therefore, his position now seems close to that of the Nancy school of the late 19th century. If one accepts that the so-called hypnotic state is on a spectrum of states of consciousness in which suggestibility exists to varying degrees, it would seem as though the difference between his views and those of Orne (1973) is largely semantic. Nevertheless, while heightened suggestibility is characteristic of the hypnotic state it is in no way an explanation of it.

Another psychological view worthy of mention is that of Meares (1960). This Australian physician regards hypnosis as a state of atavistic regression, that is a return to a more primitive form of mental function in which logical critical thought is suspended and emotion is left uncontrolled. He suggests that this mental state may possibly be associated with a neurophysiological freeing of the limbic system from cortical control, which means

that the primitive mental function is associated with predominating activity in a more primitive part of the brain.

Physiological views

Many researchers, uneasy about the vagueness of the subject, have sought for neurophysiological and general physiological concomitants of the psychological states described in the hope that it might be possible to define hypnosis in objective physical terms and to state unequivocally whether a subject is hypnotized or not. While it is possible to distinguish clearly between sleeping and waking by the evidence of the EEG, it is not possible to do so between waking states and hypnotic states. Indeed, no single clinical or instrumental measurement and no set of measurements of simultaneously occurring physiological phenomena (for example pulse rate, respiratory rate or depth, blood pressure, electrical skin resistance, basal metabolic rate, ECG, and EEG) can indicate without doubt whether or not a subject is in a hypnotic state. Therefore, no absolute physiological definition is possible.

On the other hand, advances in neurophysiology offer plausible ideas as to the physiological mechanism associated with the induction of hypnosis and grounds for productive speculation as to the neurophysiological concomitants of hypnotic phenomena, hitherto described in psychological terms.

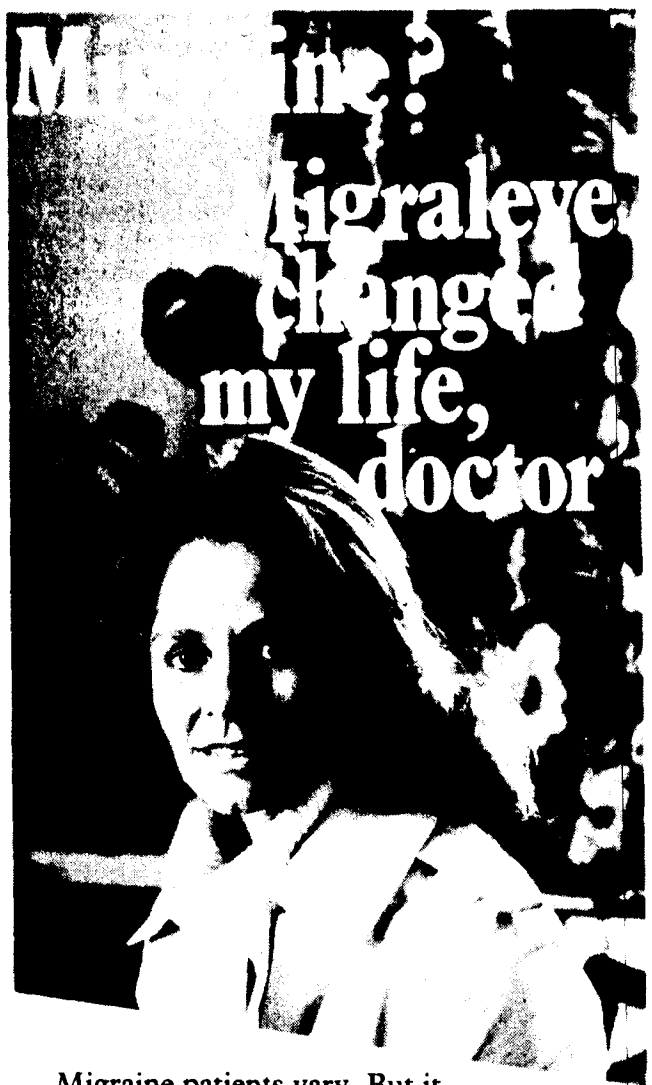
Following the observations of Hernandez-Péon et al (1956) it was proposed by Wyke (1960, 1970) that hypnotic induction involving fixation of the gaze on an object and listening to the hypnotist's voice, followed by eye closure and the concentration of attention entirely upon the hypnotist's voice, was associated with a massive blockade of all sensory pathways (with the exception of the auditory) due to counterdischarges from the brainstem central reticular formation inhibiting sensory input presynaptically and at every synapse on the afferent pathways.

As the hypnotist assumed a monotonous rhythmic mode of speech, habituation to the incoming signals would occur with still further reduction of sensory input. Psychologically the subject would become barely in touch with his environment.

Still further monotonous speech and further habituation might lead to the failure of all environmentally related signals to reach the cerebral cortex via the central reticular formation, which would cease its alerting function so producing the physiological concomitant of sleep.

Meanwhile, if the auditory sensory channel was just kept open by enough variation of tone and content in the hypnotist's statements, an abnormal waking state between ordinary wakefulness and sleep would be established. As the only input accepted through the central reticular formation would come from the hypnotist, the sound signals from his voice would have no competition and the meanings of his words (that is the images, affects, and behavioural predispositions that they may evoke as their psychological concomitants) would be more than usually effective.

Moreover, if the subject was given no input other than words of vague meaning (such as "drowsy, dreamy, and sleepy") or other words conveying vague images (for example "you are walking in your garden") associated ideas might enter his consciousness. The physiological concomitant would be the absence of normal central inhibition (associated with ordinary mixed sensory input) of nerve impulses from the temporal lobes (associated with long-term memory storage) and other association areas, especially in the frontal lobes and the



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References 1) Medical Digest (1972) 7 17 2) Practitioner (1973) 211 357

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limbic system (associated with emotion).

A physiological substrate for the psychological phenomena of daydreaming, free association, and reliving past experience in a vivid manner would therefore exist; in addition the minimal alerting of the cerebral cortex would psychologically be associated with a lack of critical function and little awareness of external reality and its incompatibility with inner experience. Therefore, suggestions from the hypnotist might more readily be accepted as fact. They would also be coded in long-term memory (learning) stores as firmly as extremely strong stimuli or material repeated again and again in ordinary consciousness (that is very rapid learning of new behavioural patterns and attitudes could take place).

This general theory is based on neurophysiological data established over the last 25 years and relates largely to the now known function of the central reticular formation. Its ascending discharges, stimulating the cerebral cortex, are responsible for the alpha rhythm (regular waves of 8–13 Hz) of the EEG observed in the inactive relaxed subject whose eyes are closed. Any activity of the subject, including thinking, gives rise predominantly to faster beta activity (14–30 Hz) in the EEG in the hypnotic state as in the normal waking state. Therefore, qualitative identification of the hypnotic state by the standard EEG is impossible.

However, it might be expected that in the hypnotic state, owing to the relatively decreased facilitation of the passage of sensory impulses in a rostral direction, the central reticular formation would still be generating more discharges associated with the resting alpha rhythm. These would be masked in the standard EEG by fast beta activity, associated (psychologically) with extreme concentration on fantasy.

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With the development of computer analysis of the complex EEG waveforms into simpler wave components, this has been confirmed. Ulett et al (1972) found increased alpha activity and increased fast beta activity on comparing the EEGs of hypnotized subjects with their normal waking EEGs. They also found a significant decrease in slow activity in the hypnotic state.

When poor subjects were given a 10 µg dose of LSD orally, it was found that the drug significantly increased hypnotizability in comparison with placebo and no drug at all. LSD produced a decrease in slow waves and an increase in alpha and fast beta activity in the EEGs of this group. When hypnotized after receiving the drug the subjects showed during trance induction a further decrease in slow waves, increase in alpha waves, and increase in fast beta activity. While the EEG changes seen during the trance-induction period in these poor subjects without LSD administration did not reach a level of statistical significance, the decrease in slow waves and increase in alpha activity was statistically significant during the trance-induction period after the ingestion of LSD.

When poor subjects received dextroamphetamine 10 mg orally, hypnotizability improved to a significantly greater degree than after placebo. Dextroamphetamine was noticed to cause a decrease in slow waves and an increase in alpha activity in the EEG. During trance induction and trance testing a further increase in alpha activity and decrease in slow waves were observed.

It is noteworthy that both LSD and dextroamphetamine are drugs with an "introverting" effect, decreasing contact with the external world through the sense organs and increasing fantasy (the creation of mental images) - sometimes, in the case of LSD, to an extreme and bizarre degree.

Therefore, these physiological and pharmacological experiments confirm that there are characteristic EEG changes (although the general nonanalysed appearances are those of the waking state) associated with entry into and maintenance of the hypnotic state. These changes are mimicked by drugs that produce psychological changes somewhat reminiscent of hypnotic phenomena and which facilitate hypnosis. The changes in the wave components of the EEG in the hypnotized subject are consistent with the expectation arising from Wyke's (1970) neurophysiological theory of hypnosis and its relationship to the activity of the central reticular formation.

In so far as the "hypnotic state" appears to be one of increased suggestibility (in psychological terms) there would appear to be some value in retaining the phrase; there is added justification now that the neurophysiological concomitants and mechanism of induction of this state are at least partially understood.

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