asgn4f -- ALTERED STATES OF CONSCIOUSNESS:
I. Sensory Deprivation, Meditation, and Hypnosis

Consciousness can be altered in many different ways. Drugs and medications can produce hallucinations (perception of things that are not there), change mood, or even wipe out consciousness (anesthetics). High fevers or prolonged starvation and many other forms of stress can have similar effects. Simpler methods also produce altered states of consciousness. This and the following exercises deal with four methods. Three are somewhat unusual: sensory deprivation, meditation, and hypnosis. The fourth is about an altered state we all experience every night: sleep.

Q1. [Mark EACH item True (T) or False (F)]
| T | F | C. removing (almost) all stimulation from the environment |
| T | F | D. meditation and hypnosis |
| T | F | E. the normal daily cycle of consciousness |

Sensory deprivation can affect consciousness and mental functioning. For centuries solitary confinement has been used to try to break down prisoners’ resistance. Scientific study of this subject began in the 1950s, based on work inspired by ideas that the Canadian psychologist D. O. Hebb (1949) proposed.

Figure 1-4f. Reticular formation (RF) in the brain stem. The RF receives inputs from the senses (and many other brain areas as well) and sends excitation to the rest of the central nervous system to wake it up.

Several questions triggered research on sensory deprivation. One was the discovery of the reticular activating system in the core of the brain stem (Magoun, 1954). This was a pivotal discovery in behavioral neuroscience. Moruzzi & Magoun (1949) stimulated the reticular formation in the brain stem in dozing or sleeping cats with weak electrical pulses. This stimulation produces EEG (“brain wave,” see asgn4h) and behavioral signs of normal waking.

Later research showed that other parts of the nervous system activate the reticular formation. One is the body’s ~24-hr internal clock (see asgn4j). Others are inputs from the senses, as illustrated in Figure 1-4f. A loud noise or a pat on the hand awakens you because the noise and the touch activate your reticular activating system.

Increased activity in the reticular formation sends excitation to the rest of the brain, waking it up. This activation (if it is not too strong; see asgn4l) makes other parts of the brain, especially association areas of the cerebral cortex, work more efficiently. These cortical areas play essential roles in perception, attention, and other higher mental functions. Researchers reasoned that sensory isolation should affect how the rest of the brain functioned, because isolation should decrease activation of the rest of the brain and make it work less effectively.

Another reason for research on sensory deprivation was the inadequacy of the drive theory of motivation (see asgn4m). This theory claimed that all motivation came directly or indirectly from body needs, like hunger and thirst. The behavior of humans and other animals with larger brains seems not to fit this description of motivation very well. The opportunity to see something interesting is an effective reinforcer for monkeys (Berlyne, 1966; Butler, 1954). The picture of another monkey was especially effective. Even rats prefer novelty (Dember, 1965). Social motives guide human behavior more than any other motive. A close second is the desire for interesting or exciting activities and experiences. Such ideas led researchers to wonder what would happen if sensory stimulation is very much reduced.

Under Hebb’s influence, Heron (1957) and others decided to test the effects of reducing sensory stimulation on human volunteers. The volunteers were paid simply to stay in a room as long as they could. They wore a blindfold and arm pads to reduce touch, and a steady “white noise” masked (covered up) other sounds. Basic necessities (food, drink, sleep, and toileting) were available as necessary.

The volunteers felt the effects of deprivation quite strongly within a few days. For example, they asked to hear a simple song over and over, apparently to break up the monotony. This finding is similar to the finding that monkeys will repeatedly make a response simply to see a picture. The volunteers had difficulty doing even simple mental tests. Some individuals reported visual hallucinations and possible signs of psychopathology (“mental” disturbance). Later research has dramatically changed the picture of the effects of sensory restriction. First, many early results, especially the more dramatic effects like the signs of psychopathology, cannot be reproduced consistently. (This often happens in a new area.) For
example, normal people individuals rarely show serious psychological aftereffects of deprivation, about 0.03% according to Suedfeld (1975). Some people with pre-existing psychopathology may get worse during and after deprivations, but other get better.

Other features have been reproduced quite consistently. Deprivation increases the attractiveness of any kind of stimulation. Although performance on simple tasks, like simple rote memorizing, improved, performance on more complex tasks was impaired. These tasks require thinking and planning, like making up new uses for common household objects.

The negative effects of sensory restriction appear to depend mostly on the stress it can induce in people.

Even anticipating the isolation can be quite stressful. One study evaluated the effects of expectations about deprivation and its consequences. The experimenter introduced one group of volunteers to the experiment wearing a white lab coat and acted quite stiffly and formally. He emphasized the volunteer’s freedom to stop the experiment if it became too distressing. He had the volunteers fill out forms releasing the research team from liability and gave them a "panic button" if they wanted to end the isolation early. For the remaining volunteers, the experimenter wore casual clothes, was relaxed, and avoided mentioning the possibility of stress or other negative effect. The participants instructed by the first experimenter showed more stress-related effects and quit the experiment sooner (Orne & Schelbe, 1964).

Q2. Early studies of sensory restriction reported dramatic negative effects. Later studies showed that
A. the early reports underestimated the negative effect
B. participants do both complex tasks and simple tasks better
C. most negative effects probably depend on stress and not on the sensory restriction itself
D. participants’ expectations influenced the effects they reported
E. C and D are both correct

More recent research has reported a variety of beneficial effects with considerably more consistency (Suedfeld, 1975, Suedfeld & Coren, 1989). Sensory reduction may play an important, though unacknowledged, role in existing methods of psychotherapy. Methods as diverse as relaxation therapy, psychoanalysis, and primal therapy incorporate sensory restriction in some form as part of their complex procedures.

Sensory restriction has been reported as successful in several areas of behavioral medicine, including stress reduction and habit control. For example, chain smokers who were trying to quit reduced smoking by 40% or more after a deprivation period of 24 hours. Control groups reduced smoking by less than 25%. Many treated smokers still smoked less a year later. This outcome is as good as or better than other kinds of treatment achieve. Because of these beneficial effects, many researchers now call the procedure Restricted Environmental Stimulation Technique, or REST for short.

Q3. If the research reports on the benefits of sensory restriction turn out to be correct, which of the following people might you expect NOT to benefit from such treatment?
A. overweight people who want to change their eating habits
B. people who want to improve mental skills
C. potential heart attack victims who need to reduce life stress and smoking
D. people who have phobias (intense fears) of things like snakes or spiders
E. all of the above can benefit

Meditation

Meditation is a part of many different cultural traditions all over the world. It became quite popular in the U.S. about 30 years ago. It involves clearing the mind and focusing all attention on some single thing, an external object or a word repeated over and over. Focusing attention acts in some ways like sensory reduction, because stimuli out-side the focus of attention do not reach consciousness.

Experienced meditators report great relaxation. Measurements of the EEG ("brain waves") and other body functions seem to confirm this (Wallace & Benson, 1972). The EEG showed intense alpha brain wave activity, characteristic of the relaxed, empty mind. Indian practitioners of yoga can gain remarkable control over body functions. Figure 2-4f shows the changes in three body functions that Wallace and Benson measured from 36 meditators with an average of three years experience meditating.
Oxygen ($O_2$) consumption, which reflects body activity and metabolism, decreased by about 20%. Blood lactate, which reflects anaerobic (without oxygen) metabolism, decreased by about 60%. Skin resistance, which reflects activity of the autonomic nervous system, increased by a factor of 12. These changes all reflect relaxation.

However, a systematic survey of the research on meditation fails to show reliable decreases in body activity compared to resting controls (Holmes, 1984). This report proposes that positive results come only in studies that did not use proper controls, especially relaxed, non-meditating participants. For example the maximum per cent decrease in oxygen consumption quoted above is only 20%. Simple quiet relaxation can achieve this modest reduction. Lifelong meditators may be different, because they apparently achieve much higher reductions in oxygen consumption. Perhaps only highly experienced meditators can produce consistently produce large decreases in body activity, more that what simple relaxation can achieve.

Q4. Forrest has been having a lot of difficulty recently. To ease the stress, he wants to reduce is body's tension. He can do this by __.
A. practicing meditation for a couple of months.
B. use hypnosis to get his body's tension to go down
C. practice relaxing his body (and mind).
D. remind himself of how his muscles feel when they are completely relaxed.
E. any of the above MAY work

Hypnosis:

Hypnosis: A trancelike state or behavior resembling sleep, characterized primarily by increased suggestibility and induced by suggestion. This typical definition of hypnosis came from an on-line dictionary. An excellent printed dictionary (Reber, 1985) does not give a definition. Instead, it lists five characteristic features:

a. Behaviorally the hypnotic state looks something like sleep, but it is not. The EEG ("brain wave") pattern does not resemble any of the stages of sleep (see asgn4l).

b. A hypnotized subject is passive. His/her normal planning functions are reduced.

c. A hypnotized subject's attention becomes very focused on one thing, excluding everything else.

d. A hypnotized subject often becomes very involved in a suggested role.

e. A hypnotized subject often shows effects of suggestion post-hypnotically.

Link to the full dictionary entry on hypnosis.

In the late 18th century, Anton Mesmer (Figure 3-4f), an Austrian physician introduced hypnosis to modern Europe. "Mesmerism" is an older name for hypnosis. You probably know the word "mesmerize," meaning to fix attention very intently. Mesmer evolved what he named "animal magnetism" from his attempts to treat patients with magnets, a procedure satirized in Mozart's opera "Cosi fan Tutti."

After being forced to leave Vienna, he settled in Paris, where his dramatic showmanship and apparently successful cures attracted large crowds. A committee of the French Academy, which included Benjamin Franklin who was then U.S. Ambassador to France, investigated Mesmer's claims. They examined the role of magnetism in his procedure and found it without merit. So Mesmer discarded the magnets, but still referred to "animal magnetism" as the basis of his procedure (Boring, 1950). Link to the story of the early development of hypnosis or Mesmerism.

Hypnosis has had a checkered career in the natural sciences since Mesmer introduced it to Europe in the late 18th century. Periods of strong interest alternate with periods of rejection. Currently, it is a topic of serious scientific investigation and practical application. It is also the subject of overblown hype and exaggerated, but unsupported claims. A simple rule does a good job of telling what's reliable and valid and what's hype: The stronger the claims made for hypnosis, the less likely they are to be reliable and valid.
Few of the websites on hypnosis I found have what I consider scientifically sound information. Many take a small part of this complex process and blow it way out of proportion. Link to a very good article about hypnosis in Scientific American (Nash, 2001).

**Hypnotic Induction**

The only absolute requirement for hypnotic induction is that the subject be willing. A quiet place, relaxation, and focusing attention on something often help induction of hypnosis, but they are not necessary. Hypnotic induction is quite simple. Some highly hypnotizable people can go into a hypnotic “trance” voluntarily, even when exercising vigorously. The induction procedure helps people who are not so easily or deeply hypnotizable enter the hypnotic state.

One important feature of hypnosis is suggestibility (J. Hilgard, 1979). Everyone is suggestible to some extent, as research on memory distortion, for example, shows (asgn3p). The nature of susceptibility in hypnosis is controversial, as it has been throughout its checkered history. Does hypnosis depend on normal suggestibility, or is it a special form of suggestibility, which has different and stronger properties? The answer may be both (Kihlstrom, 1997). E. R. Hilgard (1975, 1986), whose careful research was very important in reviving scientific interest in hypnosis, has written a very good source of information about it. Much of this exercise follows his work.

Hypnotic induction is quite simple. In a standard research induction (E. Hilgard, 1986), the hypnotist asks the subject to listen carefully to him/her and relax and let go. S/he suggests that the subject’s eyes are feeling tired and are closing. S/he asks the subject to focus attention, helped by asking him/her look intently at a small object, like the end of a pencil. (Swinging a bob on a chain back and forth is mainly a gimmick in movies and other fiction to tell the audience that THIS IS HYPNOSIS!) The hypnotist counts slowly to 20, repeating the suggestion. Counting is just a convenient way of creating a monotonous pattern. The alphabet, or slow tapping does as well. These instructions invite the participant to relax, but relaxation is not necessary. Experienced subjects can be hypnotized while working out on an exercise bicycle. Link to a book chapter about measuring hypnotizability. Link to a script for hypnotic induction modified from a standard procedure. Link to a short video showing hypnotic induction.

Hypnosis also uses relaxation and focused attention as do other behavioral methods of altering consciousness: meditation, sensory deprivation, and sleep, especially the dreaming phase of sleep. (During dreaming the brain cuts down sensory inputs to the brain. See Asgn4i and 4j.) Perhaps these common features reflect a basic process creating altered states of consciousness.

**Hypnosis is remarkable for the large effect on consciousness and behavior that suggestion can produce in some people.** The small fraction of people who can go into deep hypnosis are much more suggestible, more imaginative, and more able to create mental images, but they cannot plan or test reality well.

These effects show up in many ways. In some people hypnosis can produce pain control effective enough to permit dental or surgical procedures. Other examples of apparently unusual behavior include “automatic writing” (writing that the writer is unaware of doing) and vivid hallucinations (eg., being unable to recognize which of two images of the same person is real and which is hallucinated). Such effects are not common. They occur in only a small fraction of the population who are especially suggestible. Also, the interpretation of even these very dramatic effects remain controversial, because they can appear in people who are not hypnotized.

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**Q6. [Mark EACH item True (T) or False (F)] Compared to when they are not hypnotized, people under hypnosis**

T F A. accept suggestions and act on them more easily
T F B. picture events better mentally
T F C. can figure out better the steps required to solve a complex problem
T F D. do not check what's real and what's an illusion well

*It is often claimed that people will not do anything against their value system while under hypnosis. This*
is a difficult claim to test for several reasons (Orne, 1972).

1. the hypnotist cannot ethically ask the participant to do something that is illegal or immoral.
2. even if a hypnotist did try such a test, it would depend on knowing what the participant really believed was right and wrong. This information is rarely available, and people in the unhypnotized state do some awful things. So if a person under hypnosis did commit some crime, we would not know whether s/he might have done the same in the unhypnotized state.
3. hypnotized participants might have been willing to do antisocial actions because they knew they were in an experiment and trusted the researchers not to make them do anything really harmful. This is just what happened in a study in which participants were asked to hold a dangerous reptile or to put their hands into concentrated acid and throw the acid at an assistant. Hypnotized participants did these acts, but so did participants simulating hypnosis, and normal, untreated participants. The three groups did these acts about equally. They all said they were sure the experimenter would not ask them to do something really harmful. (Orne & Evans, 1965).

Q7. Andrew is hypnotized, and the hypnotist tells him to slap his wife. If he slaps his wife, this show that
A. Andrew was deeply under hypnosis.
B. hypnosis can override a person's moral standards.
C. Andrew did not think it immoral to slap his wife hard.
D. A and B are both correct.
E. the available information does not let us choose among these alternatives.

Link to an excellent summary of hypnosis and its application. Link to a less technical article about hypnosis. Link to the best general source of information about hypnosis I have found on the web. Link directly to information about theories and explanation of hypnosis in this site.

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Sensory Deprivation, Meditation, and Hypnosis
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asgn4g -- ALTERED STATES OF CONSCIOUSNESS:
Hypnosis (continued)

This exercise describes some of the main features of and controversies about hypnosis:
! how people are hypnotized and what the necessary conditions are for hypnosis
! psychological and physiological differences among people who differ in how easily and deeply they can be hypnotized
! the effects of peoples expectations on hypnosis
! the difficulty in evaluating whether hypnosis is a form of ordinary suggestibility or whether it is something different
! which effects claimed for hypnosis are valid (e.g., psychotherapy, pain control) and which are not (e.g., memory enhancement).

Who can be Hypnotized?

Having a strong imagination and the ability to focus attention predict that a person is likely to be hypnotizable. No standard personality dimension predicts how deeply a person can be hypnotized. A psychological trait that does predict ease and depth of hypnotic induction is imaginative involvement (J. Hilgard, 1979). People who are deeply hypnotizable are likely to become deeply involved in a story they read or a video they watch. They imagine participating in the action the story describes. They are likely to have had an imaginary playmate as a child, and in general they use their imagination a lot.

Behavioral, cognitive, and neurophysiological evidence suggests that a person who can focus attention strongly is more likely to be more deeply hypnotizable (Crawford, 1994). For example, even without hypnosis, highly hypnotizable subjects make reduced pain ratings while keeping their arms in ice water. In contrast, weakly hypnotizable subjects gave the same rating (Farthing et al., 1997).
Everyday experience tells us that focused attention can be quite effective in blocking conscious perception of even very strong stimuli. Once I started to grind my breakfast coffee beans, only to discover that they were already ground. I had ground them quite automatically less than a minute before and failed to notice the rather loud noise the grinder makes.

Even more impressive is the ability to ignore even intense pain when your attention is distracted from it. The exercise on pain (asgn2p) explained people's failure to notice severe injury as the result of stress-released endorphins, the neurotransmitter that opiates, like morphine, mimic. But attention focused on something else besides the pain can also block pain. Programs that treat chronic (long-lasting, permanent) pain teach their clients how to avoid paying attention to the pain. Even a book that really gets you involved can reduce pain. A mystery writer received an e-mail from a fan. It described how her book had eased a dying cancer patient's pain so much that the pain medication could be reduced substantially.

Q1. Dr. Krunchew, the dentist, uses hypnosis to relieve pain during dental procedures. She can predict which patients are more likely to respond to the suggestion from knowing that s/he
A. has a hysterical personality  
B. is introverted (shy, turned inwards)  
C. can focus his/her attention very well  
D. has a strong imagination  
E. C and D are both correct

A small fraction of people, about 1% to 5%, can become very deeply hypnotized. They are very suggestive. In experimental tests only these individuals exhibit the deep analgesia (pain reduction) that permits them to indefinitely tolerate painful stimuli, like surgery or keeping the arm in an ice-water mixture. Unhypnotized individuals don't take to surgery without anesthesia, and they usually take out the arm in about a minute, though people in other setting can tolerate some kinds of pain, like holding the arm in ice water, quite well. Many people hold a foot or arm in ice water as part of physical therapy for injuries.

Q2. (Select the closest answer.) Mort needs surgery on his back. He wants to avoid chemical anesthetics, so he asks about hypnotic pain control. What are the odds that hypnosis will produce enough pain control to permit the surgery? About 1 out of
A. 1  
B. 2  
C. 5  
D. 10  
E. 20

Standardized tests give an estimate of how hypnotizable a person is and how much people vary in hypnotizability. After the standard induction, depth of hypnosis can be assessed with a standard series of tests. The tests include the following suggestions: the arms are so heavy that the participant cannot raise them; the fingers are locked together and cannot be separated; a fly is buzzing around the head; post hypnotic suggestion (after hypnosis, the participant carries out a suggestion given during the hypnotic trance, without remembering the suggestion). The participant receives a point for each task s/he performs. The higher the score, the more deeply the participant was hypnotized.

People differ in how hypnotizable they are as Figure 1-4g shows (data from E. Hilgard, 1986). The red lines show the actual data; the green curves are normal distribution curves fitted (by eye) to the data. About 30% are deeply hypnotizable, passing 16 or more tests. This group forms a separate bulge in Figure 1-4g indicated by the light green curve on the high end of the hypnotic susceptibility scale. This fact suggests that they may form a separate group, which shows "true" hypnosis. The remaining 70% may simply show ordinary suggestability, which can occur without hypnosis. This group includes 15% who pass only four or fewer items of the standard test. People with such a low level or response are considered unhypnotizable.

Q3. After a standard hypnotic induction, the scores that participants get on a standard set of tasks show that
A. participants fall into a smaller high scoring group or a larger low scoring group.  
B. more than half of the people tested could go into deep hypnosis after practice.  
C. some test items predict how hypnotizable a person is better than do others.  
D. participants score higher if a high score is suggested in hypnotic induction.  
E. A, B, C, and D are all correct.
Features of the Hypnotized State

Many people believe that hypnosis has powerful and mysterious effects on the mind, allowing the hypnotist to control them. Popular entertainment has used this belief almost since hypnosis entered the Western consciousness. Many professional hypnotists have done little to discourage this belief, except to explain correctly that the hypnotist guides but does not control.

Hypnosis has been a popular topic in popular culture. One of the classic popular novels of the late 19th century was Trilby (duMaurier, 1894), a story about a nefarious hypnotist, Svengali, who controlled a young woman, Trilby, and made her a great singing star through hypnosis. Figure 2-4f is an example of an illustration from the book showing Svengali hypnotizing Trilby. Link to an extensive list of books, movies, etc. portraying hypnosis.

Reality is much more prosaic. Researchers who study hypnosis agree that mental states produced by hypnosis are exaggerations of normal mental processes that operate all the time. They disagree on which processes hypnosis affects, as asgn4h explains. They do agree that suggestibility and focused attention are importantly involved.

Another important variable is the expectations about hypnosis that people have. Hypnosis produces varied effects in subjects, even ones who are equally hypnotizable. Part of the variation among participants’ depth of hypnosis reflects what they expect hypnotized people should show.

Q4. The reactions that participants show under hypnosis depend on
A. the method of hypnotic induction
B. their personalities
C. what they expect they should show
D. what they do in their imagination
E. A and D are both correct

The 5% of the people tested who are very deeply hypnotized report that the experience is subjectively very "deep." For example, Tart (E. Hilgard, 1986) described the case of William, who reported major changes in conscious experience after extensive practice with hypnosis. Some of the experiences resembled descriptions of mystical experiences, feeling

"a new sense of infinite potentiality... ultimately reaching the sense of oneness with the universe."...
"The experimenter's voice becomes impersonal, the passage of time becomes meaning-less, [and] the body seems to be left behind..."

This description resembles some "psychedelic" experiences that people using drugs like LSD sometimes report. Based on such reports, Hilgard suggested that purely behavioral effects may not be enough to investigate the full potential of hypnosis.

For example, Orne (1970) recruited participants by describing hypnosis to two large classes. In one class he mentioned that people under hypnosis often show catalepsy of the preferred hand; they actually don’t. (Catalepsy is a waxy flexibility, in which an arm or leg remains in the posture in which it is left). In the other class, he did not mention catalepsy. A month later, he recruited volunteers for an experiment in hypnosis from the two classes. Volunteers from the class that was told about catalepsy of the dominant hand showed this effect; volunteers from the other class did not.

For example, even reports of pain from making a small surgical incision in the skin can be decreased by a simple suggestion (Austan et al., 1997). A simple medical procedure requires two incisions into the skin. While cleaning the skin with alcohol before making one incision,
the surgeon mentioned that people differed in how much pain they felt from the incision. This was the control condition. While making the other incision, the surgeon directed the patient's attention to the cooling from the alcohol rub. She then mentioned that cooling the skin tended to numb it, making the incision less painful. This was the experimental condition. The patients reported significantly less pain in the experimental condition than in the neutral control condition, even though the physical stimulation (cooling, skin incision) were the same.

Unconscious suggestion also affects what people report in simple, well-controlled laboratory settings. For example, Intons-Peterson (1983) showed a strong effect of experimenters' expectations on participants' performance on mental imagery tasks. (Mental imagery tasks ask people to create "mental pictures" to do some task). She recruited undergraduate experimenters to test participants on imagery tasks. She explained to half the experimenters why the imagery condition of the experiment should have a larger effect than the control condition with real pictures. She gave an explanation for the opposite result [imagery should have a smaller effect] to the other half.

Participants whose experimenters expected larger imagery effects showed larger imagery effects. Participants whose experimenters expected smaller imagery effects showed smaller imagery effects. Observers who watched the experiments could guess which explanation the experimenter they watched had received, but had no idea how they knew. A careful analysis of tapes of the sessions suggested that the experimenter read critical features of the instructions at a slower pace.

Q5. Suppose a deeply hypnotized subject reports that he feels so light that he is beginning to rise off the reclining chair in which he was sitting. His report is __.
A. an accurate description of what he feels
B. based on his belief that deep hypnosis can make people feel very light
C. in response to a suggestion, which the hypnotist was unaware she made
D. due to his belief that deeply hypnotized people often report this feeling
E. any of the above may be correct.

Brain Activity and Hypnosis

We do not yet have well-defined measure of brain activity that reflects hypnosis. Nevertheless, several measures indicate that the hypnotic state is associated with specific changes in brain function. Keep in mind that these brain correlates of hypnosis all have been found in subjects who are above average in hypnotizability. Measures of brain activity can help explain at least two things about hypnosis:

1. They can tell us what, if anything is special about hypnosis.
2. They can tell us something about the brain and psychological processes that produce the behavioral effects observed under hypnosis.

Several methods of measuring brain activity show the hypnotic state and susceptibility to hypnosis is associated with patterns of brain activity that differ from normal wakefulness. EEG measures during hypnosis (and meditation as well) show increased alpha activity, a condition associated with a relaxed, "empty" mind. The EEG (electroencephalogram) provided the first measures of brain activity during hypnosis. Early studies reported that deeply hypnotizable people show more alpha activity in the EEG ("brain waves") both under hypnosis and in normal mental states (Morgan et al., 1974). Experienced meditators also have unusually large alpha waves also occur during meditation. Normally, alpha activity is strongest during relaxed waking with the eyes closed and the mind "empty." This suggests that the during hypnosis and meditation probably produce mental states that are like the mental state in normal consciousness that goes with increases alpha activity.

PET scans show brain activity in more spatial detail, so they are useful for identifying parts of the brain that become more active or become less active during hypnosis. For example, comparing brain activity during reliving pleasant autobiographical events during normal waking and during a hypnotic state shows that under hypnosis the brain shows widespread activation, especially in the left hemisphere. The activation's distribution closely parallels the distribution of activity produced by mental imagery (Maquet et al., 1999).

Another PET scan study reported a similar distribution of brain activation during hypnotic relaxation (Rainvillea et al. 1999). Figure 3-4g shows the effect of hypnosis on brain activity induced by putting the hand into hot water while hypnotized. Subjects who received suggestion that the water felt painfully hot (brains on the right) showed increased activity (red & yellow areas) in the anterior cingulate area of the limbic system, which processes affect, including "suffering." Subjects who received suggestion that the water felt mildly unpleasant showed no change (Nash, 2001).
A lot of information is available about brain activity associated with attention to and detection of sensory stimulation. Therefore, changes in such measures of brain activity during hypnosis provide good evidence on the processes that hypnosis affects. Such data can serve as a baseline against which to evaluate effects of hypnosis on perceptual processing.

Hypnosis decreases attention’s ability to track changes in stimuli, because hypnosis depresses the supervising part of the attention system in the frontal lobes. Several studies show that hypnotic suggestion can change brain responses to sensory stimulation in the same way that other inter-ventions with similar effects do.

For example, detection of a change in the strength on a touch stimulus is associated with an increased “novelty response” (named P3) to the touch stimulus. Hypnotic suggestion intended to decrease sensitivity to touch stimuli reduces a brain’s P3 response to the touch stimuli (DiPascalis & Carboni, 1997). This result suggests that the hypnotic suggestion had decreased the participants' sensitivity to changes in a touch stimulus. Hypnosis’ effect on pain also appears to reflect a depressed supervising function of the frontal lobes. The attention-directing system than modifies information transferred through the pain perception system to decrease the reaction to pain (Crawford et al, 1998).

Applications of Hypnosis

Some hypnotists make greatly exaggerated claims for the effectiveness of hypnosis in dealing with many different physical and psychological problems. Other hypnotists restrict its use largely to conditions that research has show (probably) respond to hypnosis; their claims for hypnosis are much more modest. Several conditions respond or probably respond to hypnosis. Pain reduction is the most clearly supported application. Other conditions that may respond include cancer chemotherapy-related distress, and enuresis (bed-wetting) in young children, adjunct (~addition to) to cognitive-behavioral psychotherapy, asthma, skin disorders, anxiety about medical and dental procedures, stopping smoking, and treatment of post-traumatic stress disorders (Nash, 2001).
conditions hypnotic suggestion was more effective than the other three, including morphine, the standard against which pain treatment is usually assessed. However, experimental pain is a form of acute pain, which lasts for seconds or minutes. Morphine is not very effective on this kind of pain, so one cannot conclude from such studies how well hypnosis can control longer lasting pain.

Only in a small fraction of the population can control strong pain that lasts for a long time (a few hours or more). About 5% of the people tested can go into hypnosis that is deep enough to undergo surgery or dentistry. A higher percentage can hold an arm in ice water and report very little pain after suggestion that their arm feels no pain. They can keep the arm in the ice water much longer than unhypnotized controls. However, unhypnotized people in other settings can tolerate some kinds of pain, like holding the arm in ice water, quite well. Many people hold a foot or arm in ice water as part of physical therapy for injuries, but most describe the cold as painful.

People who can tolerate strong pain often use imagery to modify their perception of the pain. Some imagine their arm to be a rubber hose. Others imagine that the pain is really just tingling or that it drips off the end of the fingers. Of course, unhypnotized people can do this too, as many of you know from having iced injured arms or legs. The process is painful, at least at first, and not one that people do without a strong reason.

Memory recovery

*Memories "recovered" under hypnosis are no more accurate than other memories, but people become more confident in their recall.* Memory recovery or enhancement is a controversial application of hypnosis. Although, some hypnotists claim that hypnosis successfully retrieves or enhances memories, well-controlled research shows no support for this application. Hypnosis does loosen a subject's criterion for reporting a memory without increasing sensitivity ("accuracy").

For example, hypnosis has been used to help people recover apparently lost memories. In some cases it has been possible to test accuracy the "memories" retrieved by hypnosis. The memories are no more accurate (sensitivity unchanged) than those retrieved by careful questioning without hypnosis. However, the witness is more confident about his/her accuracy and give more details (criterion looser), many of which may be inaccurate. Controlled laboratory studies to evaluate memory recovery using verifiable (checkable) events to recall give the same result. Furthermore, hypnosis can produce memories of situations in which the observer could not possibly have seen what s/he reported. In general, hypnosis does not enhance memory any more than does careful questioning (Lynn et al., 1997). The increased confidence makes witnesses more persuasive when testifying at a trial, for example, but not more accurate.

Q7. Trina witnesses an armed robbery but can remember little about what happened. If she is hypnotized to help her recall more about the robbery and identify the robber, Trina will probably

A. describe what she remembered happening in more detail.
B. be more confident about what she remembered happening.
C. focus more on important things she saw.
D. describe what actually happened more accurately and completely.
E. A and B are both correct.
F. A, B, C, and D are all correct.

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Theories of Hypnosis

This exercise summarizes the two main kinds of theories about hypnosis. Although both have strong supporters, the data remain inconclusive on which one is correct. A good bet is that each describes different features of hypnosis and/or different kinds of subjects.

Dissociation theories state that hypnosis somehow dissociates one (or more) parts of the mind from the rest of the mind. The dissociated part functions adequately, but cannot get to the normal communication systems in the rest of the mind. Therefore, the undissociated part of the mind must work without that information.
Social Role theories state that hypnotic effects are exaggerated versions of normal suggestibility operating in a setting that encourages subjects to feel free to follow the hypnotist’s instructions. In this view hypnosis is an extension of normal suggestibility and focused attention.

Theories of Hypnosis: Dissociation and Social Role

Scientists doing research on hypnosis divide into two groups. They differ on this basic question: Does hypnosis produce a real altered state of consciousness, or does it reflect the exaggerated action of normal social and cognitive processes? The answer is probably both – as usual.

Dissociation theories and Social Role theories are the main accounts currently used to try to explain the phenomena of hypnotism. Several theories of hypnosis have been proposed over the years. Currently, most theories fit into one of two groups. One is best represented by Neodissociation theory (E. Hilgard, 1986), which claim that hypnosis can alter consciousness by separating (dissociating) a part of consciousness from other parts. The other group can be called Social Role theories (e.g., Sarbin & Coe, 1972; Barber, 1969) which emphasize the implicit (unspoken, unconscious) social agreement between the hypnotist and the subject and the role of normal suggestibility.

Neodissociation theory is an updated (neo = new) version of an old idea: hypnosis represents a dissociation (separation) of parts of the mind. According to Hilgard’s version, hypnosis somehow disconnects one part of the mind from the normal conscious control over the speech system (though not other response systems). The disconnected part of the mind remains functional but cannot gain access to the response system we measure most easily: verbal report.

Q1. Neodissociation theory states that if you are hypnotized
A. a part of your mind cannot work
B. your speech system is cut off from the rest of the mind as in isolation aphasia
C. a part of your mind is cut off from the rest of the mind including the system that controls speaking
D. the hypnotist has dissociated your language system to his control
E. your speech system shuts off and makes a part of the mind inactive

The hidden observer is the process that can report on the content of the hypnotically dissociated part of the mind. A very interesting source of evidence for this position is the “hidden observer,” which Hilgard (re)discovered during a class demonstration (E. Hilgard, 1986, p. 186). He hypnotized a blind student and suggested that he was deaf. When the student failed to respond to his name and to loud noises, a class member asked whether some part of the subject’s mind might hear. Hilgard then asked the subject to raise his finger when he was touched on the shoulder if he could hear.

When Hilgard touched the subject on the shoulder he raised his finger and then asked to be unhypnotized. The subject reported that he felt his finger rising without knowing why. Hilgard named this effect the hidden observer: a part of the mind that could take in information but had no access to the normal response system of language.

Q2. The hidden observer refers to
A. an observer of the hypnotized subjects that the subjects can’t see
B. the process that can report on part of the mind that hypnosis has disconnected from other parts of the mind
C. the response system used to test hypnosis in blind and deaf subjects
D. the mind during deep hypnosis

To get information from the hidden observer, Hilgard used a different response system: some form of “automatic responding, in which an action, like writing or key pressing occurs with apparently little conscious, voluntary control. Automatic writing can be induced in several ways. The tester puts a pencil in the subject’s hand and rests it out of sight on a sheet of paper. One procedure involves having the subject do a demanding mental task. With practice, the hand begins to write, though the subject must continue direct attention to the mental task.
This kind of automatic writing resembles automatic processing described in exercises asgn3o and asgn4c. A skilled typist can do what is quite like automatic writing. S/he can keep on typing while doing something else, like talking on the phone, because the typing is so well practiced that it is largely automatic. Another way to produce automatic writing has the hypnotist suggest a lack of awareness to the hidden hand. In his studies of the hidden observer, Hilgard suggested to the hypnotized subject that his/her hand would write what the dissociated mind experienced. The rest of the mind appears to remain unaware of the writing.

Automatic responding can generate responses that appear to report on the dissociated part of the mind, which cannot access the speech system. For example, when a deeply hypnotized subject is tested for pain in the ice water test, s/he orally reported little or no pain. According to Neodissociation model the dissociated part of the mind is the part that normally deals with pain; it is still doing this job, but it cannot report the pain through the normal language system.

The hidden observer can report on the contents of the dissociated part of the mind through automatic responding, in this case key pressing. At the same time the observer orally reports little pain from the ice water, his/her automatic key pressing produced higher ratings, though not as high as s/he gave when unhypnotized. Figure 1-4h (data from E. Hilgard & J. Hilgard, 1975) illustrates this. The curve labeled Normal on the graph refers to the volunteer’s spoken pain ratings without hypnosis. Overt (~exposed, visible) refers to the volunteer’s spoken pain ratings under deep hypnosis. Covert (~hidden) refers to the ratings the volunteer made under hypnosis using automatic key pressing to access the dissociated part of the mind.

Q3. Monica has been deeply hypnotized, and the hypnotist has suggested to her that she cannot see anything on her left. When asked to describe a picture to her left side, she says she cannot see anything. If the hypnotist asks the hidden observer to report, you would expect it

A. to give overt responses  
B. not to respond because the picture’s image goes to the non-speaking right hemisphere of the brain  
C. to report on the picture correctly  
D. to report that something is there, but can’t tell what it is or what it looks like

Physiological measures like blood pressure and heart rate during this pain test show increases characteristic of pain, although the subject orally reports none. The reactions are, however, not as strong as during the unhypnotized state. Such data can be interpreted as showing that a part of the mind has been dissociated (disconnected) from the conscious language system. It still has access to other response systems, and can be accessed by the automatic writing.

Q4. To control pain from dental work, a hypnotist suggests to a deeply hypnotized subject that her mouth feels no pain. During the dental work she does not complain of pain. Her body reactions (heart rate, blood pressure, etc.) show that

A. the dissociated part of the mind does not feel pain  
B. the hidden observer is incorrect when it reports pain in the dissociated part of the mind  
C. the dissociated part of the mind still reacts to pain normally, but less strongly  
D. A and B are both correct

Social Role models states that hypnosis uses ordinary suggestion and focused attention in a specific social setting. The hypnotist, the subject and any others present all know the socially defined rules of the hypnotic setting. So the hypnotist and the subject have an unspoken agreement: The subject agrees to follow the hypnotist’s suggestions, and the hypnotist will not suggest anything that is really
harmful to the subject. Everyone else present also knows these rules, so the subject is freed from many of the restrictions that normally guide behavior, especially in public. According to this model, there is no special alteration of consciousness. Instead, hypnosis represents an enhancement or exaggeration of people’s normal suggestibility, expectations, and focused attention.

Q5. According to Social Role models, a hypnotized person is willing to put a hand into what s/he thinks is a bowl of strong acid that would severely burn skin because
A. s/he understands without specifically being told that the hypnotist will do no harm
B. the hypnotist takes the dominant social role and the hypnotized person takes the recessive social role
C. s/he has agreed without specifically saying so to follow the hypnotist's instructions
D. the subject expects that hypnosis has made the hand immune to harm
E. A and C are both correct
F. A, B, C, and D are all correct

The Social Role model can explain the fact that subjects simulating (~faking) hypnosis can mimic most (if not all) features of hypnosis. Consider the items on the standard test of hypnotizability. Any of them are easily faked or simulated. Even apparently very difficult tasks, such as lying supported only by the head and feet, are not very difficult to do.

Hypnotized subjects can do some things better than can unhypnotized subjects who try to fake hypnosis, but the differences are rather subtle. The following are some of the tasks on which they do better.

They show better posthypnotic suggestion when the suggestion is assessed outside the testing situation. For example, both hypnotized subjects and simulators follow posthypnotic suggestion to scratch the ear when someone coughs in the testing situation. But when the secretary who pays them for their participation coughs as they leave, the hypnotized subjects are more likely to respond to the suggestion and scratch the ear. Perhaps simulators believe the experiment is over and quit simulating.

Very deeply hypnotized subjects show more pain reduction than do unhypnotizable subjects who receive relaxation instruction.

Deeply hypnotized subjects can have hallucinations so real that they show a "double take" when they see the real and the hallucinated target at the same time and have difficulty telling which is real (Orne, 1962).

Q6. People who pretend to be hypnotized ___.
A. can simulate all features of hypnosis
B. do not continue post-hypnotic suggestion outside test situation
C. cannot simulate the pain reduction that very deep hypnosis can produce
D. cannot simulate any of the standard hypnotic test items
E. B and C are both correct

Hypnosis can produce both positive and negative hallucinations. A subject has a positive hallucination if s/he perceives something that is not there. S/he has a negative hallucination if s/he fails to perceive something that is there.

Many visual illusions depend on the relation among different parts of the stimulus pattern, like the Ponzo illusion in Figure 2-4h. The two horizontal lines are objectively the same length, but the converging lines induce a sense of depth which makes the upper line look longer. When the hypnotist suggested that the inducing stimuli (the converging lines) were invisible, hypnotized subjects said they no longer saw them, but they still reported the length illusion. Therefore, the invisible converging lines still affected the perception of line length (Miller et al., 1973). According to dissociation theory, this kind of result implies that the dissociated part of the mind is separated only from the system controlling verbal reports. The system that processes (visual) sensory information functions normally. Electrical recordings and PET scans show that the sensory system functions normally.

According to neodissociation theory, hypnosis dissociates only the perception of the inducing background. Although it becomes unavailable to consciousness, the inducing background still affects the perception of the horizontal lines before it reaches consciousness. The dissociation affects only the conscious perception of the inducing stimuli, which can still influence perception of other parts of the stimulus. Social role theory would explain the effect as the subject’s social compliance with the hypnotist’s suggestion.
Q7. Many optical illusions depend on an illusion-inducing part of a pattern changing the perception of the target part of the pattern (the part that is perceived incorrectly). If hypnotized observers receive the suggestion that they cannot see the inducing part, then ___.
A. the target part also disappears
B. the target part looks the way it does when there is no inducing part to affect perception
C. the inducing part still affects the target part
D. the target part breaks down into its sensory elements

One possible resolution of the different interpretations of hypnosis is the following: There may be two populations that respond to hypnosis differently, as described in the preceding exercise (asgn4g). Social role theories may describe the majority, who score lower than 9 on the 12-point hypnotic induction scale. These people may show only ordinary suggestibility, which can be produced without hypnosis. That suggestibility is enhanced by the social roles hypnotist and subject take. Dissociation theories may describe the 30% of people who have high scores (10 or greater) on the measure of hypnotic induction. These people may go into "real" hypnosis, in which suggestibility is enhanced, consciousness is significantly altered and separated into isolated parts, which normally communicate with each other. Perception and information processing are apparently modified at least to some extent in the people who fit into this group.

Q8. Barber's social role theory _____, whereas Hilgard's neodissociation theory _____.
A. is correct; is incorrect
B. is incorrect; is correct
C. may account for the 70% of people who are not deeply hypnotizable; may account for the 30% of the people who are deeply hypnotizable
D. emphasizes social aspects of hypnosis; emphasizes cognitive and perceptual aspects of hypnosis
E. C and D are both correct