Cognitive Correlates of Hypnotizability and Imaginativity: A Movement Towards a Perceptual Control Model of Hypnosis

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ABSTRACT

Cognitive Correlates of Imaginativity and Hypnotizability: A Movement towards a "Perceptual Control Model" of Hypnosis

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Recent studies suggest an association between hypnotizability and superior frontal abilities (Crawford et al., 1998; Ray et al, 1998). Recent findings emphasize the role of Response Expectancy (RE) in predicting suggestibility (Braffman, & Kirsch, 1999; Council, 1999). This study had two aims: Firstly, to investigate cognitive correlates of hypnotizability and imaginativity. Secondly, to examine cognitive processes associated with RE and responsivity to different types of hypnotic suggestions. Eighty four participants completed RE questionnaire in two sessions, assessing behavioral and subjective RE, motivation, effort, and confidence, prior to suggestibility assessment on the HGSHS:A in both hypnosis and imagination conditions. In a third session, participants were administered imagery and absorption scales in addition to a battery of neuropsychological tests: Stroop, Digit Span, Self Ordered Pointing Test, Target Detection (D2), and Wisconsin Card Sorting Test. Expectancy was associated positively with imagery, absorption, and motivation in both conditions, and negatively with effort in hypnosis and with confidence in imagination. Predictors of hypnotizability were imaginative suggestibility, a

faster RT on Stroop congruent and a slower RT on neutral trials. Predictors of imaginativity were: hypnotic suggestibility, behavioral RE, absorption, a slower RT on both Stroop congruent and incongruent, and a faster RT on neutral trials. Passing ideomotor suggestions was associated with imagery and absorption; and cognitive suggestions with verbal facilitation, interference, and weaker working memory. The role of STM in conscious experience is discussed in the context of a "Perceptual Control Model" of hypnosis based on the interactions of imagery, absorption, verbal facilitation and dissociation.

I Dedicate this Thesis with Love and Gratitude to

Nabeela and Ahmad

Your Love and Support.....
made this journey much easier for me...

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One of the problems facing psychologists in the study of nonconscious processes is that all methods of study are indirect. Throughout the history of psychology, the central aim and effort has been devoted towards understanding human behavior. An observer who is watching the behavior of an organism can only see and describe what appears from the outside. He/she can see neither what the organism perceives nor what aspects are controlled. Similarly, the processes underlying the act or behavior in question are not seen. In scientific inquiry, researchers try to predict behavior by inferring those inner perceptual and control processes underlying behavior. Therefore, prediction of behavior becomes a useful tool in that it can shed light on those inner processes. Its value comes from directing our attention to important factors associated with phenomena in question.

One of the few areas of psychology that have stimulated great interest among both professionals and lay persons is hypnosis. Despite this interest, many controversies still remain regarding the nature of this phenomenon. One of these controversies relates to whether hypnotizability is a trait or a state (Kirsch, & Lynn, 1995). Some theorists emphasize individual traits such as absorption, imagery, and fantasy proneness as the underlying factors for hypnotizability

(Hilgard, 1986; Bowers, 1992), while others emphasize social influence (Sarbin & Coe, 1972; Spanos, 1986; Kirsch & Lynn, 1995, Lynn, 1997; Council, 1999). However, recent advancement in new technologies, such as electroencephalography (EEG), regional cerebral blood flow (rCBF), and functional Magnetic Resonance Imaging (fMRI), shed a new light on the neurophysiological underpinnings of hypnotic behaviors. The ability to construct mental images which are the neural correlates of mental processes allowed a basis of the study of the nonconscious mental life to change from indirect inference to more direct observation. Studies using these technologies have become a new focal point for modern theories of hypnosis including the possibility of bridging some of the gaps that exists between theories.

Hypnotic susceptibility is an important individual variable that has interested researchers considerably. A small percentage of people are very susceptible to hypnosis (approximately 12%) and respond to almost all suggestions, while a similar percentage tends not to respond to any suggestions at all. The majority of people are responsive to some suggestions but not to others such as the more difficult ones. Hypnotic susceptibility has been found to be stable within an individual over a period of 25 years with a test-retest reliability of 0.71 (Piccione, Hilgard, & Zimbardo, 1989). Despite this stability, researchers have not been successful in finding psychometric measures to

differentiate high from low susceptible subjects. One exception was for the absorption and fantasy proneness scales, which were found to correlate consistently, but not strongly with hypnotizability ($r < .30$). Imagery correlates consistently with hypnotizability, however, it was found that while all high hypnotizable (HH) subjects score high on imagery scales, similarly, some low hypnotizable (LH) subjects obtain high scores on these scales also.

For an observer, an encounter with hypnosis results in a relatively clear conception of the behavioral characteristics that define such a state. Hypnosis typically begins with a hypnotic induction, followed by some suggestions varying in difficulty. The induction commonly involves instructions for focused attention (e. g., the subject is asked to fix his gaze on a target or to focus attention on a specific point or on his hand). This is followed by relaxation instructions as the hypnotist monotonously intones soothing suggestions of muscle relaxation, breathing deeply, and becoming more deeply hypnotized. Ideally, the subject's eyes will feel heavy and tired and close naturally (often resembling sleep for an observer). The hypnotist continues by giving suggestions to narrow the subject's attention and focus on the hypnotist voice, and ignoring any sounds or events that may be usually perceived. Subsequently, the hypnotist moves into other suggestions.

Hypnotic susceptibility can be assessed using standardized scales. The mostly known and used scales are the Harvard Group Scale of Hypnotic Susceptibility; HGSHS: A (Shor & Orn, 1963), and the Stanford Hypnotic Susceptibility Scale; SHSS: C (Weitzenhoffer, & Hilgard, 1962) for individual assessment. In both scales, and after the hypnotic induction, three types of suggestions are usually administered: (a) Ideomotor suggestions requiring motoric movements such as involuntary movements of a limb (e.g., moving the arm down when a suggestion that the subject's arm will begin to feel heavier and heavier, (b) Challenge suggestions requiring motoric inhibition, that is, the inability to execute movements (e.g., not being able to bend an extended arm when a suggestion that the arm will feel very rigid like a bar of iron), (c) Cognitive suggestions which could be classified into two categories: suggestions requiring cognitive productions such as hallucinating sensory experiences (e.g., hearing a mosquito flying in the room when a suggestion to hear a mosquito and feeling it on the subject's hand is given); and suggestions calling for cognitive inhibitions requiring subjects to inhibit cognitive responses (e.g., such as the suggestion that subjects will forget events of the session until the amnesia suggestion is reversed). The hypnotic procedure is ended by the instruction to be fully awake and refreshed after backward counting (e.g., from 10 to one).

A subject is scored depending on the total number of suggestions responded to or passed, or the level of his/her hypnotic susceptibility (i.e., low, medium, and high). Responding to different suggestions on the scales requires different abilities. For example, a person who produces hallucinations goes through perceptual and cognitive processes that are different from the ones required for lowering the arm in the arm lowering suggestion. Additionally, not all subjects may experience amnesia after hypnosis. Memory inhibition requires different processes than closing the eyes after fixating on a target. Different processes are clearly required to execute different categories of suggestions. Most subjects pass the simple items of ideomotor movements, and very few subjects pass the cognitive items which are considered the hallmark of HH subjects' experience, and response to these suggestions requires qualitatively different processes and abilities.

Different theories of hypnosis emphasize different aspects of hypnotic behaviors. Since the beginning of investigation in this field, hypnosis theorists have adopted one of two perspectives for the explanation of hypnotic phenomena; physiological or psychological. The physiological approach can be further sub-divided into two categories; one adopting a pathological perspective, which evolved from early studies on hysteria, and continued with dissociation theories; however, more recent dissociation theories emphasized the non-

pathological nature of hypnotic processes. The other perspective is the sleep theories, which considers hypnosis as a "sleeping trance" (Udolf, 1987), hence the Greek root of the word hypnosis; "*hypnos*" being the "*God of sleep*" (Moss, 1965). The failure of finding physiological markers to support the similarities between hypnosis and sleep has led to the rejection of sleep theories in favor of a waking state description of hypnosis (Lesser, 1985). Psychological theories can also be divided in two categories, the social-cognitive perspective emphasizing role playing, expectations, beliefs and motivation as the main factors explaining hypnotic behaviors, and the psychoanalytical perspective which explains hypnosis as a regressive state. In the coming sections, a brief review of theories in hypnosis will be presented together with the research stimulated by them. Also, the influence on theory from recent findings in neurophysiological, social and cognitive fields will also be discussed.

THEORIES OF HYPNOSIS

The first physiological theory was that of animal magnetism first expounded by Mesmer in the late 18th century. Mesmer believed in the existence of a magnetic fluid in the therapist's body that passes to the patient's body. This led to convulsions followed by healing effects. A second physiological theory was that of Jean-Martin Charcot (1825-1893), who was interested in the similarities between hypnosis and hysteria. He viewed hypnosis as associated

with pathological physiological states stemming from a weakness in the central nervous system (Dixon, & Laurence, 1991). The pathological concept of hypnosis was further elaborated by Janet in 1925 with his theory of dissociation. Janet view of "dissociation" as a pathological mechanism described how ideas and patterns that normally occur together or in sequence can become separated or dissociated from one another. This theory became the basis for more modern theories of "neo-dissociation" and "dissociated control" subsequently endorsed by Hilgard (1986), Bowers (1992), Woody and Bowers (1994), Woody and Farvolden, (1998).

Sleep theories developed with James Braid (1795-1860), who first thought that the hypnotic state is produced by the fatigue in the muscles of eyes. This was preceded by Puysegur who gave the term somnambulism to his hypnotic subjects (Ellenberger, 1970). Sleep theories gained credibility due to the similarity in appearance between the hypnotized subject and that of a sleeping person, and by the fact that most inductions used the metaphor of sleep to induce hypnosis. However, Pavlov regarded hypnosis as partial sleep that is a state of cerebral inhibition similar, but not identical to sleep (cited in Edmonston, 1981). The localized inhibition was a result of the relaxation condition promoting motor functioning inhibition, and allowing more primitive areas in the brain (which are more responsive to suggestions) to become more dominant. This state is different

from that of normal sleep as it is confined to specific areas of the cerebral cortex, while inhibition in the normal sleep is a general cortical inhibition.

Psychological theories emerged in parallel with physiological ones. This resulted primarily from James Braid changing his view of hypnosis by endorsing the suggestibility hypothesis. Subsequently, suggestibility was adopted by many investigators, the most prominent spokesmen of this notion being Liebeault (1823-1904), and Bernheim (1840-1919) who postulated that "there is no hypnotism, it is all suggestion" (Moss, 1965). Both psychoanalytic and socio-cognitive theories branched out of this perspective of suggestibility. While the former focused interest on inner processes, the latter emphasized social influence. For example, Ferenczi's theory of hypnosis suggested that the hypnotist represented the parental image that once put the child to sleep. If hypnosis went well, these parental images, via the hypnotist, had a highly controlling influence upon the perception of any other stimuli in a similar manner to the influence of parents in early infancy when there was no differentiation between thought and reality. Freud's original interest in hypnosis, however, was concerned with hysterical amnesia and the traumatic origin of hysteria. Age regression was used to facilitate remembering or to breach amnesia for childhood traumatic events, which led to symptom relief. However, Freud abandoned hypnosis as a method of therapy in favor of free association,

recognizing that there was no way to isolate repressed memories from fantasies and subsequent constructions and modifications by patients. Hypnosis is seen by psychoanalysis as a partial exclusion of the ego similar but not identical to the process of falling asleep. The exclusion of the ego is partial and not complete as in sleep; cognition of the hypnotist is maintained and some functions of reality testing are delegated to the hypnotist. While the degree of ego-exclusion varies with the stages of hypnosis, in psychoanalysis all phenomena produced in hypnosis are regarded as being under the control of the ego. This theory, however, has been abandoned as it was not supported by research.

Modern theories and research in hypnosis have evolved from this historical perspective. Two main streams of thought have dominated the field: the neo-dissociation models, evolving from and influenced by the physiological and/or pathological view of hypnosis, emphasizing dissociation as the mechanism for hypnosis (Hilgard, 1986, 1991; Bowers, 1992; Woody, & Bowers, 1994); and the socio-cognitive model evolving from the suggestibility hypothesis, emphasizing role playing, response expectancy, and motivation (Spanos, 1986, 1991; Kirsch, & Lynn, 1995, 1998). Recently, the synergistic approach has emphasized individual differences in hypnotizability and explained hypnotic behavior in term of the interaction between some aspects of the hypnotic context with individual abilities to produce hypnotic behavior (Nadon, Perry, &

Laurence, 1991). The idea behind this approach is that people may have certain cognitive and perceptual abilities independently of the hypnotic situation, which predispose them to respond effectively to hypnotic suggestions.

NEO-DISSOCIATION THEORIES

Earlier versions of neo-dissociation theories (Hilgard, 1986, 1991) postulate the existence of multiple cognitive processing systems or structures organized in a hierarchical order, although each is independent, with its own inputs and outputs, and with multiple feedback relations among them. At the top of this hierarchy there is a central "control structure" or "executive ego" responsible for initiating action sequences (output function) of the lower subsystems, and for monitoring their consequences (the input function). Once activated, the lower systems carry out actions automatically with the least involvement of the executive control center. An example of this is highway hypnosis, when travelers, particularly drivers, reach their destination without remembering the details of the journey, or when people drive unintentionally to a habitual destination.

According to Hilgard (1986), during hypnosis, much of the control is relinquished by the subject thus influencing the executive functions; that is, there is a division within the central control system into two parts. These two parts are separated by an amnesic barrier with one part not available to consciousness.

According to Hilgard, a subject's experience of involuntariness is a result of this dissociation within the executive control system. Actions are simply initiated by the part of the executive control system dissociated from conscious awareness. Most of the evidence for this theory came from "hidden observer" experiments. For example, in hypnotic analgesia experiments, the subject's hand is immersed in cold water and then a hypnotic analgesia suggestion is given. Subjects usually report lower levels of pain when asked to rate how much pain they felt (Hilgard, 1973; Laurence & Perry, 1981). However, if a hidden observer suggestion was given (that there is a hidden part of the subject's mind that knows the true level of pain they are experiencing, and the hypnotist asks to talk to that part of the mind), usually the hidden observer reports higher levels of covert pain than the overt reports given after the analgesia suggestion. These experiments were used to support the division in consciousness in hypnotized subjects where the covert pain was thought to be excluded from awareness through the amnesic barrier. Automaticity observed in hypnotized subjects was thought to be a result of actions executed and controlled by the dissociated part of the executive system without subject's awareness. Therefore, automaticity is produced by the lower level system concerned with well learned behaviors and routine actions (such as driving a car).

More recent dissociation models (Bowers, 1992; Woody, & Bowers, 1994) argued that postulating amnesia as the mechanism of dissociation was problematic, because amnesia is a difficult response not passed by many subjects, and spontaneous amnesia is very rare. On the other hand, many subjects pass the simple ideomotor items. Therefore, the use of amnesia as a dissociation mechanism of hypnosis meant that a rare hypnotic event was used to explain a common one (Woody, & Bowers, 1994, p. 55). Instead of amnesia, Hilgard's concept of "dissociated control" was adopted as the mechanism of dissociation.

Influenced by the cognitive model of behavioral control proposed by Norman and Challice in 1986, Woody and Bowers (1994) developed the "dissociated control" theory of hypnosis. In this theory, there exists two systems responsible for the initiation and control of behavior; firstly, the "contention scheduling system" (CSS), which does not require awareness or attention. This system is considered a decentralized process involving a very large but finite set of discrete programs hierarchically organized. It is automatic and could be activated by schemas or by environmental triggers. Secondly, "the supervisory attentional system" (SAS), which is a higher level control system, responsible for planning, monitoring, modulating and error correction. The SAS influences behavior indirectly by evaluating and modulating the contention-scheduling system, and by activating or inhibiting particular schemas, thus biasing schema

selection process of the lower system. Additionally, it monitors and modulates these schemas depending on how well they meet the person's intentions and goals. The SAS is also necessary for the initiation of new and not-well learned behaviors. In every day life, the SAS is usually engaged in all these functions giving rise to the different subjective experiences people have. When the supervisory system is engaged in monitoring a schema without modulating it, the subjective experience is that of ideomotor action; an action following an idea. If the system is modulating a schema, the subjective experience is that of "will". When the higher system is not engaged, the experience is that of automaticity. According to Woody and Bowers (1994), the hypnotic induction partially disables the higher control system from its normal functions of monitoring and modulating schemas, as a result, lower level systems become modulated directly through hypnotic suggestions issued by the hypnotist, and consequently, hypnotized subjects will have the subjective experience of non-volition.

In support of their theory, Woody and Bowers (1994) drew attention to similarities in behaviors between hypnotized subjects and patients with frontal lobe damage. The frontal lobe is thought to be the seat of executive functions, and patients with frontal lobe disorders exhibit behavioral rigidity, memory impairment, impulsivity and/or disinhibition of control. Similarly, hypnotized

subjects display rigidity, amnesia, idiosyncratic behaviors which appear to be resulting from "disinhibition" of control.

Bowers believed that hypnosis shifts behavioral control from within the subject to the environment (hypnotist's words). The effects of suggestions are not mediated through their influence on the executive ego (as Hilgard would argue), but that "subsystems of control can be directly and automatically activated as a result of weakening frontal lobe control" (Bowers, 1992, p. 267). For Hilgard, the subjective feelings of non-volition are cognitively mediated by dissociation; Bowers however believed that hypnotic behaviors are truly involuntary initiated by hypnotist's words (Kirsch, 1995).

While the concept of controlling the subsystems of automatic behaviors seems to explain subjective feelings of involuntariness, it does not explain how the production of hallucinations, amnesia, and subject's inability to execute a movement, could be construed as automatic behaviors. In normal every day life, people do not hallucinate or forget on command. Automatic behaviors are known to be over-learned procedures that are put into action when required and without effort to serve the individual in everyday life. The main criticism directed at "dissociated control" theory comes from adherents of the socio-cognitive model who claim that this theory fails to explain self hypnosis (Kirsch,

& Lynn, 1998). If lower systems are activated by the hypnotist words, it follows that systems cannot be activated in self hypnosis.

NEUROPHYSIOLOGICAL THEORIES

Neurophysiological research was first stimulated by the sleep theories of hypnosis. However, clinical and experimental evidence has shown that hypnosis is markedly different from sleep. Nevertheless, it is generally accepted that dream-like features and imagery based thinking is very close to the hypnotic experience (Gruzelier, 1998; Nadon, 1997). Dreaming includes some cognitive features such as an altered sense of time and absence of temporality, a lack of critical judgment and guiding reality, affective coloring, the anchoring in personal experience, and dissociation from sensory input and context (Fuster, 1995).

Psychophysiological measures have been sought as an alternative approach for finding psychometric measures predicting hypnotizability. Individual differences among HH and LH were sought in and out of hypnosis. Electrocortical activity studies showed that the measure mostly associated with hypnotic susceptibility is a higher EEG theta (4-8Hz) activity in high susceptible subjects (Ray, Blai, Coyle, Bjick, 1998). Neuropsychological tests indicated that HH and LH subjects have different styles that could be captured by these tests at the baseline level. Ray et al. administered the Wisconsin Card Sorting Test

(WCST), Controlled Oral Word Association Test, Stroop, and Towers of Hanoi, to their HH and LH subjects. These tests were chosen to test the range of potential differences in frontal tasks reflecting executive functions along verbal and visual-spatial modalities. Overall, HH performed better than LH on the WCST suggesting greater ability to detect relevant abstract information, flexibility in shifting cognitive set and decrease in perseverative tendencies. HH also performed better on the Stroop and FAS reflecting verbally mediated abilities.

Slako (2002), investigated the relationship between hypnotizability, as measured on the Stanford Scale of Hypnotic Susceptibility (SSHS: C) and frontal functions. A battery of frontal tasks assessing executive functions and attention was administered to subjects prior to, and without knowledge that they would be assessed for hypnotizability: the Stroop, Wisconsin Card Sorting Test (WCST), Target Detection (D2), Trail making Tests, the Verbal Fluency Test (FAS), Self Order Pointing Test (SOPT) and the Continuous Performance Test. Hypnotizability correlated positively with all speed measures of the Stroop and (D2) test. In addition, HH performed faster across several frontal tasks indicating higher frontal abilities in HH at the baseline level.

Gruzelier, 1998, proposed a three-stage top down model for the traditional hypnotic induction requiring frontal-attentional, frontolimbic inhibitory, and a right hemisphere temporo-posterior phases: The first stage relates to instructions

to fixate on a small object or a spot on the hand while listening to the hypnotist voice, which requires focused selective attention. The neural substrate underlying this phase requires a thalamocortical attention control system, and parietofrontal connections, with the engagement of left anterior focused attention control system. The second stage starts with eye closure, suggestions of fatigue and tiredness from continued fixation and suggestions for relaxation, which sets in motion frontolimbic inhibitory processes. According to Gruzelier, this phase reflects the "letting go" component of hypnosis, whereby anterior executive functions are suspended. This process underlies the suspension of reality testing, critical evaluation and the handing over of executive planning and functions to the hypnotist. In the third stage, instructions of relaxation and passive imagery lead to a redistribution of functional activity and an increase of posterior cortical activity through passive imagery and dreaming (mostly in the right hemisphere). Gruzelier view was that LH subjects fail either in the first or second stages; that is, they fail to show left frontal attentional control, or they fail in the "letting go" of the inhibitory process.

Many neurophysiological studies supporting this model were presented. Gruzelier and Brow (1985) used electrodermal measures to study the effects of hypnosis on attentional processes of the orienting response (OR) to tones interspersed during hypnotic induction. HH subjects showed a reduction in OR

and faster habituation rates, whereas LH showed retarded habituation in hypnosis. Furthermore, electrocortical event-related potentials (ERP) studies revealed similar inhibitory influence on attention. HH subjects showed sustained attention at baseline level and a progressive reduction in attention with each stage of the induction, whereas LH subjects showed the opposite response pattern. As HH experienced attention inhibition, LH experienced attention enhancement as the induction progressed.

Inhibition is believed to be biased towards the left hemisphere. This effect was demonstrated through behavioral studies using haptic sorting task both in hypnosis and waking conditions. Gruzelier, Brow, Perry, Rhonder, and Thomas (1984) asked blindfolded subjects to sort objects by class with each hand separately, with hand order counterbalanced. Results indicated left hemispheric preference for HH at the baseline level. After hypnotic induction, right hand processing time increased while left hand processing remained constant, indicating stronger left hemispheric inhibition. No changes in the processing time were noticed with LH subjects. When HH performance was compared with their performance in a hypnotic alert induction (while paddling on a stationary exercise bicycle with instructions of mental alertness), they showed the same reduction in right hand processing in both conditions. However, in the alert condition faster left hand sorting was observed.

Other noticed changes concern focal versus distributed influences of hypnosis and hemispheric asymmetries in the parietal regions. Gruzelier and Warren (1993) administered the word and design fluency tests, which are known as a left hemisphere tasks, both at baseline and during hypnosis conditions. HH had a slight advantage than LH on verbal fluency test at baseline level. After hypnotic induction, HH subjects showed a decrease in word fluency whereas LH showed an increase from base level. Hypnosis improved design fluency performance for both groups. In contrast to the focal changes observed in HH, medium hypnotizable (MH) subjects showed bilateral change, suggesting a more defused processing. Because of these differences, Gruzelier highlighted the importance of segregating subjects according to their hypnotizability groups.

The involvement of attentional and inhibitory processes in hypnotizability was demonstrated further in studies investigating hypnotic analgesia (Crawford, Knebel, & Vendemia, 1998). Understanding mechanisms of pain reduction in hypnotic analgesia is important because of its clinical application, and theoretically, it gives an indication how sensory and affective components are inhibited during hypnosis. Hypnotic analgesia is similar to hypnotic amnesia in the sense of cognitive inhibition of a perceptual experience. Pain processing is a complicated experience influenced by emotional, motivational, social and situational variables. According to Pribram (1991), sensory aspects of pain are

associated with processes in the central and posterior brain regions, while the distress aspects are more associated with anterior regions. HH subjects were more likely to reduce or eliminate both, the distress and the sensory components of pain (Hilgard, 1986, 1994). FMRI and PET studies (Crawford, Horton, McClain-Furmanski, and Vendemia, 1998; Crawford, Knebel, Kaplan, Vendemia, Xie, & Pribram, 1998; Pribram 1991) suggest the participation of many cortical and subcortical sites in processing pain. During hypnotic analgesia, pain reduction was associated with a reduction in activity in the anterior cingulate, insula, thalamic region, as well as frontal regions in the brain, where the anterior cingulate is thought to be involved in the affective pain component, attentional deployment, and the execution and suppression of motoric responses.

Attentional abilities of HH subjects are also indicated by Scalp Event Related Potentials (SERP) studies. For example, hypnotic analgesia was investigated in 17 men and women with lower back pain, all of them but one being HH (Crawford, Knebel, Kaplan, Vendemia, Xie, & Pribram, 1998). Participants dipped their hands in iced water followed by hypnotic analgesia suggestion. SERP were measured in both waking and hypnotic conditions, while subjects received ischemic pain stimuli to their left middle finger. During hypnosis, subjects were asked to attend to pain, then analgesia, and then to attend again. When HH concentrated on pain, the left hemisphere was

significantly more dominant in high theta activity. By contrast, during hypnotic analgesia a shift towards decreased left and increased right hemispheric theta activity was observed.

Differential hemispheric activity was also reported when accessing emotional experiences. HH subjects show greater capacity to access emotional life-experiences, in both waking and hypnotic conditions (De Pascalis, 1998). Differential hemispheric activity was more pronounced during hypnosis than during the waking condition. In contrast, LH subjects did not show such differential hemispheric variation among emotional types.

Other neuropsychological studies indicate that HH subjects have greater control and flexibility to modulate activities in cortical structures underlying normal perception. Suggestions directed at modulating affective component of pain produced less subjective unpleasantness, while suggestions directed at the sensory intensity of pain produced less subjective pain intensity (Rainville, 1998). Support for a top-down control of sensory processing by attenuating or amplifying the sensory component of the incoming input is demonstrated in positive and negative hallucinations studies. Spiegel, Cutcomb, Ren, and Pribram (1985) examined the influence of obstructive hallucination on ERP activity. HH subjects showed a reduction in P300 amplitude during obstructive hallucination of visual stimuli. These findings were replicated by De Pascalis (1994) who tested

obstructive hallucination of train-flash stimuli. HH subjects were asked to visualize a cardboard box that would prevent them from seeing train-flash stimuli. While experiencing stimulus elimination, significant attenuation of P1 (70 ms), N2 (240 ms) and to a less extent of P3 (290 ms) ERP peak amplitudes were observed. In contrast, a relative increase in P1 and N1 peaks were observed in HH when a suggestion to enhance the brightness of the flash-stimuli was given.

In summary, neurophysiological studies on hypnotic analgesia support the notion of inhibitory processing of the anterior frontal attentional system, and a top-down inhibition of incoming pain and pain memories (Crawford et al., 1998). Pain reductions correlated significantly with the decrease in total EEG amplitude in the right hemisphere indicating reduced activity of sustained attention (De Pascalis, 1998). Compared to LH subjects, HH subjects displayed superior attention-inattention skills, and were able to inhibit processing of painful stimuli during hypnotic analgesia. However, what remains unclear from these studies is how hypnotic suggestions produce the frontal inhibitory processing of incoming painful stimuli.

REACTION TIME STUDIES / STROOP TASKS

Another line of research focused on the relationship between hypnotizability and some cognitive processes outside the hypnotic context.

Researchers from this perspective adopt an interactive model to explain hypnotizability (Nadon, Laurence, & Perry, 1991). Research efforts using this approach have been directed towards investigating individual differences in cognitive processing outside the hypnotic context then correlating the findings with measures of hypnotizability. One of these individual differences concerns perceptual automaticity.

A shared concept for most theories in hypnosis is automaticity. However, while dissociation and socio-cognitive perspectives emphasize automaticity on a molar level (as sets of well learned automatic actions), an interactive model emphasizes automaticity on the perceptual or molecular level (speed and mode of processing information), with the term perceptual automaticity being used to differentiate it from the general concept of automatic actions.

Studies in this domain concentrate on investigating Stroop and Stroop-like tasks (Stoop, 1935). Earlier studies indicated that HH demonstrated faster reaction times on congruent trials and more Stroop interference on the incongruent trials (Dixon, Brunet, & Laurence, 1990; Dixon & Laurence, 1992). In those studies, subjects did not know about the link between the Stroop testing and hypnotizability. In a Stroop-like task, individual thresholds for word perception were first established using a staircase method, where a color word was presented followed by a color patch to be named. Subjects were then

presented with stimuli at both sub-threshold and suprathreshold conditions for word presentation. Information was given regarding the probability that the color word and patch color will be congruent (e.g., word red followed by a red patch) to manipulate strategic effects. Two sessions were conducted for all subjects with the probability of congruence of 25% for the first session, and 75% for the second session. Compared to LH, HH showed faster performance (shorter reaction time) on congruent trials in all conditions. In addition, HH were faster in implementing strategies to improve their performance. Findings were interpreted as supporting the automaticity hypothesis and the possibility of stronger connection strengths along the verbal pathway that facilitate hypnotic responding (Dixon, Brunet, & Laurence, 1990).

In a following study, and to disentangle the automaticity and strategy effects, Dixon and Laurence (1992) manipulated the inter stimulus intervals (ISI) between the presentation of words and color patches to control for strategic planning. In this study two words and colors (red and blue) were used. Subjects were informed that in 75% of the trials, the word and color will be incongruent. Results indicated that HH subjects were faster than LH at all time delays. However, at longer delays, HH were faster than LH subjects in implementing strategies and reversing the Stroop effect, that is, they became faster at naming the color when the word and color did not match.

Faster reaction times on a Stroop-like test displayed by HH were demonstrated in neuropsychological investigation of ERP recordings carried out without subjects' knowledge of the connection between the test and hypnotizability (Baribeau, Le Beau, Roth, & Laurence, 1994). The task consisted of four conditions; a Word condition (naming color words written in black ink), a Neutral condition (naming the color of series of xxxx printed in different colors), a Congruent condition (naming the color print of a congruent color word), and an Incongruent condition (naming the color print of incongruent color word). Stimuli were presented in blocks instead of randomly, due to the complexity of the ERP procedure. Shorter latencies for HH subjects on the P300 negative wave were observed at the frontal site for the word and neutral conditions. These results were interpreted as indicating that the automaticity exhibited by HH is more likely to be perceptual rather than verbal in nature.

Stroop-like task performance was also investigated during hypnosis. HH subjects were significantly faster than LH subjects in both hypnotic and nonhypnotic conditions (Kaiser, Barker, Haenschel, Baldwig, & Gruzelier, 1997). However, HH subjects experienced greater automatic Stroop interference during hypnosis. Compared to the nonhypnotic condition, HH subjects showed an increase in errors on incongruent trials during hypnosis, but no change in errors on congruent trials was observed. In contrast, LH subjects' performance

remained constant in both conditions, and RT did not change with hypnosis in either group. These results were interpreted as a failure to inhibit automatic responses resulting from the weakening of frontal attentional control. Interestingly, *error detection* signals (a negative wave at about 100 msec. usually elicited after making an error but not after correct responses) were found nonsignificantly larger in HH group, and those were not altered by hypnosis, indicating that an error detection system that operates at a preconscious stage remains intact and detects errors. However, the positive *error evaluation* signals (positive waves that appear after error detection signals, and were thought to reflect error evaluation and adjustment of response strategies) were reduced in amplitude during hypnosis in HH subjects only. The *error detection* waves were localized at the anterior cingulate, which has been implicated in the affective component of pain and in the deployment of attention in previous studies on hypnotic analgesia (the anterior cingulate is thought to be implicated in executive functions consisting of both cognitive and affective-motivational components of behavior and in the deployment of attentional processes). Because RT and error detection signals remained intact in hypnosis, the increase in errors in the incongruent trials was thought to result from an unresponsivity of the affective-motivational system (evidenced in the absence of *error evaluation* waves), thus reflecting motivational influences on performance. However, the

monitoring of motor performance carried out by the cognitive system remained intact (Gruzelier, 1998).

Another reaction time study required participants to distinguish between happy and angry faces, and to press either a switch labeled "happy" or another labeled "angry" when they make their judgments (Crawford, Harrison, & Kapelis, 1995). HH were faster than LH subjects in both hypnotic and nonhypnotic conditions. Faster reaction times were also associated with higher scores on the Absorption scale (Tellegen, 1982) and Differential Attentional Process Inventory (DAPI). The latter required subjects to rate themselves on a 7 point Likert-type scale measuring focused attention and absorption. The association between faster reaction time and hypnotizability was explained as a result of less vulnerability to distraction and a sustained attentional ability based on the frontolimbic attentional system.

Moreover, this association between RT and hypnotizability was demonstrated after controlling for nonhypnotic suggestibility (Kirsch, & Braffman, 2001). Hypnotizability was associated with faster performance on simple RT and with slower performance on go-no-go reaction times. Simple RT was measured by asking subjects to click on their mouse as soon as the picture of a leopard appeared on a computer screen. To measure the go-no-go RT, subjects did the same task with a lion picture, and then they were presented with pictures

of either a lion or a leopard, and their task was to click on the mouse only when the leopard appears. Hypnotizability was associated with faster simple RT even when nonhypnotic suggestibility was held constant.

The relationship between hypnotic susceptibility and sustained attentional abilities has been challenged in a recent study by Jamieson and Sheehan (2001) who investigated the relationship between hypnotic susceptibility and behavioral tasks thought to reflect sustained attention. These tasks were: Music meditation intrusions, in which subjects pressed a button every time they experienced intrusive thoughts during music meditation (focusing attention on a piece of music while closing their eyes), and signal detection intrusion, in which subjects had to press a white button whenever they heard a low frequency tone that was presented randomly with a higher frequency tone over headphones. Participants were also instructed to press a black button whenever they experienced task-irrelevant thoughts during the signal detection. These two tasks were considered a measure of distractibility-external focus. The ability to attend to salient cues in the visual field hypothesized as the reason behind HH subjects experiencing more figure reversals (Wallace, Knight, & Garrett, 1976) was tested using reversals of the Necker cube and Schroeder staircase. The Binaural Word Pair Test (BWPT) was also conducted where subjects had to discriminate and write down two words presented to them simultaneously over head phones.

Scores on the BWPT test, Mental Imagery Questionnaire (QMI), and Attentional Control Questionnaire (SIPI), were considered as measures of distractibility internal-focus. The SIPI required subjects to rate themselves on 5 point scale on tendencies for mind wandering; boredom; cannot work for a protracted period; or being easily distracted by telephone, TV set, or talking. The absorption scale (TAS) was also administered. In this study, the only measure found to correlate with hypnotizability was absorption. In their factor analysis, attentional variables did not load on the hypnotizability factor. The authors concluded that Crawford's hypothesis that sustained attentional abilities underpinning differences in hypnotic susceptibility is not yet proven.

Slako (2002) found little support for the association between attentional processing and Hypnotizability. From the Attentional measures administered in this study, HH displayed significantly faster reaction times on Target Detection Test only; however, their faster speed on this test was compromised with significantly more omission errors, indicating a speed / accuracy trade off. The faster speed exhibited by HH performance on the Stroop Test, especially on incongruent trials rendered inhibitory processes as more important than attentional processes for hypnotizability in this study.

These two studies do not support the strong association between attentional processes and hypnotizability hypothesized by Gruzelier (1998) and

Crawford (1994). There is a possibility that this discrepancy is due to measurement choice. Different measures seem to give different associations with hypnotizability. One of the problems facing research in this field is the use of different measures which render findings difficult to interpret and evaluate. Jamieson et al. investigated sustained focused attention using behavioral measures of external and internal distractibility or intrusions. Slako used well known neuropsychological frontal tests. Crawford et al. (1995) used the RT measure for judgments of emotional states. While these measures may tap certain aspects of attentional processes, they may not be measuring the same processes. Attention is a complex construct that is influenced by many factors and could not be studied in isolation. Furthermore, neither these studies, nor the neuropsychological research addressed the issue of voluntary-nonvoluntary attentional processes.

In Gruzelier and Warren's (1993) study, there was a slight advantage at the baseline level in HH on measures of verbal fluency. Attentional processes allocated in hypnosis may have a different quality than attentional processes required in visual search and other tasks requiring conscious and deliberate attention. In addition, unlike visual search task, hypnotic behavior is personally relevant, and motivationally enables behavior; therefore, it is more likely to be nonconsciously and involuntarily directed. This is supported by the notion that

cognitive monitoring of errors remains intact, while subjects may be motivationally non-responsive.

To illustrate the difficulty in evaluating results when measures differ in experiments, in Jamieson et al. study, absorption, which is an attentional measure, was associated with hypnotizability. Tellegen and Atkinson (1974) defined absorption as a state of extremely focused or "total" attention, in which there is "full commitment of available perceptual, motoric, imaginative, and ideational resources to a unified representation of the attentional object". Jamieson et al. alluded to Tellegen's definition of absorption as the tendency to set aside the instrumental set of attention (which is reality oriented, effortful, and goal directed striving) in favor of experiential set (which is effortless, non-striving and nonvolitional). Associating hypnotizability with absorption, it appears that Tellegen is alluding to nonconscious, non-volitional attentional processes as an important factor. Despite its explicit description by Tellegen and Atkinson attention has not been paid to the distinction between these two sets of attentional processes; one volitional and effortful, the other non-volitional and effortless. Therefore, studies assessing effortful attention are in effect assessing the instrumental set of attention which is voluntary and conscious in nature.

The discrepancy between these studies may prove to be more artificial than real. For example, the lack of correlation between hypnotizability and

intrusions of irrelevant thoughts in Jameison et al. study may reflect similar abilities in HH to focus attention on cognitive tasks of this sort. This is not inconsistent with the hypothesis of focused attention at the beginning of hypnotic induction. In most studies previously cited, performance of both HH and LH subjects was similar at the baseline level. However, it was HH who showed faster habituation and reduction in OR with stimulus repetition. It would be important to examine whether HH display faster habituation without hypnosis. This could indicate that HH subjects have a better capacity to make faster judgments as to whether a stimulus is relevant or irrelevant to goal attainment at a level below conscious awareness. A good indicator of this interpretation is that HH subjects had faster RT making judgments whether a face is "happy" or "angry", in both hypnotic and nonhypnotic conditions.

In summary, while neurophysiological research emphasizes attentional and inhibitory processes in producing hypnotic behaviors, reaction time studies emphasize speed of processing and inhibition of automatic responses as the main factors associated with hypnotizability. However, there is strong evidence indicating that attentional abilities and automaticity (processing speed) are among the factors involved in and associated with hypnotizability. Therefore, studying individual differences in cognitive functioning may prove to be a

fruitful and promising avenue for understanding processes underlying hypnotizability.

SOCIO-COGNITIVE THEORIES

The socio-cognitive theories endorsed by Sarbin and Coe (1972), Spanos (1986), Kirsch, & Lynn (1995, 1998, 1999) among others, emphasize social and cognitive variables as the factors determining hypnotic responding. This line of thought evolved from earlier theories emphasizing suggestibility as the main factor behind hypnotic behaviors. Accordingly, hypnotic phenomena are context-dependent social actions that reflect the conception of hypnosis shared by the hypnotist and the subject. Hypnotic states are seen as role played by the subject and is influenced by his/her motivation, beliefs, and expectations, and is also facilitated by the subjects' knowledge about hypnosis. This perspective emphasizes the notion that all hypnotic behaviors could be produced voluntarily with the exception that they lack volition associated with everyday actions. These behaviors can be changed to suit different situations and demands, and they appear to consume attentional resources in a manner comparable to nonhypnotic behaviors (Lynn, Rhue, Weekes, 1990). The subjective feelings of non-volition were usually explained in terms of misattribution and self deception, where subjects may delude themselves that their actions are involuntary. However, this

interpretation was criticized as to how HH subjects are able to misattribute the cause of their responses (Laurence, & Gendron, 1995).

More recently, automaticity became a part of socio-cognitive theorizing shared with other theories of hypnosis. Kirsch and Lynn emphasized the importance of the "response expectancy" construct, defined as the anticipation of automatic reactions to particular situational cues, as a determinant and a final pathway to hypnotic suggestibility (Council, 1999). From this perspective, people construe perceptual sets or expectancies with a high likelihood for certain outcomes of specific behaviors (e.g., to feel relaxed if the person drinks a cup of coffee). According to Kirsch and Lynn, 1999, response expectancies function as stimulus expectancy and they are self-confirming because they influence the subject's perception, their effects is automatic in that the subject does not need to attend to the expectancy for its effects to be seen. The occurrence of a particular hypnotic response is "a function of subjects' expectancy that it will occur". Many studies were presented to demonstrate a role of response expectancy in shaping hypnotic responding, overriding the effects of trait and ability variables such as absorption, fantasy proneness, and attitudes towards hypnosis (Council, 1999).

Influenced by recent social and cognitive theories of automaticity of everyday behaviors of Chomsky (1957), Vallacher and Wegner (1987), Nisbett and Wilson (1988), and Gollwitzer (1993), the "response set" theory of hypnosis

was presented as an extension to response expectancy theory (Kirsch, 1997; Kirsch, & Lynn, 1999; Council, Kirsch, & Hafner, 1986). The "response set", which was defined as a cognitive set to respond appropriately to suggestions, is a behavioral response set in the form of "emit behavior X if Y situation is encountered". These sets are triggered automatically, and hypnotic behaviors experienced as nonvolitional are "intentional acts that are triggered by situational cues (suggestions) and by cue- related bodily sensations experienced during hypnosis" (Kirsch, & Lynn, 1999). Self reports of intentionality and volition come as *post hoc* interpretations of the experience; they are influenced by socially and culturally mediated schemas of involuntariness in hypnosis.

For the first time in socio-cognitive theorizing, Kirsch and Lynn share with dissociation theories the concept of hierarchical control of habitual behavior. In addition, and similar to Bowers' model, response sets (schemas) could be triggered automatically by hypnotic suggestions. However, while Bowers theory is based on the concept of weakened control, Kirsch and Lynn theory is more behaviorally oriented and is more aligned with stimulus response theory. Bowers hypnotic behaviors are triggered by the hypnotist words as a result of weakening of the executive functions of the frontal lobe. For Kirsch and Lynn, direct activation of hypnotic responses by suggestion could be facilitated by two ways: first, higher level identification by HH respondents; that is, subjects

identify themselves as being hypnotized, rather than concentrating on lower level functions, such as lifting the arm or keeping it stiff, thus allowing automatic activation of responses. The second way is through forming implementation intentions, which lead to direct activation of responses by suggestions. HH subjects may implement intentions to delegate some control of their experience and behavior to the hypnotist, a concept that is similar to Hilgard and Bowers models.

Based on Libet's findings in 1985, that the cerebral initiation of voluntary acts begins 350 to 400 msec. before conscious awareness of it, Kirsch and Lynn stated that the experience of intentionality and volition in initiating an act may be an illusion. People may not be aware of the cognitive processes mediating the effects of stimuli on behavior (Nisbett, & Wilson, 1988). From this perspective, all experiences are conceptualized as constructions or interpretations made possible by the automaticity of everyday behaviors.

RESEARCH ON RESPONSE EXPECTANCY

In his review of the literature on expectancy, Council (1999) dated research on this concept to Mesmer in 1784. Mesmeric phenomena of convulsions followed by healing effects were interpreted as a result of influencing peoples' beliefs, thus influencing their expectations of healing, by informing them falsely that mesmeric forces are directed at them. Further work by Braid and Bernheim

with emphasis on suggestibility in hypnosis was cited as part of the expectancy history. Moll (1890) emphasized the role played by beliefs and expectancy in producing alterations in perceptual and motoric experience in an out of hypnosis. He viewed expectancy as an important factor influencing both hypnotic and other nonvoluntary behaviors. The placebo effect of sleep medication was explained in terms of expectancy, where people sleep after taking the placebo because they expect to do so. When they know that what they took was not a medication they will not sleep.

Not all contemporary theories of hypnosis share the same emphasis on expectancy. For example, Neither Hilgard (1977) nor Woody and Bowers (1994) gave any consideration to expectancy in their theories of hypnosis. Similarly, Orne (1959) assigned an artificial role for expectancy in shaping hypnotic behaviors. On the other hand, sociocognitive theorists in general assign a major role for expectancy in shaping hypnotic behavior (Sarbin and Coe, 1972; Barber, 1969; Spanos, 1996). Barber (1969) stressed the role of situational variables (appropriateness of the situation for hypnotic behavior), perceived difficulty of suggestions and peoples' beliefs about their own hypnotic abilities as expectancy related cognitions. According to Barber, these cognitions have their influence on motivation, and consequently, responsivity and involvement in the hypnotic situation. Positive expectancies lead subjects to get involved in goal directed

fantasies which then lead to hypnotic behaviors. For Barber, expectancy is mediated through involvement in fantasies.

Despite the similarity with Barbers' views, "response set" theory puts more emphasis on expectancy in shaping hypnotic behaviors. For example, similar to Barber, Kirsch postulated that expectancy-related cognitions include: role perceptions, situational perceptions, perceived task difficulty, and expected hypnotic suggestibility (Kirsch, 1991). Personality variables, such as absorption and fantasy proneness, were thought to be mediated through it (Braffman, & Kirsch, 1999). Absorption and fantasy proneness shape subjects' response expectancies which then lead to hypnotic behaviors, this hypothesis is opposite to Barber's views.

In general, research conducted to support the influence of expectancy on hypnotic suggestibility took one of two forms: firstly, the prediction of responses to suggestions, in which subjects' expectancies are measured prior to hypnosis by asking them to predict how well they expect to respond, and then comparing these measures with actual performance. Secondly, the prior manipulation of subjects' expectancy, in which subjects' expectancy is manipulated and the influence of manipulation on responsivity to suggestions is measured and compared to a control group who doesn't receive the manipulation.

Early studies using the prediction method (Derman, and London, 1965; Barber, and Calverly, 1969) used global measures, or an overall self-reports of subjects' expectancies to predict their level of hypnotizability. In general, small but significant positive correlations were found between pre-experimental expectancies and responses to test suggestions as measured on the Harvard Scale (HGSHS: Form A). Global measures of pre-induction expectancies were moderate but significant, accounting 10% - 11% of the variance in hypnotizability (Kirsch, 1985). Similar results were obtained by Pekala, Kumar, and Hand (1993).

In more recent studies assessing expectancy, subjects are given more detailed descriptions of hypnotic suggestions in order to improve predictions. Additionally, subjects are asked to rate their expectancies on continuous rating scales rather than a pass / fail rating usually used in known standardized scales. The rational behind this change is that hypnotizability is a continuous variable, and dichotomous responses are not appropriate to measure the effects of expectancy on suggestibility. Studies using the new method showed higher correlations between hypnotizability and response expectancy ranging from $r = .47$ to $r = .65$ (Council, Kirsch, Vickery, & Carlson, 1983).

The second method used to support the expectancy construct is by manipulating subjects' expectancies prior to the administration of a hypnotic suggestibility measure. By manipulating expectancy, researchers aimed at

demonstrating its role in the determination of responsivity to suggestions. When compared to a control group, the increase or decrease in responding was usually interpreted in terms of expectancy effects on hypnotic responding. The manipulation is usually done in one of two ways; firstly, by giving pre-experimental instructions to influence subjects' beliefs about hypnotic procedures (e.g., giving them positive or negative expectations that the hypnotic inductions are more or less effective), or by instructing them that responding will be easier or harder; and secondly, by changing peoples' self perception of themselves and conveying to them that they are good hypnotic subjects.

A series of experiments on the hidden observer suggestion is a good illustration of the first method of manipulation. Spanos and Hewitt (1980) exposed HH subjects to the procedures used by Hilgard for eliciting hidden observer reports of pain during hypnotic analgesia experiments. Prior to the session, eight subjects were told that their hidden part will continue to feel high levels of pain. Eight additional subjects were given the opposite suggestion, that their hidden part will feel less pain than the hypnotized part. Results showed that subjects expecting higher levels of pain reported higher levels of "hidden pain", whereas those expecting lower levels of pain reported accordingly. Subjects' overt and hidden reports of pain were consistent with induced expectancies. The authors argued that the hidden observer response is goal

directed behavior shaped by demand expectancies conveyed in the hidden observer suggestion.

In another study, Vikery and Kirsch (1991) instructed their subjects that their hypnotic responding will increase, decrease or remain the same over repeated testing. A fourth group was not given any expectancy information (control), and a fifth group was given a cognitive skill training package to increase responsivity. Results showed that subjects' performance was in accord with pre-experimental manipulation; both positive and negative expectancies were found effective. The authors claimed that a simple two sentence expectancy manipulation was sufficient to alter subjects' hypnotizability. The skill training group did not differ significantly from the positive expectancy condition; therefore, the effects of skill training were considered entirely due to expectancy.

There is considerable documentation on the success of expectancy manipulation in the literature. However, it is difficult to delineate the direct effects of it on performance from the demand characteristics embedded in the manipulation leading to the subject's compliance to behave accordingly. To illustrate this, Teggart (1991) presented a group of subjects with positive information about hypnosis assuring them that they would be successfully hypnotized (positive expectancy condition). A second group was presented with information telling them that the aim of the study was to investigate the factors

that make a hypnotic induction work by comparing different techniques of inducing hypnosis, one that works with one that doesn't work. Subjects in this group were told that they had been chosen for the technique that doesn't work (negative expectancy condition). A third group was not given any instructions, but they were asked to relax and cooperate as best as they could. Results showed that mean hypnotic responsiveness of the negative expectancy group was significantly lower than both positive and control groups. Generating negative expectancies inhibited responsiveness, whereas generating positive expectancies did not facilitate responding. These results were interpreted as supporting the expectancy theory; similarities between the positive and control groups were explained in terms of expectancies generated by the subjective experience during the hypnotic induction. The reduction in responding in the negative condition was interpreted as due to the stronger effect of negative expectancy manipulation overpowering subjective expectancy generated during the hypnotic induction. If a pre-induction negative expectancy manipulation is more powerful than induction sensory experience, it is unclear why it made no difference in the positive condition leading to better performance. It is not clear whether negative information had its effect through disengaging subjects from participating, or through shaping their experience as suggested by the authors. It is possible that subjects reduced their involvement in the hypnotic experience

because they were told that the technique used was not a good one leading to disinterest and lack of focus. In fact, some of their subjects in the negative expectancy group were highly hypnotizable and responded to suggestions despite the manipulation. It is possible that expectancy manipulation (and therefore demand characteristics) influences subjects in the lower and medium range of hypnotizability more than highs.

An example of the second method of manipulating subjects' expectancies is to change subjects' self perceptions of themselves as hypnotizable. To illustrate, during a hallucination suggestion, Wilson, (1967) lit a tiny bulb to give faint red light to convince his subjects that they are responding to a hallucination suggestion. This manipulation significantly increased subjects' responsivity to suggestion; it has led subjects to think that they are responding to suggestions experientially. Consequently, subjects have generated positive expectancies that they will respond to other suggestions, therefore they did. This study was replicated by Wickless and Kirsch (1989) with the addition of a "bogus feedback" informing subjects that results of their personality tests indicate that they have "excellent hypnotic talent". Results showed that using both manipulations rendered 70% of their sample highly suggestible. Furthermore, even after being told about the manipulations, subjects retained their high level of performance.

The authors reported that enhancing response expectancies can lead to lasting changes in suggestibility.

It is hard for any worker in the field to view such an easy verbal manipulation leading to permanent increase in hypnotizability. Demand characteristics are very clear in these studies. When subjects were informed of the manipulation, they may have continued acting as good hypnotic subjects so as not to experience cognitive dissonance, and / or appear gullible in front of others. They continued responding as they had before in order to keep a constant image of themselves in front of others.

On the other hand, many studies failed to replicate the expectancy effects. Wagstaff, Graham, Toner, and Cole (2002) presented 37 subjects with a clear visual stimulus (a paper with the number 8 written on it) during a negative hallucination suggestion after leading subjects to expect that they would see nothing. Response expectancy was assessed after the session together with the clarity of the image. Results showed that all subjects reported seeing something, although half of them were 100% confident that they would see nothing. Moreover, response expectancy did not correlate with the clarity of the image, although hypnotic depth did.

A replication of Wickless et al. study of "bogus feedback" failed to support its effect on responsivity to suggestions (Benham, Bowers, Nash,

Muenchen, 1998). In this study, the "bogus feedback" had its influence by increasing expectancy without having any effect on responsivity to suggestions. In another study, subjects' expectancies were manipulated in another paradigm aiming at creating false memory in hypnosis (Moghrabi, 1998). One group was led to expect memory enhancement, while another group was warned about the accuracy of memories retrieved in hypnosis, and a control group did not get any instruction. Expectancy manipulation failed to influence the production of false memory, where no difference in false memory production among the three groups was found.

Recently, there has been a rising interest in distinguishing between two highly correlated constructs; waking or imaginative suggestibility, and hypnotic suggestibility. The relationship between imagination and hypnotizability was extensively studied in the mid 70s by Spanos, Barber, and others. Socio-cognitive researchers criticized research on hypnotic suggestibility in that it does not control for subjects' waking suggestibility (Kirsch, & Lynn, 1998; Braffman, & Kirsch, 1999). Because of the high correlation between hypnotic and imaginative suggestibility, it is postulated that using hypnotic scales may not be an accurate measure of hypnotizability, where what these scales may be measuring is suggestibility in general. Imaginative suggestibility was defined as "subjects' ability to respond to suggestions without hypnotic induction", and hypnotic

suggestibility was defined as "subjects' ability to respond to the same suggestions with hypnotic induction" (Braffman, & Kirsch, 1999). Therefore, hypnotizability was considered as the effect of hypnotic induction on responses to suggestion, after controlling for nonhypnotic (imaginative) suggestibility.

In their assessment of both constructs, Braffman and Kirsch, 1999, asked their subjects to rate their behavioral and subjective response expectancy on a 5 point Likert-type scale for the seven items of CURSS Scale of hypnotic suggestibility (Spanos, Radtke, Hodgins, Bertrand, & Stam, 1981). The same suggestions were administered twice with and without hypnotic induction, with the order of assessment counterbalanced. Results indicated a failure of finding a significant effect for hypnosis when nonhypnotic suggestibility was assessed before hypnotic suggestibility. According to the authors, imaginative suggestibility was suppressed when it was measured after hypnosis. Imaginative suggestibility, expectancy, and motivation were significant predictors of hypnotic responding.

According to Braffman and Kirsch, 1999, expectancy varies along two dimensions: the strength of expectancy (how confident one is that the response will occur) and the expected magnitude of the response. A strong expectancy for a small change tends to be confirmed, and a weak expectancy for a large change tends to be disconfirmed. Because peoples' confidence in their expectancies is

less than complete, responses tend to be weaker than anticipated. However, in all research reviewed, the role of confidence was not investigated, and this is one of the aims of this study.

Using a larger sample, their second experiment examined individual variables of absorption, fantasy proneness, motivation, and response expectancy, in addition to nonhypnotic suggestibility, as predictors of hypnotizability. Based on their previous findings that subjects suppressed their responses in the nonhypnotic condition only when hypnosis was encountered first, hypnotic suggestibility in this experiment was assessed after imaginative suggestibility only. Nonhypnotic suggestibility, together with motivation and response expectancy accounted for 53% of the variance in hypnotic suggestibility. Because this amount exceeds the test-retest reliability of the CURSS, the authors concluded that there is no more variance to predict, therefore, nonhypnotic suggestibility, response expectancy and motivations were the only predictors of behavioral hypnotic responding. The effects of other personality measures (absorption and fantasy proneness) were thought to be mediated completely by expectancy, with expectancy controlled, neither absorption nor fantasy proneness significantly predicted suggestibility, but the opposite was not true. In this study, expectancy was strongly associated with nonhypnotic suggestibility accounting for 25% of the variance, even after controlling for other variables.

Additionally, response expectancy was also highly associated with hypnotic suggestibility accounting for 25% of the variance even with imaginative suggestibility held constant. In this study, 25 % of subjects passed fewer suggestions in hypnosis; 29% showed no change in both conditions; and 47% exhibited greater suggestibility after induction. The authors interpreted these results with caution, and concluded that hypnosis could be observed in few subjects, where only 10% of subjects scored three or more points higher in hypnosis.

In summary, there is a wealth of documentation on the prediction or manipulation of expectancies or peoples' beliefs about their responsivity. However, the manipulation of beliefs is not as easy as the results of expectancy research may suggest. Many personal beliefs and knowledge about one's self and the world are well established. They set the parameters and rules for personal behavior, and they channel individual perceptions and cognition in everyday life. If one believes it, one will see it, one will do it, and one will expect it to happen the next time. Additionally, prediction of behavior is important to the extent that it provides us with understanding about the phenomenon under investigation. It is quite easy for researchers to be occupied in the prediction of behavior running the risk of neglecting the underlying mechanisms and/or

processes underlying the behaviors under investigation, leading to a dearth of knowledge in this important area.

According to sociocognitive theory, response expectancy directly produces the expected effects, and if expectancy is manipulated behavior will occur. This view makes people appear as gullible, and the experimental manipulation as powerful. In fact the converse applies; people expect to do things based on what they know about their abilities, what they have done before, and what they believe they are capable of doing. There is however some ambiguous situations, where people could be influenced to expect something that is close enough to what they believe and know about themselves. However, if there is a large discrepancy between expectancy manipulation and the personal beliefs and knowledge they will not be influenced. Subjects may comply, or pretend, but the actual generation of experience would be impossible. For example, if an athlete who exercises and lifts weights everyday is asked to predict if he/she can lift a heavy box (say 200 pounds) in the air; the subject's expectancy will be based on his/her muscle strength dependant on past experience in lifting weights. If the subject had lifted 180 pounds easily before, it would be easy to be influenced with the possibility of lifting the box. If the lifting of 180 pounds weight was rarely experienced, the subject may be hesitant to make this expectation; nevertheless, it is still easier to influence the expectation in

this situation because the discrepancy from what the subject knows is not too large, and with little extra effort it could be done. On the other hand, if the heaviest weight this person has lifted was 100 pounds, which was done with difficulty, it will be very hard to influence the expectation in this condition, and consequently the behavior of lifting.

Response expectancies are shaped by three factors; firstly, subjects' past experience and knowledge about their capabilities; secondly, social influence through cultural and social construction and definition of an event or situation; and thirdly, contextual effects demonstrated as demand characteristics embedded in the manipulation. The contextual effects exert their influence in ambiguous situations and may lead to compliance which is hard to disentangle from true responding. The socio-cognitive perspective does not differentiate or investigate the relative importance and influence of these factors.

Additionally, it seems that constructs such as beliefs, suggestibility, and expectancy are used interchangeably by sociocognitive theorists. Despite the strong relationship between these constructs, they may not be identical processes. For example, a person may have the *belief* that in hypnosis people behave involuntarily, and *expect* them to behave accordingly; however, the subject could be LH and cannot execute any of the hypnotic behaviors despite his beliefs and expectations about hypnosis. Despite its vital importance,

suggestibility and hypnotizability entail more than beliefs *per se.* In addition to general beliefs and schemas, they entail personal knowledge and beliefs about oneself and skills from past experience. One of the aims of this study is to explore the role of some cognitive variables is shaping response expectancy.

CURRENT STUDY RATIONALE

The Major aim of this study was to explore cognitive correlates of hypnotizability and imaginativity. Based on the recent findings of superior frontal abilities in HH subjects as measured by neuropsychological tests, it is important to test whether these associations are unique contributors to hypnotizability or to suggestibility in general. Compared to their performance in hypnosis and imagination conditions, some subjects had higher scores in hypnosis while others responded better imagination (Braffman, & Kirsch, 1999). These findings were explained as a result of subjects' suppressing imaginative suggestibility after experiencing hypnosis. However, there is a possibility that despite the great overlap between imagination and hypnotizability as evidenced by the high correlations between the two constructs, there may be some individual differences between these two groups that can account for this difference. Therefore, cognitive correlates of imaginativity were also explored. The question addressed in this study relates to which cognitive variables are associated with Hypnotizability (hypnotic suggestibility after controlling for

imaginative suggestibility) and with Imaginativity (imaginative suggestibility after controlling for hypnotic suggestibility) that may dispose subjects to be more responsive to the same suggestions in one context more than the other.

To answer this question, hypnotic and nonhypnotic suggestibility were assessed using the Harvard Group Scale for Hypnotic Suggestibility HGSHS; Form A. Suggestibility was measured twice in two experimental conditions, imagination and hypnosis. In the imagination condition, an induction of imagination and relaxation, adopted from the HGSHS with some modifications to emphasize imaginative involvement was administered. All subjects were exposed to both conditions with the order of presentation counterbalanced to control for order effects.

A battery of neuropsychological tests measuring frontal lobe functions was administered to all subjects in a third session. The association of hypnotizability and speed of processing (automaticity) as measured on RT tasks has been documented in many studies. Therefore, RT measures on the Stroop congruent and neutral conditions, and RT on Target Detection (D2) were used as a measure of automaticity and processing speed. RT on the Stroop incongruent was used as a measure of inhibitory processes. Other frontal tasks showing association with hypnotizability in previous research were also administered: the Wisconsin Card Sorting Test (WCST) and the Self Ordered Pointing Test (SOPT)

are known to be measures of executive functions (in addition to the Stroop). As mentioned before, attentional processes and the ability to ignore irrelevant stimuli (inattention) is thought to be important for carrying out hypnotic suggestions (Crawford, 1994; Gruzelier, & Warren, 1993). As visual search tasks may not tap on this kind of attention, Digit Span Forward (DSF) was considered a better measure for attentional capacity in this study, and Digit Span Backward (DSB) as a measure of short term memory functions. In addition to frontal tests, all subjects were administered the imagery and absorption scales. Depending on previous findings of superior abilities in HH on frontal tasks, it was hypothesized that hypnotizability will be associated with some of these measures, and that different cognitive abilities will be associated with hypnotizability and imaginativity.

Response expectancy (RE), defined as the extent to which subjects respond to hypnotic suggestions because of prior expectancies, has played a central role as a strong predictor of both suggestibilities. Subjects' behavioral and subjective Response Expectancy (RE) were assessed before each session to investigate the role of RE in predicting hypnotizability and imaginativity. Behavioral and subjective RE were obtained on a Likert-type scale used by Braffman and Kirsch (1999). After the sessions, all subjects completed a scoring booklet designed to measure their actual responses based on Pass /Fail criteria, and Likert scale

ratings of behavioral and subjective scores. Motivation has been associated with both suggestibilities, and was a strong predictor of hypnotizability. Motivation, effort, and confidence in expectancy were also assessed before each session.

A consistent finding in research indicates a strong role for RE in predicting both suggestibilities, however, little effort is paid to explore how these predictions are formed. According to sociocognitive approach, response expectancy varies along two dimensions: confidence and magnitude of anticipation (Braffman, & Kirsch, 1999). However, most expectancy research use the magnitude measure of expectancy to demonstrate its influence on suggestibility and the confidence dimension is neglected. In this study, the role of confidence and effort as well as imagery, absorption, and motivation in predicting behavioral and subjective RE was explored. Due to the importance of personal abilities and past experience in forming predictions, it was hypothesized that some of these variables will be associated with RE.

The last aim of this study was to explore associations between cognitive variables and responsivity to different types of hypnotic suggestions (Ideomotor, challenge, and cognitive) in order to delineate the cognitive abilities associated with responding to each type of suggestion. It was hypothesized that different cognitive abilities will be associated with performance on each type of suggestions.

Method

Participants

One hundred and four participants (82 females and 22 males) were recruited on a voluntary basis through advertisements in Concordia University newspapers and undergraduate class recruitment. Performance on frontal tasks has been found to deteriorate with age; therefore data from four subjects was discarded because of age (above 45 years old). Another 16 subjects had missing data for one or two sessions and they were excluded from analysis. The final sample of 84 subjects (63 females and 21 males) was randomly assigned to one of the two experimental conditions (hypnosis first/ imagination first). Subjects ranged in age from 17 to 43 years (M = 24.19; SD = 5.34). All subjects were non-color blind and have a normal or corrected to normal vision. Subjects were screened for medications that can influence performance on frontal tasks.

Procedure

All subjects attended three sessions. The first session was for individual assessment on frontal tasks, absorption and imagery. The duration of this session was approximately one hour. Subjects were told that the aim of this experiment was to study the relationship between some cognitive processes and hypnotizability. At their arrival, subjects were asked to read and sign a consent form (see Appendix A), and this was followed by the administration of frontal

tests and paper-and-pencil tasks. Tests administered were: The Stroop Test, Digit Span (DS), Self Ordered Pointing task (SOPT), Target Detection Test (D2), and the Wisconsin Card Sorting task (WCST), in that order. At the end of the session, subjects filled in the Differential Personality Questionnaire (DPQ) (Appendix B), and Individual Differences Questionnaire (IDQ) (Appendix C). At the end of the session, subjects were scheduled for the second session.

To assess hypnotic and imaginative suggestibility, group sessions of 5 to 10 subjects were scheduled for hypnosis and imagination conditions interchangeably. Subjects were informed about the dates on which these group sessions were to be held, without being told of the content of the session. At the end of the second session, subjects were given the dates in which the other condition sessions were held (either hypnosis or imagination). In total, 44 Ss did the imagination condition first then hypnosis, and 40 Ss did the hypnosis first followed by the imagination condition. The "Hypnosis First" group was tested for hypnotic suggestibility in the second session and for imaginative suggestibility in third session. The "Imagination First" group was tested for imagination in the second session and for hypnosis in the third session.

Procedure for the Hypnosis session:

At the beginning of the session (which lasted approximately one hour), subjects received a brief explanation of the purpose of the session and the nature

of hypnosis (Appendix E). Subjects were encouraged to raise any questions or concerns they may have about the session and any questions were answered. After that, subjects filled in the Hypnotic Response Expectancy Questionnaire (Appendix D) followed by the administration of the Harvard Group Scale for Hypnotic Susceptibility (HGSHS: Form A) (see Appendix E for script of the session). At the end, subjects rated their responses to hypnotic suggestions on the Response Booklet for Hypnotic Suggestibility (Appendix F).

Procedure for the Imagination Session:

After a brief explanation of the purpose of the session (Appendix H), Ss filled in the Imaginative Response Expectancy and Motivation questionnaire (Appendix G) followed by Imaginative Suggestibility assessment. At the end of the session, subjects rated their responses to suggestions on the Imaginative Response Booklet (Appendix I).

Material

Assessment of hypnotic and Nonhypnotic suggestibility and other related measures

Measures of Individual Differences

Harvard Group Scale of Hypnotic Susceptibility; A (HGSHS: A); (Shore & Orne, 1962):

The purpose of this scale was to evaluate the subjects' level of Hypnotizability. The HGSHS:A consists of an induction and 12 suggestions

varying in difficulty. One suggestion from the SHSS: form C (taste hallucination) was added to the original suggestions to add difficulty to the scale, and the head falling suggestion was removed.

The scoring criteria were adopted from the original HGSHS scoring booklet. Scores ranged from 0 to 12 based on subjects' reports, with subjects' total score equaling the number of items passed (yes or no). Subjects were classified according to their level of hypnotizability; LH (0 – 3 suggestions passed), MH (4 – 7 suggestions), and HH (8 – 12 suggestion). Additionally, subjects rated each item on a 5 point Likert-type scale with (0 = not at all) to (4 = to a large extent) for each of the following: behavioral scores, indicating to which extent they responded to suggestions behaviorally; and subjective scores, indicating to which extent they had the subjective experience of suggestions.

Scores were derived for each type of suggestion on the scale. These scores were: Ideomotor scores consisted of the sum of subjects' behavioral performance on the eye closure, hand lowering, and hands moving together suggestions. Challenge scores were the sum of behavioral performance on the arm immobilization, fingers locked together, arm rigidity, communication inhibition, and eye catalepsy suggestions. The cognitive scores consisted of the sum of behavioral responses on the fly hallucination, taste hallucination, amnesia and post-hypnotic suggestions.

The HGSHS suggestions were administered twice, once with hypnotic induction to measure Hypnotic suggestibility (HS), and once with an imagination induction to measure Nonhypnotic Suggestibility (NHS).

Individual Differences Questionnaire (IDQ): (Paivo & Harshman, 1983).

This scale is a measure for imagery. It is composed of items tapping three different factors: habitual use of imagery (13 items), use of images to solve problems (2 items), and vividness of dreams, daydreams and imagination (6 items). Subjects rated each statement as to how characteristic it is of their way of thinking. A 5-point Likert-type scale is used with anchors of extremely characteristic (+2), or extremely uncharacteristic (-2).

Differential Personality Questionnaire (DPQ) "AB" (Tellegen, 1980).

The DPQ is a measure of absorption ability. Tellegen and Atkinson, (1974) defined absorption as a state of extremely focused or "total" attention, in which there is full commitment of available perceptual, motoric, imaginative and ideational resources to a unified representation of the attentional object (p. 274). The scale consists of 34 statements to be answered in a true-false mode. This scale measures abilities relating to the degree of personal involvement in fantasy, new experiences, and absorbing events. The subject's score is the number of "True" statements. An internal consistency coefficient reliability of 0.89 has been reported for this scale (Isaacs, 1982)

Other Measures

Response Expectancy Questionnaire

Subjects rated response expectancy to suggestions before both conditions (Imagination and Hypnosis). Response Expectancy scores were obtained by providing a detailed description for each suggestion. Subjects rated whether they expected to pass (Yes) or fail the item (No). Total scores were the sum of yes responses (range 0 – 12). In addition, Ss rated behavioral and subjective expectancies for each item on a 5 point Likert-type scale (0 = not at all, and 4 = to a large extent); Behavioral Expectancy indicates whether the subject expected to make the behavioral response called for by the suggestion; and Subjective Expectancy indicated to what extent the subjects expected to have the subjective experience called for by each suggestion. For example, subjective expectancy for the arm heavy suggestion would be their rating of how heavy they expected their arm to feel. Response expectancy scores were the sum of these ratings.

Subjects' motivations to experience each suggestion was assessed by asking subjects to rate to which extent they wanted or hoped to experience each suggestion, regardless of what they expected. For example, for the arm heavy item, subjects were asked to which extent they would like to experience their arm feeling heavy and going down (0 = not at all; 4 = very much). Scores were the sum of these ratings.

Subjects' confidence in expectancy on each suggestion was assessed by asking subjects to rate the level of confidence in their expectancy of each suggestion (0 = not at all; 4 = very much). Scores were the sum of ratings. Expected Effort was assessed by asking subjects to rate the effort needed to respond to the suggestion (0 = not at all; 4 = very much). Scores were the sum of subjects' ratings on all suggestions.

Neuropsychological Testing (see Appendix J for instructions)

The Stroop Test:

The Stroop test is known to be a measure of automaticity and inhibition. The test consisted of 108 randomly presented stimuli representing three conditions of 36 stimuli each; In the congruent condition, Ss were shown color words printed in colored ink that matched the word (i.e., the word "red" printed in red ink); in the incongruent condition, the word was printed in a different color (i.e., the word "red" printed in blue ink); and the neutral condition, in which series of **xxxx**s were printed in different colors. Stimuli were presented in one of four colors (red, green, blue, or yellow) at the center of a MacIntoch 12-inch monitor in capital letters, Times Font 48 points on a white background. The subject's task was to identify the color of the letter print by pressing a pre-selected key for the color on a keyboard. Subjects did a practice block consisting of 36 trials prior to the experimental block of 108 trials. Response time and errors

for each condition were recorded. People with frontal damage are particularly susceptible to errors on this test (Perret, 1974). Trial to trial reliability for the average of three trials is above .75 (Spreen & Stauss, 1998).

Target Detection Test (D2)

In this task, the subject was required to search through 6 rows of 40 characters, and to cross out the occurrences of target characters randomly interspersed among the other characters. The test consisted of three parts with gradually increasing difficulty; A, B, and C. Part A has one simple target that could be recognized easily; part B has one single target that is more difficult to detect because of its similarity to other characters; and part C was the hardest because it consisted of three characters target. Subjects were given two rows of parts A, B, and C as practice trials and were tested on part C only. Average time taken to complete rows, as well as the number of omission and commission errors was recorded. Internal consistency on this test is reported to be above .80 (Spreen & Strauss, 1998).

Self-Ordered Pointing Test (SOPT):

This test is considered a measure of executive function, the ability to organize information and to maintain a record of them in memory, in addition to monitoring responses. Subjects were presented with a group of abstract designs printed in different locations on a number of white pages presented one at a

time. The subject's task was to point to a different abstract design on each page. Although the original test consisted of groups of 6, 8, 10, and 12 designs per page, only the 10 and 12 designs groups were used in this study. The subject was asked to point to one design on the first page, and then to choose a different design on each consequent page. The total number of errors summed across all sections, as well as perseverative errors (when the subject points to the same design on consecutive pages) was recorded. The SOPT is a relatively new test assessing frontal functions; therefore, information about the test reliability is not available yet. However, this test has been found to correlate with the Wisconsin Card Sorting Test (r = .33), and with the Stroop test (r = .36) (Diagneault, & Brown, 1993).

Wisconsin Card Sorting Test (WCST):

The test is said to measure concept formation, the maintenance of a concept in working memory, strategic planning, learning, and the ability to use environmental feedback to shift cognitive goals. This test was presented on a Packard Bell 486 processor attached to a 13-inch monitor. On each trial, four card stimuli appear at the top of the screen, and a target card at the bottom to be matched with one of the cards on top. The cards varied according to three criteria; form (square, circle, cross, or star); color of forms (red, blue, green, or yellow), and the number of forms on each card (from 2 to four). Subjects were

required to match the card at the bottom with one of the four cards on top. Maintaining or shifting responses is guided by a feedback of "right" or "wrong" appearing on the screen after each trial, indicating that they were successful in matching the stimulus card with the grouping criterion. Grouping criterion (color, form, or number) shifts after a few trials. Scores involved the number of categories completed, the number of trials required to complete them, the number of errors as well as perseverative errors. This test is sensitive to age and education; therefore, corrected standardized scores were used. Frontal patients encounter difficulty with the WCST when the category changes, they will persist in sorting cards according to the previous category. Test-retest reliability coefficients are moderate in value, ranging from .37 to .72 for errors, but the use of computer software has been found to increase test reliability (Heaton, 1993).

Digit Span: Wechsler Adult Intelligence Scale-Third Edition (WAIS-III) (Wechsler, 1997).

This is a subtest from the WAIS lll intelligence test known as the best measure of attention and working memory. This test is composed of two tasks administered independent of each other: Digit Forward and Digit Backward. On both tasks, a sequence of numbers, varying in difficulty according to the length of the sequence (from two to eight numbers), is read to the subject at the rate of one number per second. In the Digit Forward (DSF), the subject is required to

repeat the number sequence in the same order as presented; and in the Digit Backward (DSB) the subject is required to repeat the number sequence in the reverse order. Digit forward (DSF) is considered a measure of Attentional span and rote learning, while digit backward (DSB) is a measure of short term memory. Series were administered in blocks of two trials for each number of items. Administration stopped after failing to repeat the sequence in the two consecutive trials in the same block. Scores were the number of series repeated correctly in each order, and a total score equals the sum of both DSF and DSB.

Results

Outliers and Normality tests

Prior to analysis, standardized scores from frontal tasks (Stroop, TD, SOPT, WCST, and DS) and other measures (HGSHS, Imagination, Expectancy, Motivation, IDQ, & DPQ) were examined for univariate outliers. Cases with standardized values in excess of $z = \pm 3$ were considered outliers. These scores were modified by giving them a score one unit more than the next most extreme score in the sample. Modified scores were for: For the Stroop Test, modified cases were: case # 5, # 12, # 55, # 76, and # 85; On the D2 Test, cases # 33, # 42, and # 48; on the WCST, cases # 33, and #38; On the SOPT, case # 61; and on the IDQ cases # 2, and # 51.

Stroop reaction times were screened for extreme values using a maximum and minimum descriptive statistics (Psysquash 1.1 software). Reaction times exceeding 2000 ms were replaced with the subjects' average response in the same condition (e., g., congruent, incongruent, or neutral). Such excessive scores can stem from distraction, or excitement when making a mistake during test performance resulting in a high score that does not reflect true reaction time for the item that follows. This will lead to distorting mean reaction times for that condition. Eighteen cases were found with such distortions, and they were modified as mentioned before: case #2, case # 9, case #11, case #13, case # 23, case

26, case # 28, case # 29, case #30, case # 31, case # 34, case # 38, case #39, case # 41, case # 45, case # 48, case # 51, and case # 53.

Prior to analysis, all variables were examined through various SPSS programs of data entry, missing values, and fit between variables' distributions and the assumptions of multivariate analysis. Regression analysis (using residuals subcommand) with a dummy dependant variable (case number) was used to detect multivariate outliers on all frontal lobe tasks scores, the IDQ and DPQ. The Mahalanobis distance was computed for each case, and no multivariate outliers were detected. Mahalanobis distance is the distance of a case from the centroid of the remaining cases, where the centroid is the point created by the means of all variables (Tabacknick, & Fidel, 1996). Univariate normality tests were used to detect for skewness and kurtosis values for each variable. Most variables were within the acceptable range. Some variables had some deviations; D2 commission error had slight positive skewness (2.89) and large positive kurtosis (10.49); SOPT has a slight positive kurtosis = 1.84.

The same screening procedures were used with measures of suggestibility (hypnotic and nonhypnotic) scores, Response Expectancy (both behavioral and subjective), and Motivation. No univariate or multivariate outliers were detected. Also, all variables were normally distributed with very slight and/or negligible skewness or kurtosis in some variables.

To test for gender differences on frontal tasks, independent t-tests were conducted on all test scores. Significant gender differences were found on Stroop error neutral; $t_{(84)} = -2.87$, $p < .05$. Female subjects made fewer errors on this test: $M = 2.65$, $SD = 2.40$ for females, and $M = 4.69$, $SD = 3.83$ for males. Another significant gender difference was on SOPT error, $t_{(84)} = 2.39$, $p < .05$. However, on this test males made fewer errors than females: $M = 8.28$, $SD = 3.51$ for females, and $M = 6.09$, $SD = 3.99$ for males. No gender differences were found on Response Expectancy, Motivation, Hypnotic suggestibility (HS), and Nonhypnotic suggestibility (NHS).

In this sample of 84 subjects, subjects' hypnotizability was classified according to the number of suggestions passed on the HGSHS. A total of 21 subjects were classified as LH (0 – 3), 45 subjects were classified as MH (4 – 7), and 18 subjects were classified HH (8 – 12).

TESTING FOR ORDER EFFCT

Forty four Subjects were assessed in the Imagination condition first followed by Hypnosis (NH group), and the other 40 Ss were assessed in the opposite order, Hypnosis first then Imagination (HN group). Descriptive statistics displaying means and standard deviations of behavioral and subjective responses to suggestions, behavioral and subjective RE, and motivation, as a function of hypnotic induction are presented in Appendix K (Table 1K).

To test for order effects, a 2 trials (Hypnosis and Imagination) x 2 orders (HN, NH) repeated measures Analysis of Variance ANOVA was conducted on subjects' suggestibility scores (fail / pass). No main effects or interaction were found significant (Appendix K, Table 2K). However, there was a tendency toward better performance in the hypnosis condition, $F_{(1, 82)} = 2.89$, $p = .09$; $M = 4.86$, and $M = 5.22$, for Nonhypnotic and Hypnotic conditions respectively.

Correlational Aspects of Response Expectancy

To investigate the relationship of hypnotic and nonhypnotic suggestibilities with RE and cognitive measures, a series of Bivariate Pearson Product correlations were calculated (See Appendix L for analysis of this section). First investigated was the relationship between Hypnotic Suggestibility (HS), Nonhypnotic Suggestibility (NHS), and RE measures in both conditions: Hypnotic Behavioral RE (HBRE), and hypnotic Subjective RE (HSRE); Nonhypnotic Behavioral RE (NHBRE), and nonhypnotic Subjective RE (NHSRE). High correlations were observed between both suggestibilities and RE measures (Table 1L). HS correlated with: NHS($r = .72$, $p < .01$), HBRE ($r = .42$, $p < .01$), HSRE ($r = .45$, $p < .01$), NHBRE ($r = .46$, $p < .01$), and with NHSRE ($r = .45$, $p < .01$).

To understand the relationship between Suggestibility, RE, Motivation, Effort, and confidence measures, two Bivariate Pearson Product correlations were performed, one for each condition. In the hypnosis condition, no significant

correlations were obtained between motivation and any suggestibility measure (Table 2L). Motivation correlated significantly and positively only with RE measures: behavioral RE ($r = .26$, $p < .05$), and subjective RE ($r = .36$, $p < .05$), suggesting that the role of motivation may be mediated through RE. In addition, Effort scores correlated highly and negatively with both RE scores: behavioral ($r = -.31$, $p < .01$), and subjective ($r = -.34$, $p < .01$), indicating subjects' expectancy of effortless responsivity to suggestions in hypnosis.

In the imagination condition (Table 3L), Motivation correlated positively and significantly with subjective RE ($r = .38$, $p < .01$), and with all suggestibility measures: with NHS ($r = .34$, $p < .01$), NHBS ($r = .34$, $p < .01$), and NHSS ($r = .39$, $p < .01$). Effort correlated significantly with subjective RE only, suggesting that only subjective feelings were expected to be effortless in the imagination condition. Confidence scores correlated negatively and significantly with behavioral RE ($r = -.27$, $p < .05$), indicating that subjects were not sure of their behavioral expectancies.

The relationship between Suggestibility, RE, and cognitive measures of imagery (IDQ) and absorption (DPQ) was examined next. Pearson correlations on these measures were calculated for each condition. In the hypnosis condition (Table 4L), the IDQ did not correlate with any suggestibility scores, the only correlation observed was between IDQ and subjective RE ($r = .32$, $p < .01$),

suggesting a role for imagery in subjective RE. The DPQ was highly correlated with both RE measures, behavioral ($r = .32$, $p < .01$), and subjective ($r = .51$, $p < .01$), as well as with HS ($r = .25$, $p < .05$), and HSS ($r = .23$, $p < .05$).

In the imagination condition (Table 5L), and similar to correlations obtained in hypnosis, the IDQ was associated with subjective RE only ($r = .22$, $p < .05$). Also, the DPQ correlated significantly with both behavioral ($r = .25$, $p < .05$), and subjective RE ($r = .34$, $p < .01$) and with all suggestibility measures: with NHS ($r = .40$, $p < .01$), NHBS ($r = .35$, $p < .01$), and NHSS ($r = .45$, $p < .01$), indicating a stronger association between DPQ and nonhypnotic suggestibility.

To summarize correlations with suggestibility and RE measures: Suggestibility and RE correlated highly with each other. Motivation and imagery were not associated with any suggestibility measure, but they were both associated with subjective RE in both conditions. The DPQ was associated with behavioral and subjective RE in both conditions. Effort correlated negatively with behavioral and subjective RE in hypnosis, and Confidence scores correlated negatively with behavioral and subjective RE in the imagination condition only.

Prediction of Response Expectancy.

One of the aims of this study was to explore the role of personality variables associated with response expectancy. To address this issue, regression

analysis were conducted to predict both behavioral and subjective RE scores from variables that showed significant correlations with RE in previous analysis. The IDQ, DPQ, Motivation, Effort, and confidence correlated significantly with RE measures. All regression tables (see Appendix M for analysis of this section) display semipartial correlations (sr^2), unstanderdized regression coefficients (B), the standardized regression coefficients (β), and increments of change Δ, and R, R^2, and adjusted R after entry of all variables, for each respective case. The entry of variables in the regression equations was the same for all RE predictions. In all analysis, the IDQ was entered first, followed by DPQ, then motivation, followed by confidence scores, and finally Effort was entered last.

One regression analysis was conducted to predict each behavioral and subjective RE in the hypnosis condition. The first regression was performed on HBRE scores as the dependent variable (Table 1M). The DPQ was the only significant predictor of HBRE ($p<.01$) contributing 8.5% of the variance, suggesting that subjects use their absorption abilities to predict their behavioral responses. R for the model was significant at each step of regression, and with all variables entered, $R^2 = .198$, $F_{(5, 78)} = 3.36$, $p<.01$.

The second regression was conducted on subjective RE scores as the dependent variable (Table 2M). The IDQ ($p<.05$), DPQ ($p<.00$), Motivations ($p<.01$), and Effort ($p<.05$) were all significant contributors to HSRE prediction. R

for the model was significant at each step of the analysis, with all predictors entered, $R^2 = .387$, $F_{(5, 78)} = 8.58$, $p<.00$. When the IDQ was alone in the equation, $R^2 = .082$, $F_{(1, 82)} = 6.39$, $p<.05$; and with the DPQ was added as a predictor, $R^2 = .273$, $F_{(2, 81)} = 13.34$, $p<.00$; and when Motivation was entered, $R^2 = .343$, $F_{(3, 80)} = 12.16$, $p<.00$, when confidence was entered it did not to prediction, $R^2 = .343$, $F_{(4, 69)} = 9.01$, $p<.00$.

The same analyses were conducted on RE measures in the Imagination condition. The first regression was performed to predict behavioral RE from the same variables, (Table 3M). Both, the DPQ ($p<.05$), and Confidence ($p<.01$) were significant predictors, with confidence being negatively associated with NHBRE, indicating that subjects were not sure of their predictions. *R* for the model reached significance only after entering confidence scores, and with all variables entered, $R^2 = .173$, $F_{(5, 78)} = 3.26$, $p<.01$. The last regression was performed on NHSRE as the dependent variable (Table 4M). The IDQ ($p<.05$), DPQ ($p<.05$), Motivation ($p<.01$), and Confidence ($p<.05$), were significant predictors of NHSRE scores. Similarly, confidence in prediction was also negatively associated with NHSRE. *R* for the model was significant at each step of the analysis, with all predictors entered, $R^2 = .267$, $F_{(5, 78)} = 5.67$, $p<.00$. With the IDQ alone in the

equation, $R^2 = .049$, $F_{(1, 82)} = 4.21$, $p<.05$; and when the DPQ was added as a predictor, $R^2 = .119$, $F_{(2, 81)} = 5.47$, $p<.01$; and when Motivation was entered, $R^2 = .209$, $F_{(3, 80)} = 7.04$, $p<.00$; and with confidence added to the equation, $R^2 = .261$, $F_{(4,791)} = 6.96$, $p<.00$. Intercorrelations, Means and standard deviations for predictor variables are presented for both, the hypnosis condition (Table 5M), and the imagination condition (Table 6M).

To summarize RE prediction, the IDQ, DPQ, and Motivation were significant contributors to subjective RE in both conditions. From these variables, only DPQ predicted behavioral RE in both conditions. Expected effort was negatively associated hypnotic RE, and confidence scores were associated negatively with nonhypnotic RE.

Correlations between Hypnotizability and Frontal Tasks.

To examine the relationship between frontal tasks and hypnotizability (see Appendix N for analysis of this section), Pearson product correlations coefficients (Pairwise) were calculated for HS scores (Pass/Fail) and all neuropsychological tests (WSCN, (D2), SOPT, DSF, DSB, DST). First conducted were correlations with WCST scores (Table 1N), followed by correlations with D2 and SOPT scores (Table 2N), with no significant correlations observed. Inter-correlations with memory measures were also not significant (Table 3N), as well

as Stroop RTs and Errors (Table 4N). To examine the relationship between RT measures of processing speed (Stroop congruent, Stroop Neutral, and D2), a Pearson correlation indicated significant correlations between (D2) RT and all Stroop RT measures (Table 5N) indicating some relationship between these speed measures. D2 correlated significantly with Stroop congruent ($r = .37$, $p < .01$), Stroop Incongruent ($r = .28$, $p < .01$), and Stroop Neutral ($r = .40$, $p < .01$).

Prediction of Hypnotizability from Frontal Measures

The major aim of this study was to examine if performance on frontal tasks is associated with hypnotizability after controlling for NHS, and to examine the hypothesis that different cognitive variables would be associated with hypnotizability and imaginativity. Similar to Braffman and Kirsch findings (1999), in this sample, 23 subjects (27%) obtained higher scores in imagination than in the hypnosis condition; 26 subjects (31%) obtained similar scores in both conditions; and 35 subjects (42%) obtained higher scores in hypnosis than in imagination condition. Because subjects responded almost to the same suggestions in both conditions, the test-retest reliability of the scale is of utmost importance. Since the HGSHS:A is a relatively stable measurement of hypnotic suggestibility over time (Perry, Nadon, & Button, 1992), it is unlikely that these differences in responding are due to measurement error entirely. Only 31% of

subjects had similar scores in both conditions. Moreover, ANOVA analysis showed a tendency toward better performance in hypnosis. This pattern of responding suggests that other cognitive variables may be implicated differently in both suggestibilities, and this hypothesis was examined next.

Two regression analysis were performed to predict both Hypnotizability (HS with NHS controlled) and Imaginativity (NHS with HS controlled) from subjects scores on frontal tasks. Frontal measures were entered after other variables known to be associated with both suggestibilities (RE measures, IDQ, and DPQ) to see if performance on these tests contributes to prediction beyond what is accounted for by these variables. The same order of entry was used to predict both hypnotizability and imaginativity. The order of entry of predictors was based on theoretical connections with hypnotizability.

The first hierarchical regression was conducted on HS scores as the dependent variable. NHS was given a priority of entry to get its share of variance. All other variables were entered in blocks with hypnotic RE measures entered next, followed by IDQ and DPQ, then RT on speed measures were entered (Stroop congruent, Stroop neutral, and D2), and finally, Stroop Incongruent was entered last. Table 1 displays the semipartial correlation (sr^2), unstanderdized regression coefficients (*B*), the standardized regression

Table 1

Summary of Hierarchical Regression Analysis for Frontal and Cognitive Measures as Predictors of Hypnotizability (N = 84)

Variables	B	β	sr^2	ΔR^2
Nonhypnotic suggestibility	.67	.72	.72**	.522
Behavioral RE	.07	-.09	.19	.015
Subjective RE	.03	.19	.07	
IDQ	-.00	-.01	-.01	.011
DPQ	.08	-.12	.16	
Stroop Congruent RT	-.01	.00	-.39*	.033
Stroop Neutral RT	.02	.45	.18*	
(D2) RT	.01	.02	.01	
Stroop Incongruent RT	-.02	-.12	-.06	.004
Constant	-.80			
		$R^2 = .585$		
	Adjusted	$R^2 = .535$		
		$R = .765$		

** *p* .01; * *p*< .05

coefficients (β), and increments of change Δ, and R, R^2, and adjusted R after entry of all variables.

R was significantly different from zero at the end of each step. After step 1, with NHS alone in the equation, $R^2 = .522$, $F_{(1, 82)} = 89.57$, $p<.00$. NHS was a significant predictor ($p<.00$) accounting for 52% of the variance in HS. In Step 2, RE measures were entered as predictors, they did not contribute to prediction significantly, $R^2 = .537$, $F_{(3, 80)} = 30.96$, $p<.00$. Then in step 3 with IDQ and DPQ added to the equation, $R^2 = .548$, $F_{(5, 78)} = 18.93$, $p<.00$, neither of them add to prediction significantly. In Step 4, with Speed measures entered, $R^2 = .581$, $F_{(8, 75)} = 13.01$, $p<.00$, both RT for Stroop Congruent ($p = < .05$), and Stroop Neutral ($p = < .05$) were significant predictors of HS but in opposite directions. Hypnotizability was associated with faster RT on the congruent trials and a slower RT on Neutral trials. Finally, the Stroop incongruent did not add to prediction significantly, $R^2 = .585$, $F_{(9, 74)} = 11.59$, $p<.00$. The whole model predicted 58.5% of the variance in HS[1].

Predicting Imaginativity from Frontal Measures.

To predict Imaginativity (NHS with HS controlled), another hierarchical regression was conducted on NHS scores as the dependent variable. Table 2 displays the semipartial correlation (sr^2), unstanderdized regression coefficients (B), the standardized regression coefficients (β), and increments of change Δ, and

Table 2

Summary of Hierarchical Regression Analysis on Frontal and Cognitive Measures as Predictors of Imaginativity (N = 84)

Variables	B	β	sr^2	ΔR^2
Hypnotic suggestibility	.77	.72	.72**	.522
Behavioral RE	.07	.27	.19*	.092
Subjective RE	.03	.10	.07	
IDQ	-.00	-.02	-.01	.028
DPQ	.08	.19	.16*	
Stroop Congruent RT	.00	.35	.14*	.020
Stroop Neutral RT	-.01	-.34	-.13*	
(D2) RT	.03	.02	.02	
Stroop Incongruent RT	.01	.32	.16*	.026
Constant	-.31			
		$R^2 = .688$		
	Adjusted	$R^2 = .650$		
		$R = .830$		

** p .01; * $p < .05$

R, R^2, and adjusted R after entry of all variables. The regression model was significant also at each step. After Step 1, with HS alone in the equation, $R^2 = .522$, $F_{(1, 82)} = 89.57$, $p<.00$. HS was a significant predictor of NHS ($p= <.00$) accounting for 52% of the variance. In Step 2, with RE measures entered, $R^2 = .614$, $F_{(3, 80)} = 42.34$, $p<.00$. Behavioral RE added significantly to the increment in R^2 ($p<.05$) accounting for 9% of the variance. In step 3, with IDQ and DPQ added as predictors, $R^2 = .642$, $F_{(5, 78)} = 27.99$, $p<.00$. The DPQ also contributed significantly to NHS prediction ($p = < .05$) accounting for an extra 3% of the variance, above its shared variance with HS and RE measures. In Step 4, with RT measures entered, $R^2 = .662$, $F_{(8, 75)} = 18.36$, $p<.00$. Both Congruent ($p<.05$) and Neutral trials ($p<.05$) were significant predictors of NHS but in opposite directions. With hypnotizability controlled, Imaginativity was associated with slower RT on Stroop Congruent and faster RT on neutral trials. Finally, with the Stroop Incongruent added to the equation, $R^2 = .688$, $F_{(9, 74)} = 18.15$, $p<.00$. Stroop Incongruent was also a significant predictor of NHS where a slower RT was associated with imaginativity ($p<.05$).

In summary, both Hypnotizability and Imaginativity were significant predictors of each other accounting for 52% of the variance. From the cognitive variables, a faster RT on Stroop congruent and a slower RT on Neutral trials was associated with hypnotizability. In addition to HS, predictors of imaginativity

were: behavioral RE, DPQ, faster RT on Neutral trials, and slower RT on both Stroop congruent and incongruent trials.

Both Congruent and Incongruent trials involve word processing. The association between faster RT on these measures and hypnotizability suggests a verbal facilitation effect in hypnotic responding. The significant longer RT on both congruent and incongruent trials associated with Imaginativity may indicate slower verbal processing in highly imaginative subjects and more interference. To further examine the verbal facilitation and interference hypothesis, a verbal facilitation effect (facili) was calculated as the difference between subjects' RT on Congruent and Neutral trials. Similarly, an interference effect was calculated by subtracting RT on Incongruent trials from both congruent trials (intercon), and from neutral trials RT (intern). A Pearson correlation (Pairwise) was conducted on these measures and both imaginative and hypnotic suggestibility scores (Appendix O). Correlations indicated an association between verbal facilitation and subjective scores on hypnosis ($r = 23$, $p<.05$), and an association between both measures of interference and NHSS: intercon ($r = 25$, $p<.05$) and intern ($r = 23$, $p<.05$).

Correlations with Ideomotor, Challenge, and Cognitive Scores.

The last aim of this study was investigate associations between cognitive variables and different types of suggestions. To address this issue Pearson

correlations (Pairwise) were calculated for frontal test scores and the Ideomotor, Challenge, and Cognitive scores (see Appendix P for analysis of this section). Significant positive correlations were observed between Ideomotor scores and both the IDQ ($r = .25$, $p < .05$) and DPQ ($r = .34$, $p < .05$), indicating the importance of imagery and absorption for performance on these suggestions. Cognitive scores correlated negatively and significantly with both memory measures, DSB ($r = -.25$, $p < .05$) and DST scores ($r = -.25$, $p < .05$), indicating a role for short term memory in responding to hard items on the HGSHS scale. No significant correlations with Challenge scores were observed (Table 1P).

Gruzelier (1998) pointed out the importance of examining hypnotizable groups separately because of different processing styles observed in these groups in neurophysiological research. To further examine the relationship between frontal tests that showed significant correlations with ideomotor and cognitive scores, within group intercorrelations between Ideomotor, Challenge, and Cognitive scores and the IDQ, DPQ, and memory measures was conducted. The SOPT measures were added to analysis to understand better the role of memory. Performance on SOPT relates to memory functions, in that it reflects subjects' ability to organize information and to maintain a record of them in memory. Intercorrelations were calculated after splitting groups according to their hypnotizability level (HH, MH, and LH). No significant correlations were

observed in the LH group (Table 2P). However, significant negative correlations with hypnotic scores were found for both MH and HH groups.

For the MH group, all memory measures correlated negatively with hypnotizability, with the correlation of DSB ($r = -.37$, $p < .05$) and the DST ($r = -.31$, $p < .05$) being significant (Table 3P). Additionally, the SOPT perseverative errors correlated negatively with HS scores ($r = -.32$, $p < .05$), and with DPQ scores ($r = -.30$, $p < .05$), suggesting that lower absorption scores were associated with more perseverance. In this group, Ideomotor scores correlated positively and significantly with both, the IDQ ($r = .36$, $p < .05$) and DPQ ($r = .30$, $p < .05$), while Challenge scores correlated significantly with DSB ($r = -.33$, $p < .05$).

In the HH group, the DSF correlated negatively with hypnotizability ($r = -.56$, $p < .05$), as well as DST scores ($r = -.55$, $p < .05$), indicating the importance of attention span for hypnotizability in this group. Ideomotor scores correlated positively and significantly with the DSF scores ($r = .49$, $p < .05$), and Cognitive scores correlated negatively with all memory measures: with DSF ($r = -.62$, $p < .01$); DSB ($r = -.64$, $p < .01$); and DST ($r = -.70$, $p < .01$), indicating a strong association between memory functions and responsivity to Cognitive suggestions (Table 4P).

The absence of correlations between these measures and global hypnotizability scores for the whole sample, and the presence of high correlations within groups may indicate *heteroscedastic* distribution. That is, residuals may have grossly unequal variances at different values of the dependent variable (HGSHS scores). Nevertheless, because of the small size of the HH sample, these correlations will be considered valid only after testing for their significance.

First examined was the statistical significance of "*r*" between Attention span (DSF) and Cognitive scores ($r = -.62$, $p \leq .01$) in HH group. A two-tailed t-test for "*r*" was significant; $t_{(16)} = -3.16$, $p < .01$, indicating that "r" is different from zero and that a linear relationship between the two variables exists. Because the sampling distribution for the non-zero correlations is skewed the more the departure from zero increases, it is necessary to estimate the confidence limits of the population "*r*" (Cohen, & Cohen, 1989). Fisher's z' transformation of "*r*" with a sampling distribution that is nearly normal and a standard error that depends only on the number of subjects in the sample was conducted (Fisher's formula determines if the linear relationship between DSF and cognitive scores in HH is different than the relationship between these two variables in another sample). Group comparisons indicated significant difference from MH group,

z = -3.16, p≤ .05, indicating that the role of attentional processes in the performance on cognitive suggestions is different in these two groups.

A t-test for "*r*" between DSB and cognitive scores (r = -.64, $p \leq .01$) in HH was also significant indicating a linear relationship between the two variables, $t_{(16)} = -3.33$, $p < .01$. However, Fisher's comparisons revealed a significant difference from LH (z = 2.44, $p \leq .01$) only. The relationship of working memory and responsivity to cognitive items seems to be similar in both HH and MH groups. Descriptive statistics, means and standard deviations for memory measures, IDQ, and DPQ, as a function of the number of cognitive items passed in HH are presented in Table 3 It was observed that as the number of cognitive items passed increased, mean scores on the DSF and DSB decreased. The "r" between DSB and Challenge scores and SOPT perseverative error correlation with HS scores in the MH sample were all not significant.

Prediction of Ideomotor, Challenge, and Cognitive Scores

Thus far, many variables have been associated with hypnotizability and with different types of suggestions on the HGSHS. To address the issue of how cognitive variables are related to different types of suggestions, hierarchical regression analyses were conducted to predict Ideomotor, Challenge, and Cognitive scores in the whole sample.

Table 3

Means and Standard Deviations for Digit Span measures, DPQ, and IDQ Scores as a function of Number of cognitive items passed in the HH group (N = 18).

Number of Items	n	DSF	DSB	DST	DPQ	IDQ
00	2					
M		13.50	12.50	26.00	16.00	26.00
SD		.71	.71	1.14	3.35	8.48
1	3					
M		11.66	7.33	19.00	26.00	28.00
SD		1.52	.57	2.00	.57	8.28
2	11					
M		11.54	6.62	18.27	23.09	20.36
SD		2.11	1.73	3.49	6.31	6.42
3	1					
M		8.00	8.00	16.00	27.00	21.00
SD		-	-	-	-	-
4	1					
M		6.00	5.00	11.00	16.00	8.00
SD						

The first regression was performed on ideomotor scores as the dependent variable, and the IDQ, DPQ, verbal facilitation, and Interference (intern), DSF, and DSB, as predictor variables. Predictors were entered based on associations with hypnotizability found in previous analysis, with memory measures entered last to examine if they contribute to prediction above and beyond these measures. The same entry procedures were followed for the prediction of the three types of suggestions. In the first step, the IDQ was entered alone in the equation, followed by the DPQ, then the facilitation scores, followed by Interference scores, then by DSF, and then the DSB was entered in the last step. All regression tables for this section (see Appendix Q) display the semipartial correlation (sr^2), unstanderdized regression coefficients (B), the standardized regression coefficients (β), and increments of change Δ, and the R, R^2, and adjusted R after entry of all variables.

The first analysis was conducted to predict ideomotor scores (Table 1Q). R was significantly different from zero at the end of each step. After step 6, with all variables in the equation, $R^2 = .166$, $F_{(6, 77)} = 2.55$, $p<.05$. Only IDQ ($p<.05$) and DPQ ($p<.05$) were significant predictors of ideomotor scores. After step 1 with IDQ alone in the equation, $R^2 = .065$, $F_{(1, 82)} = 5.71$, $p<.05$. In step 2, with DPQ added to IDQ in the equation, $R^2 = .131$, $F_{(2, 81)} = 6.11$, $p<.01$.

The second regression analysis was conducted to predict Challenge scores, and none of the variables predicted challenge scores significantly. The third analysis was done on cognitive scores as the dependent variable (Table 2Q). Verbal Facilitation, Interference, and DSB were all significant predictors of cognitive scores at their points of entry. *R* for regression was significant at the end of each step, after step 1 with IDQ alone in the equation, $R^2 = .021$, $F_{(1, 82)} = 1.75$, $p = .19$. After step 2, with the DPQ added as a predictor, $R^2 = .026$, $F_{(2, 81)} = 1.10$, $p = .34$. After step 3, with Facilitation scores added to the equation, $R^2 = .088$, $F_{(3, 80)} = 2.58$, $p=.59$. The addition of facilitation in the equation with the IDQ and DPQ results in a significant increment ($p<.05$) in R^2, indicating greater verbal facilitation is associated with passing successfully these suggestions. After step 4, with interference scores added, $R^2 = .148$, $F_{(4, 79)} = 3.42$, $p<.05$. Interference scores were also significant predictors of cognitive items ($p<.05$). Passing cognitive suggestions was associated with more interference on the Stroop task, indicating a role for verbal automaticity in responding to cognitive suggestions. In step 5, with DSF scores added as a predictor, $R^2 = .169$, $F_{(5, 78)} = 3.17$, $p<.05$. Despite its high correlation with cognitive scores in HH group, DSF did not reliably improve R^2. Finally, with DSB in the equation, $R^2 = .219$, $F_{(6, 77)} = 3.59$, $p<.01$. DSB contributed significantly to the prediction of cognitive scores ($p<.05$) confirming the role played by short term memory in performance

of cognitive suggestions. Correlations, Means and Standard deviations for predictor variables are displayed in table (3Q).

To summarize, results showed a significant association between responsivity to ideomotor suggestions and both IDQ and DPQ. Challenge suggestions were not predicted successfully by any variable. Responding to cognitive suggestions was associated with verbal facilitation, verbal interference, and a weaker working memory.

Discussion

The major aim of this study was to investigate cognitive correlates of hypnotizability and imaginativity, and to test the hypothesis that different cognitive abilities predispose subjects to respond differently in both contexts. A second aim was to explore the factors influencing participants' predictions of their responsivity to suggestions. Finally, the relationship between some cognitive variables and different types of suggestion was explored. It was hypothesized that different cognitive abilities would be associated with imaginativity and hypnotizability, and with different types of suggestion, and that some cognitive variables will be associated with RE. Results from this study confirmed all three hypotheses. The association of hypnotizability and imaginativity with RE and cognitive measures will be discussed first, and their associations with frontal tasks will follow.

Hypnotizability, Response Expectancy, and Imaginativity

Results of this study replicated previous findings in the literature demonstrating a strong association between hypnotic and imaginative suggestibilities; both were highly correlated and were strong predictors of each other, accounting for 52 % of the variance. Similarly, high correlations were observed between RE and both suggestibilities that are similar to those reported in the literature. Nevertheless, results did not replicate the strong role of RE in

predicting hypnotic suggestibility found by Braffman and Kirsch (1999, 2001). Instead, a discrepancy in the predictive role of RE in both conditions was observed. With imaginative suggestibility controlled, neither behavioral nor subjective RE measures contributed to HS prediction, however, behavioral RE and absorption remained significant predictors of imaginativity.

The finding that behavioral RE predicted imaginativity seems to be consistent with sociocognitive theory about the role of RE in predicting imaginativity beyond what is accounted for by hypnotic suggestibility. However, the finding that absorption predicted imaginativity, after controlling for both hypnotic suggestibility and RE measures, was not consistent with the hypothesis that the effects of absorption are mediated completely through response expectancy (Braffman, & Kirsch, 1999); the DPQ remained a significant predictor of imaginativity accounting for extra 3% of the variance in imaginativity beyond its shared variance with hypnotizability and RE measures. Absorption seems to be strongly associated with imaginativity.

The discrepancy between the findings of this study and those reported by Braffman and Kirsch (1999) concerning the predictive role of RE could be due to different measurements used in both studies. Different hypnosis scales contain different items which may overlap but may also differ in what they measure (Perry, Nadon, & Button, 1992). In addition to differences in items, differences in

induction procedures and wordings may also convey different messages to research participants, thus rendering different results. For example, while both scales HGSHS and CURSS emphasize participants "willingness to cooperate", the CURSS induction has the situational demands that participants should respond behaviorally even without concomitant subjective experience, which is not the case in HGSHS induction which also emphasizes the ability to "subjectively experience the suggestions". The use of different hypnotic scales in different studies was criticized by Nadon (1997), and the use of HGSHS: A (used in this study) and SHSS:C scales was encouraged because they have the dual advantage of popularity and relatively good psychometric properties.

Prediction of Response Expectancy

One of the aims of the study was to investigate the role of confidence as the second dimension of RE, and to examine the associations between RE and some cognitive and personality variables. Imagery, Absorption, Motivation, and effort were associated with hypnotic subjective RE, accounting for almost 39% of the variance.

The discrepancy observed in the role of RE in predicting both suggestibilities poses the question of why would the role of RE in predicting suggestibility be different despite the fact that subjects were rating their expectancies on the same suggestions in both conditions. In addition, success of

behavioral RE in imagination condition runs counter the argument that higher confidence in predictions increases the probability that behaviors will be occur; in the imagination condition, behavioral RE was associated with less confidence. However, if we take in consideration the effort dimension, this discrepancy becomes more understandable.

RE analysis indicated that imagery, absorption, and motivation were highly associated with subjective ratings of RE; they all correlated with and were significant predictors of subjective RE in both conditions. This suggests that subjects use their motivations, imagery and absorption abilities to predict their subjective experience. Absorption was the only cognitive variable predicting behavioral RE in both conditions, indicating its importance for the behavioral aspects of expectancy prediction, where subjects use their absorption abilities to make their behavioral predictions. However, Effort scores correlated negatively with both RE measures in hypnosis, indicating that subjects were expecting that responsivity to suggestions in hypnosis should unfold effortlessly, thus reflecting the common beliefs about hypnosis that may shape subjects' expectancies, and consequently responsivity to suggestions. Subjects seemed relatively confident in this belief, as reflected in the absence of significant correlations between confidence and RE scores in hypnosis. These analyses point to the importance of

the belief system (in addition to personality variables) in shaping both RE and experience.

Confidence scores correlated negatively and significantly with RE measures in the imagination condition, indicating that subjects were not sure of their expectations. The reason for this lack of confidence is probably due to the forming influence of the belief system on expectancy, where effortless behavioral responding was not expected in the imagination condition (effort did not correlate significantly with behavioral response expectancy in imagination condition). Findings suggest that some of the unique variance contributed by behavioral RE in the prediction of imaginativity may be associated with the lack of confidence in prediction and to the expectancy of exerting some effort in order to respond to suggestions. It was noticed that effort scores correlated negatively and significantly with imagery and absorption in the imagination condition only, indicating that subject who scored low on these two measures were expecting to put some effort to respond to suggestions, and therefore they may have exerted some effort to respond which could be construed as effortful responding or contextual demand characteristics. However, subjects will not exert any effort to respond in hypnosis because their belief system dictates that behaviors are produced effortlessly.

Another possible explanation for a better success of behavioral response expectancy in predicting imaginativity may relate to the fact that imagination is a closer experience to people in everyday life than hypnosis. Therefore, subjects were able to make better judgments about their responses to suggestions in imagination condition, where hypnotic expectancy would be more connected to beliefs about hypnosis at the absence of actual experience.

These results support the importance of a belief based interpretations of hypnosis proposed by Moghrabi (1998), and indicate the importance of assessing other variables to delineate their effects on the role of RE in predicting suggestibility, such as the confidence in RE, beliefs about hypnosis, past experience, and contextual demands of the situation to better understand how subjects form their predictions and consequently their responses. This in turn could be linked to actual performance. More research in this area is required.

It was interesting to note that despite their importance, motivation and imagery did not predict hypnotizability or imaginativity. However, subjects seemed to use their motivations and imaginative abilities to predict their subjective experience. It is possible that because of their association with both conditions (hypnotizability and imaginativity), these variables did not predict significantly either of them. Nevertheless, motivation and imagery are common factors for both imaginativity and hypnotizability despite this lack of association.

The conductor of two symphonies will be cancelled out (statistically) and will not be associated with either of them because he/she is central to both.

Hypnotizability, Imaginativity, and Performance on Frontal Tasks

The major aim of this study was to investigate cognitive correlates of hypnotizability and imaginativity. This study replicated the same pattern of responding found in Braffman and Kirsch studies, where 27% of subjects responded better in the imagination condition, 42% responded better in hypnosis, and only 31% had similar scores in both conditions. Furthermore, 15 subjects (17%) passed three or more suggestions in hypnosis than in imagination, and 5 subjects (6%) passed three or more suggestions in imagination than in hypnosis condition. The HGSHS is a relatively stable measure of hypnotic susceptibility across time (Perry, Nadon, & Button, 1992), and these differences could not be attributed totally to measurement error. No order or a trial x order interaction was found; therefore, these findings cannot be interpreted as resulting from subjects' suppression of their imaginative responding after hypnosis as hypothesized by Braffman and Kirsch (1999).

Regression analysis predicting hypnotizability and imaginativity confirmed our hypothesis that different cognitive processes would be associated with these two constructs. On the speed measures, hypnotizability was associated significantly with faster RT on the Stroop congruent and slower RT on

neutral trials, suggesting a verbal facilitation effect in hypnotizability. In addition, verbal facilitation and interference scores were significant predictors of responding to cognitive suggestions, which are the hallmark of HH experience. These results are consistent with Dixon and Laurence hypothesis (1992) of the role of stronger verbal connections in the facilitation of hypnotic responding, and with Ray et al. (1998) findings of verbally mediated abilities in HH subjects. These interpretations are also consistent with neurophysiological findings of a slight advantage for HH on verbal tasks at the baseline level (Gruzelier, 1999).

Imaginativity was associated with a faster RT on neutral trials, suggesting the possibility of stronger spatial processing in highly imaginative people (as opposed to verbal facilitation with hypnotizability). Neutral trials consisted of series of **xxxx** printed in different colors which may appear as simple configurations where no word processing is required. These results indicate that it is not automaticity *per se* that accounts for hypnotizability but more precisely "verbal facilitation". Shorter RT on neutral trials involves faster processing speed and automaticity of action, but hypnotizability was significantly associated with slower RT on these trials. Imaginativity was also associated with a slower RT on both congruent and incongruent trials, which could be interpreted in two ways: either indicating a slower verbal processing, or more interference from automatic word processing. The slower verbal processing hypothesis is preferred, because

interference could be better indicated by the number of errors on incongruent trials, which represent true interference and intrusions from automatic word processing, and LH subjects did not make significantly more errors than HH subjects on these trials.

In summary, data from RE and frontal test analyses suggest that there seem to be some areas of non-overlap between imaginativity and hypnotizability, and that some cognitive processes can account for some differences between them. Because of the great overlap between these two constructs, such individual differences in cognitive performance could be obscured if imaginative suggestibility was not controlled when predicting hypnotizability, and vice versa.

Cognitive Associations with Types of Suggestions

The last aim of this study was to investigate cognitive correlates of different types of suggestions. Results also confirmed our hypothesis that different types of suggestions will be associated with different cognitive abilities. These findings suggest that hypnotizability is not a unitary phenomenon, and responsivity to suggestions is not a degree of involvement but more of having the ability to respond to each type of suggestions, with most people being able to respond to some items but not others.

Intercorrelations and regression analysis showed that responding to ideomotor suggestions was significantly associated with imagery and absorption only, indicating the importance of these cognitive variables for responding to these suggestions. Responding to cognitive suggestions was significantly and negatively associated with short term memory, indicating that weaker short memory (STM) capacity is important for passing the hard items on the scale. In addition, verbal facilitation and interference measures predicted performance on cognitive suggestions, further supporting the verbal mediation of hypnotizability hypothesis. While imagery and absorption seem to be the crucial components for responding to ideomotor suggestions, verbal facilitation and memory functions seem to be crucial for generating imagery associated with responding to hard items on the scale.

The pattern of performance observed across hypnotizability levels also indicated that MH subjects performed worse on all frontal measures suggesting more diffused processing. Because of these differences, Gruzelier (1998) pointed out to the importance of segregating subjects according to their hypnotizability level in order to understand different processing styles within each group. When intercorrelations within each group were examined, significant differences emerged. The most important finding in this study was the negative association of memory measures with hypnotizability and with different types of

suggestions in both MH and HH groups. Significant negative correlations were observed between hypnotizability and working memory in MH group, and between hypnotizability and attention span in HH group. Moreover, in MH group, a significant negative association between challenge scores and working memory was observed indicating that weaker short term memory is associated with passing challenge suggestions. In HH group, cognitive scores were associated negatively with all memory measures, indicating that both, shorter attention span and weaker short term memory (STM) capacity are important for passing hard items on the scale.

Other cognitive variables also correlated with different types of suggestions. In the MH group, ideomotor scores correlated positively and significantly with both imagery and absorption. The SOPT perseverative errors correlated negatively and significantly with hypnotizability and with DPQ scores ($r = -.30$) indicating that perseverance is due to lower absorption ability. It is worth noting that interference experienced as perseverative errors on SOPT test relates to imagery and to the priming effects of images and configurations. In SOPT task, subjects are presented with different configuration on each page, and the perseverance is due to choosing the same configuration that was chosen in the previous page. This is different than Stroop interference which is related to automatic word processing associated with responding to cognitive suggestions.

This being said, I will discuss each of these correlations in terms of subjects' performance on each type of suggestions specifically.

Imagery and absorption were the only significant predictors of ideomotor scores. For subjects to pass ideomotor suggestions, they need to employ both absorption and imagery capacities, with absorption being more important (higher correlation with ideomotor even in the LH group) to facilitate the *subjective experience of the image,* and to convert it from just an image to an experienced event. Absorption is an attentional phenomenon, as defined by Tellegen and Atkinson (1974) albeit effortless and nonvoluntary, directed toward experiencing in the present, while imagination and remembering are usually associated with the future and the past respectively, although not experiential in nature. To have the subjective experience of the image, absorption seems to be the principle vehicle for both MH and LH subjects. Conversely, it was attention span and not imagery and absorption that were associated with hypnotizability and ideomotor suggestions in the HH indicating the importance of attention span for passing these items in this group. Furthermore, testing with Fisher's equation, the "*r*" between attention span and cognitive scores was significantly different in HH and MH, indicating different processes of attention in these two groups.

As suggestions became more difficult, fewer subjects passed the challenge items, and this could be explained in terms of its negative correlations with working memory functions. Working memory integrates moment-to-moment perceptions across time, rehearses them, and combines them with stored information about past experience, actions and knowledge (Baddeley, 1986). Basically, each of the challenge suggestions, such as arm rigidity and arm immobilization and eye catalepsy, is really two suggestions in one. The arm rigidity suggestion will be used as an example; however, the same explanation could be applied to other challenge suggestions as well.

In the arm rigidity suggestion, the first suggestion asks subjects to imagine their arm rigid like a bar of iron. This suggestion is implemented by generating an image of the arm as rigid, and concentrating on it with the aid of absorption ability, thus facilitating the generation of subjective feelings of arm rigidity as the representations of this image become well established in working memory. The second suggestion embedded in this suggestion challenges subjects to bend the arm, which requires generating a new image of the arm moving and bending. If the capacity or the connections of working memory are weak, it would be difficult to implement the second suggestion successfully by generating the new image and imposing it on the rigidity image especially that the two images conflict with each other thus creating confusion, or noise as to which image to

choose. MH subjects show a less focused and a more defused processing style, therefore, the new image competes with the old one for occupying working memory, and the new image which has been recently experienced intrudes on working memory because of its high baseline level of activation, leading to failing to pass the suggestion. However, subjects with higher absorption capacity can overcome this problem by directing attention towards the old image (goal directed) thus letting the subjective feeling of arm rigidity win the race; and the subject fails to bend the arm and therefore passes the suggestion.

Generating the image of the arm moving may also require the replacement of the first image, thus, relinquishing the hypnotic suggestion from awareness, which they may not be motivated to do. Motivation may deploy attentional processes in line with goal directed behaviors (to be hypnotized). Absorption correlated significantly and negatively with SOPT perseverative errors in this group, suggesting that lower absorption ability lead to perseverance of the newly activated image (priming). It seems that hypnotizability in MH group is associated with less perseverance requiring high absorption abilities. Perseverance is a function of imagery and absorption interactions within the limited capacity of working memory creating confusion as to which part of the suggestion subjects should respond to.

HH subjects seem to overcome this difficulty with their shorter attention span (which helps them exclude irrelevant tasks from awareness). DSF scores correlated negatively with hypnotizability in this group which may lead to more focus on the rigidity image. They may not even try to form the new image because it is not consistent with the goal of being hypnotized (as will be clarified later, verbal communication directs HH experience, and not the concentration on the image that is more dependent on both imagery and absorption associated with MH and LH groups).

Working memory functions and absorption may explain challenge items in MH subjects without postulating inhibitory functions. What could be explained in terms of inhibition is accounted for by attentional processes (absorption and attention span) and short term memory dynamics.

Correlations within HH group should be interpreted with caution because of the small number of HH in this sample, especially that only two subjects scored in the 10 -12 range of hypnotizability. However, the following interpretations may have some credibility because testing with Fishers' equation (which takes sample size in consideration) indicated the significance of these correlations.

The association with hypnotizability shifts from the DSB to DSF when correlations were examined within the HH group. In this group, all memory

measures correlated negatively with cognitive scores. Cognitive suggestions, such as hallucinations, posthypnotic suggestion, and amnesia, are the hardest items on the scale, requiring the noticeable change in perception, thinking, and memory functions. It seems that the role of memory becomes more pronounced for the most difficult items with attention span playing a major role in HH subjects' experience of suggestibility. Narrowing attention to processing suggestions successfully may be mediated by motivation and facilitated by stronger verbal connections and focus on the hypnotist's words.

Mean scores on DSF were associated with ideomotor suggestions in HH group, and not with IDQ and DPQ. This does not mean that IDQ and DPQ are not important, however, what is important is how these abilities are controlled, and this process differs among groups, with attention span being more important for HH subjects (narrowing external attention) to control their perceptions and the generation of experience. It was also noticed that DSF scores correlated negatively with challenge items and positively with both IDQ ($r = .23$) and DPQ ($r = .30$), giving the possibility that attention span may function as a vehicle for absorption and imagery in the HH group. The "*r*" between DSB and cognitive items was similar for HH and MH group, but the "*r*" between DSF and cognitive scores differed significantly in these two groups indicating a different process.

The capacity of HH subjects to attend and generate the ideomotor responses may hinder some subjects from responding to more difficult items on the scale if there is no dissociation from external processing, where it was found that weaker attention span and working memory are associated with passing more cognitive items. Analysis of mean DSF and DSB scores with IDQ and DPQ revealed this pattern clearly. As the number of cognitive items passed increased, the DSF and DSB scores decreased, however, this decrease was more pronounced for the two subjects who scored in the 10-12 range. The subject who passed all cognitive suggestions had also low self-report measures on both IDQ and DPQ indicating that some HH subjects can respond to suggestions despite their perceived low imagery and absorption capabilities (as measured by self reports). The production of imagery in these subjects seems to be involuntary and automatic. Many of the items on the IDQ and DPQ measure conscious use of imagery in every day life which may be more associated with imaginativity and the part it shares with hypnotizability. This pattern suggests that for cognitive suggestions to be passed, subjects may dissociate in varying degrees. Dissociation in this context is from external focus and directing attention to internally generated experiences anchored to the hypnotist words and facilitated by HH subjects verbal capacity. The three significant predictors of cognitive scores were verbal facilitation, interference, and weaker STM. Weaker attention

span may facilitate the narrowing of attention allowing the automatic generation of imagery and experience. However, the pattern of responses on cognitive suggestions suggest that only few subjects dissociate (may be the ones who score above 10 on hypnotic scales). It is possible that dissociation is important to pass the amnesia and post hypnotic amnesia suggestions only as these are known to be the hardest suggestions on the scale. Other cognitive suggestions, such as taste hallucination and mosquito hallucinations could be passed by subjects with high imagery and absorption because they are common experiences in our everyday life, and with high imagery and absorption abilities the experience could be generated vividly enough.

To summarize, verbal facilitation and STM functions seem to be the most important factors in responding to cognitive suggestions associated with HH experience. While absorption is needed to help MH subjects focus on the image to generate the subjective experience, it is needed to help HH dissociate from processing external events and to divert their attention inward, towards internally generated experience occupying their perceptual system. MH subjects are more dependent on both absorption and short term memory capacity to support imagery and create the subjective experience of ideomotor and challenge responses but they fail to dissociate from external processing and a big part of their attention remains focused outwardly. This interpretation is in accord with

Ray et al. hypothesis (1998) that HH subjects use absorption and imagery to dissociate.

From this perspective, HH subjects would be more like abstract thinkers who manipulate imagined programs and principles through verbal communications; while MH and LH like high imagers and concrete thinkers who manipulate specific events, movements, configurations or sensations of the situation. While attention span is the vehicle for absorption and imagery leading to dissociation in HH, working memory capacity and absorption are vehicles for vivid imagery in MH and LH subjects. This interpretation is in agreement with the sociocognitive perspective that HH identify themselves at a higher level allowing automatic behaviors to unfold instead of paying attention to details of the arm rigid or moving. It can also explain the stronger association of absorption with imaginativity but not with hypnotizability. In addition, cognitive performance on frontal tasks in this study supports these interpretations where hypnotizability was associated with verbal facilitation and imaginativity with faster RTs on configurations of neutral trials, and possibly a better spatial processing.

Thus far, imagery, absorption, and dissociation from external processing interact and produce hypnotic behaviors, with attention span and short term memory processes as the common denominator and the stage on which all of

these are displayed. It is the narrowing of external attention that facilitates the creation of vivid experience of images in HH subjects, and it is only the contribution of absorption that allows working memory system to override the strong bias in favor of an image that has been recently active from biasing the system towards its choice in MH subjects. This process could be influenced and directed by the motivational system, as will be discussed later.

This is the first study documenting a relationship between hypnotizability and memory functions. One limitation of this study is that the number of HH subjects in this sample is small; therefore, these results should be replicated in future research to support the interpretations and hypothesis presented in this thesis. The replication of this study using the SHSS:C is recommended because this scale contains more cognitive suggestions and harder ones such as hypnotic dreams and age regression.

In conclusion, this thesis emphasizes the role of perceptual and cognitive processes in guiding behavior. Should results be replicated in future studies, perceptual and cognitive processes may prove to be the most fruitful areas of investigation leading to better understanding of the underpinnings of hypnosis. Based on the present findings indicating a role for some cognitive processes in responsivity to hypnotic suggestions, and also integrating information from other studies in different fields of cognitive neuroscience of memory and

neurophysiological research, a hypothetical model is proposed that delineate the roles of imagery, absorption, verbal facilitation, dissociation, and memory processes in the production of hypnotic experience.

THE PERCEPTUAL CONTROL MODEL

To use Barrs' (1997) metaphor of working memory as the theater of consciousness, all conscious experience, in and out of hypnosis, is displayed on this stage. Despite the important role of imagery, the hallmark of hypnosis is to perceptually experience events in the present; it is not a purely cognitive process like imagination. Before presenting the perceptual control model (PCM), and because of the common role of imagery in both imaginativity and hypnotizability, different kinds of imagery and their relation to conscious experience in and out of hypnosis will be discussed.

Imagery and Verbal Facilitation

A wide-range of neurophysiological and neuropsychological research into different aspects of visual processing suggest that images, including dream images, are reconstructed from stored memory dispositions projected into the perceptual system and represented in short term memory for conscious awareness. This conception of imagery is based on PET and fMRI studies showing that when we recall an image, a transient synchronous activation of

neural firing patterns happens, largely in the same early sensory cortices, where the firing patterns corresponding to the perceptual representations once occurred (Damasio, 1994). Therefore, when we remember or imagine an event, the same areas in the brain that were stimulated during a certain event are activated, as if it is happening now. This is the same mechanism proposed by Zeki about dreaming as "internalized images which are fed backward in the cortex as if they were coming from outside" (Zeki, 1993, p. 326). The similarity between dreams and hypnotic experience (see Fuster, 1995) suggest that the mechanism used in imagery during hypnosis is more likely to be the same one used during dreaming. However, dreaming and hypnotic experience differ from both imagination and remembering experientially due to how much of external attention is functional.

Imagining and remembering belong to the same category in that they do not pertain to the present but they may differ in the composition of images projected. While in remembering some of the same neural patterns are constructed in the same areas, in imagination any combination could be constructed and put together (e.g., imagine a pink elephant). This faculty of the human mind is an important function to aid planning and projecting possible outcomes for future use (like a future memory). Visual images resemble visual percepts in many aspects, and to be conscious of them, they must engage

working memory. We cannot be conscious of something that is not represented in working memory, while we can be unconscious of many events processed without awareness. It was hypothesized that when imagining or remembering, only the higher systems in the hierarchy of the neural processing in the brain are engaged (Powers, 1974), the lower systems could be engaged in doing other automatic actions such as walking, sitting, driving etc....

In the hypnotic experience of MH and LH subjects, absorption seems to be crucial for converting an image to subjective involvement of the whole organism and not to keep it at the cognitive abstract level only (more about this later). It is the ability to concentrate on the concreteness of the image that provokes automatic motor responses related to ideomotor suggestions, thus engaging the lower system and giving it the experiential quality. According to Powers, the experiential vividness of a memory relates directly to the degree of lower system engagement in the process. Having discussed previously how imagery processes pertain to responding to ideomotor and challenge items in LH and MH groups, discussing imagery in responding to cognitive suggestions may help to show the link between dream processes and hypnotizability; and this link will now be examined.

To experience hallucinations, which are complete programs of actions, and not only restricted to imagining one event (e.g., the arm rigid or the eyes

tightly closed) requires the manipulation of abstract thoughts or words to generate the whole experience of that program, and here lies the difference between HH and LH; concentrating on words which activate programs (for HH) versus concentrating on images leading to the activation of ideomotor responding to the image (for LH). When a subject is given the fly suggestion, a whole scenario of the fly is fluently produced (and may be elaborated) and not only an image of the fly: the fly buzzing, going and flying around, falling on the subject's face or arm, and its emotional relevance to the organism as annoying, creating the behavioral response of pushing it away. Similarly, in the dream suggestion, a whole scenario of events has to be constructed totally and integrated temporally from memory and projected back in the perceptual system (cortex), with a narrative-like quality (e.g., like a movie).

Because of the limited capacity of STM, this process requires diverting attentional resources from the external processing to allow constructed images to be projected sequentially and fluently from memory and occupy the perceptual system and to be represented in STM. Attention is fluid in nature; allowing the organism to move from one percept to the next almost without effort, unless problems are encountered which disturb the usual flow of present processing. The first attentional requirement is to be able to exclude irrelevant stimuli from conscious awareness. Neuropsychological research indicates that HH showed

faster habituation and flexibility of diverting attention, and a higher capacity to attend-inattend to stimuli. In addition, this study highlights the role of attention span in the production of HH experience. Shorter attention span was significantly associated with hypnotizability and responsivity to cognitive suggestions in HH group indicating the importance of "inattention" to external stimuli for the production of hypnotic behavior. Inattention clears the STM creating a space for program images to be activated enough in early sensory cortices and STM, leading to the perception of these images in the now (like dreaming, and unlike the ordinary use of imagination which is more connected to LH experience) and consequently to experienced hallucinations. It is possible that weakness in both components of STM makes HH narrow their attention and rely more on automatic processing of information via the verbal route which facilitates hypnotic responsivity. Conversely, it is also possible that the observed weaker STM is a result of attentional processing rather than weakness of connections in STM. When measures of DSF and DSB are taken, they represent the external and effortful attentional span and not nonvolitional effortless capacity. Some of HH subjects' attentional resources may be directed and used involuntarily and effortlessly. In habituation studies, stimuli that leave conscious awareness are processed albeit without conscious awareness of them. The OR studies show that if any of the stimulus attributes changes from the predictable

pattern (e.g., presenting a new sound, or making it louder), the OR will occur again. For OR to occur again it must be processed and attended to though effortlessly and without subjects' awareness. If that is true, then HH and LH differ in the way they allocate their attentional resources and what may appear to us (observers) as a weaker memory capacity may indicate weaker external focus, but stronger automatic processing. Attention is embedded in the fabric of all automatic behaviors because adjustments to the environment are required all along.

Attentional flexibility exhibited in HH subjects can shed some light on responsivity to hypnotic analgesia suggestions, where anything that is integrated and represented in STM for conscious awareness may include or exclude sensory and affective pain sensations facilitated by HH capacity to attenuate or amplify sensory signals shown in obstructive hallucination studies. Hilgard (1986) thought that pain sensations were excluded from awareness by the division in consciousness, but they are accessible through the hidden observer suggestion. However, attentional processes may give a plausible explanation to what has been designated as hidden-observer reports. Evidence from neurophysiological studies suggests that HH subjects have a more effective attentional system that permits them to attend or not to attend to incoming sensory experience. In this sense, hidden observer suggestions may be seen as suggestions to direct

attention to images of the hand "not in pain" projected from memory or constructed in STM as suggested in the analgesia suggestion; or to shift attention to ongoing sensory processing (as it become represented in STM); thus, different levels of pain are reported.

Another possibility influencing the success of analgesia suggestion may be mediated through inhibition/disinhibition of sensory input to the cortex, and here too, studies on obstructive hallucination have shown that HH subjects are capable of modulating incoming input of sensory stimulation to the sensory cortex (De Pascalis, 1994; Spiegel, Cutcomb, Ren, & Pribram, 1985). There is also the possibility that both mechanisms are used together, where inhibiting the input clears the path for suggested images to be represented in sensory cortices. The inhibition in this context may reflect less attention to external stimuli, we are continuously screening out of conscious awareness a lot of stimuli bombarding our sensory receptors. The inattention model is preferred, because it accounts for subjects' hidden reports of pain as they attend. In addition, in the Stroop study by Kaiser et al (1997), *error detection signals* were still functional, but subjects may have not responded because of lack of motivation to direct attention to it (to be discussed later), even though errors were detected and represented on the nonconscious level. Also OR and habituation studies indicate that stimuli screened from conscious awareness are still processed, because any variation in

the parameters of stimulation brings it back to conscious awareness. It is as if as long as the repetitive pattern is predictable it remains nonconscious; only when discrepancy is detected conscious attention is diverted towards it where events become represented again on center stage of STM.

Other cognitive suggestions such as amnesia and posthypnotic amnesia also represent programs that differ from hallucinations and dreaming scenarios in that they require time delay to generate a response that is contingent on another event; for example remembering when hearing the hypnotist words "now you can remember every thing", or touching the ankle contingent on hearing the tapping. This invites different kinds of memory to be represented in this model, which need to be clearly delineated.

Explicit and Implicit Memory Systems

Fundamental to the PCM are memory functions (conscious and nonconscious). Recent advancement in cognitive neural science of memory indicate that memory is not a unitary phenomena. Kandel, a winner of the Noble prize in physiology and medicine in 2000 for his work on different memory systems, delineated two distinct kinds of memory; the first is declarative or explicit memory system, which is a form of conscious memory for people, objects, and places that is mediated by the medial temporal lobe and hippocampus. The second is the procedural or implicit memory system which is

concerned with learning new perceptual and motor skills that are not accessible to conscious recall, but become evident only in the performance of the individual (Kandel, 1999).

Evidence for the separation of these two systems comes from studies on the amnesic patient H.M., who had no conscious recall of new memories of people, objects, or places, but was nonetheless fully capable of learning new and complex motor and perceptual skills, indicating that procedural or implicit memory is completely nonconscious (Milner, Squire, & Kandel, 1998). According to Kandel, procedural memory is a complex system which includes a variety of learning experiences processed by different areas of the brain: nonassociative learning (reflex pathways), emotional responses (amygdala), priming (neocortex), and procedural memory concerned with learning skills and habits (striatum). The two memory systems (explicit and implicit) interact and overlap in a way that allows many learning experiences to occur, for example, many declarative memories can turn into the procedural type, such as driving a car, and conversely, implicit memories can become conscious when executing actions for goal achievement and/or for survival issues.

The PCM relies on the distinction between these two forms of memory systems. The lower level in the hierarchy of control will be called "Procedural Operations System" which is dependent on the implicit procedural memory

system, with all the components described by Kandel. It is the older system and developmentally the first form available to the infant, with the declarative system maturing later in development. This lower system could be described as nonconscious, nonverbal, and concerns automatic skills and habits, as well as emotionally and motivationally relevant events. This system evolved through associative learning and classical conditioning responsible for detecting contingencies between stimuli; a mechanism that is important for the survival of the organism. However, in associative learning, the organism does not only learn that an event is contingent to another event only, but it learns to predict an event from another to ensure a fast response (fight vs. flight) to threats or to avoid harmful events. Pavlov pointed out the survival value of this associative function by his quote: "it is not the sight or the sound of the beast of prey which is itself harmful to smaller animals, but its teeth and claws" (Pavlov, 1927, p. 14). Unfortunately, sometimes associations of benign stimuli with painful ones may render them threatening at the absence of real threat, leading to anxiety and phobias.

The higher system, which will be called "Abstract Operations System", could be associated with consciousness and delayed recall, and the prefrontal cortex is more likely to be its substrate, with its functions of planning, judgment, and goal-directed behaviors; it is verbal, available to conscious reflection,

concerns planning, and is cognitive and abstract in nature (as opposed to procedural). This system is associated with activity in the hippocampus and medial temporal lobe responsible for declarative memory as suggested by Kandel. Unlike the procedural memory system with its dependence on detecting contingencies and predicting events through associative learning, it is argued that the hippocampus evolved to associate noncontiguous events over space and time (Eichenbaum, 1998). According to Kandel, this form of learning is dependent on trace conditioning (in which the CS starts and ends at least 500 ms before the UCS, and requires awareness of the time gap between two events). These two forms of memory are recruited simultaneously to encode different aspects of the sensory patterns of the external world. However, it is the hippocampus that mediates between aspects of conscious and nonconscious forms of memory through its connections with the prefrontal cortex and STM. It has been seen that H. M. could learn different procedural operations but could not recall that he had learned or done it before. Similarly, patients with lesions to the medial temporal lobe suffer from amnesia and cannot acquire trace conditioning. According to Kandel (1999), sensory information are integrated and linked to planned movements within the association area of prefrontal cortex. This function is achieved through the STM, and therefore it is dependent on both attention span and working memory to represent moment-to-moment

conscious experience across time, with the hippocampus and the circuitry of the medial temporal lobe involved in conscious recall.

It is speculated that to pass hypnotic amnesia and post hypnotic suggestions, the hippocampus is shut down or inhibited from recalling events. However, the procedural implicit memory system (dependent on contingencies) is functional, and as the words of the hypnotist "now you can remember" or as they hear the "tapping", the contingent behaviors are executed automatically, by either remembering or touching the ankle. This hypothesis leads to the speculation that HH subjects (especially the ones who pass these two suggestions) have weaker declarative or explicit memory system and stronger procedural or implicit system than LH subjects at the baseline level. Results from this study support the first part of this hypothesis (weaker working memory system). Some evidence hinting at the second part of this hypothesis could be gleaned from neuropsychological studies showing that HH subjects have faster access to emotional experiences (De Pascalis, 1998), which is a part of the procedural memory system. Also HH subjects had faster RT making recognizing whether a face is "happy" or "angry", in both hypnotic and nonhypnotic conditions. In addition, HH subjects show faster habituation in hypnosis, where faster habituation is associated with the procedural system (Kandel, 1999). It would be important to examine whether HH display faster habituation without

hypnosis. It may prove fruitful for future studies in hypnosis to target these areas of investigation relating to procedural system, such as forming habits, learning skills, priming, habituation and sensitization, and recognition tasks which are all associated with the procedural implicit system.

Goal Directed Behaviors

Thus far, with this model several kinds of hypnotic suggestions were explained. What remains is to construct how these two systems function in everyday life, making possible the achievement of goals. Like other behaviors, hypnotic behavior is a goal directed behavior that is dependent on procedural memory of how to do things stemming from past experience. For example, if a person wants to go for a walk, a series of actions are automatically executed by recruiting appropriate lower levels to do the action learned from past experience. We are hardly aware of the complex actions and movements executed when we walk. However, all these actions are represented in the preconscious part of STM requiring the least of conscious attention, thanks to memory associations learned previously. Not all contents of STM are conscious (Barrs, 1997), and representations of automatic acts occur, most probably, in the preconscious part of STM directed by nonvolitional and nonconscious processes; however, they are available to conscious awareness when needed (e.g., if something wrong happens) such as stepping on a broken step, then focal attention is directed

towards it because what is encountered does not fit the procedures or intentions of the individual (discrepancy is detected). This brings the question as to how goals are represented and how they are translated into behaviors in and out of hypnosis.

From the PCM perspective, goal directed behaviors require a feed forward (top-down) from the higher abstract system which represents plans and programs in terms of operations broken down into details in descending levels of the hierarchy. The feed forward mechanism represents the person's intentions and plans and ways to execute them. In Powers' hierarchy of control (1974), procedures are retrieved from memory of past events at each level of the hierarchy and broken down to operations and sequences of movements which vary in levels of abstraction according to each level until the movement of joints and muscles are expressed at the bottom. Accordingly, the feed forward mechanism is not static in form, or cognitive or abstract at all levels; only at very high levels, with each level doing the part associated with its functions. We are not aware of the feed forward mechanism because our attention is usually directed outwardly.

A second requirement for this model is a feedback system composed of sensory information coming through the perceptual pathway to which the forward plans are compared step by step in time; as long as there is a fit between

the two systems, actions are carried out automatically requiring the least of conscious attention. I suggest that at the higher level, the STM, with its conscious and preconscious parts house this comparison, where automatic behaviors are carried out in the preconscious part and out of focal attention. Only when there is a discrepancy, or there is a need to have more information from environment for more planning, events will occupy center stage and become conscious.

Plans could be projected as sequences of procedural memories or images (the body in motion) and not in the form "do behavior X when Y situation is encountered" suggested by sociocognitive theory, which happens only at the higher levels of abstraction. To experience an event, the lower procedural system must be engaged, otherwise it is experienced as imagination having the "as if" quality. Take for example a chess player planning how to make his/her moves on the chess board, where many movements and counter-movements are imagined until a decision is made about which one to do, the lower system is then engaged.

Procedural memory consists of personal experience and skills not in abstract and language form, but as bodily performance connected to the organisms past experience and actions. The phantom limb phenomena, such as experiencing a movement or pain in the limb, coming from the memory of the limb experiencing the motion or pain, gives us a glimpse on this form of feed

forward in the system. We can have a glimpse of the feed forward also when one tries to put his/her hand out of a car window and the hand crumbles against the clear glass (not seeing it); the image of the arm moving out is presented faintly in consciousness (Powers, 1974).

Procedural memory system, as a nonverbal system, would be connected directly to the body as it is experiencing events; there is no gap of recall which is the function of the hippocampus and related areas. In everyday life, the two mechanisms would be linked together in STM; the on-line feed back information of sensory stimulation (perceptual pathway) is juxtaposed to operations fed forward in the perceptual system giving the subjective experience of doing something. When I walk, it is "I" who is walking, and when I see, it is not only seeing but it is "I" seeing with my eyes. Experience comes from the perception of body involvement in action at all levels; otherwise, it is only imagination or a memory of the past that is constricted to the higher levels only. From this perspective, all perceptual experience is dependent on memory. Perception entails recognition, and recognition entails memory. Similarly, acting on the world requires memory and the associative network of procedural knowledge. Perception is about acting on the world as much as it is for receiving sensory stimulation (Damasio, 1994).

HH subjects allocate less of their attention outwardly and because of their ability to screen irrelevant stimuli from conscious awareness (less external feed back in STM), projected procedural programs become sufficiently and vividly activated in the sensory cortices and experienced as happening now (similar to phantom limb phenomena, at the absence of perceptual feed back from the limb, the body image from procedural memory prevails and the amputee experiences the limb movement in the now where no limb exists at all).

The same argument applies to dreams, and fantasies created by people and lived in different degrees of intensity depending on the degree it is represented in the perceptual system and depending on how much external feedback is shut out. Dreaming and hypnosis may portray a reversal of the normal processes of perception in which concrete images of stimuli are converted to abstract memories and knowledge; here abstract knowledge and memories are converted to concrete images and experience; this process is facilitated at the higher level by the abstract verbal representations of the world.

The association of verbal facilitation with hypnotizability found in this study is easy to reconcile with both, neodissociation and sociocognitive theories. Both theories emphasize the verbal pathway for triggering automatic actions. However, the association of weaker STM functions with cognitive suggestions (which is the hallmark of HH experience) is easier to reconcile with

neodissociation theory than with socio-cognitive theory. The Procedural Operations System could be seen as similar to the contention scheduling system of Woody and Bowers in that it addresses procedures that could be modulated and constructed in different combinations, but differs from the automatic behavioral "response sets" adopted by Kirsch and Lynn, with the latter being more cognitive than procedural in nature, which makes it belong to higher abstract levels in the hierarchy. However, Woody and Bowers' model postulates that the weakening of the SAS results from hypnotic induction. If STM functions are considered a part of the supervisory system (which I think they are), these effects are there at the baseline level not as a result of hypnotic induction, even though they may become more pronounced in hypnosis. Sociocognitive models emphasize social influence on goal directed behaviors at the expense of the role of individual cognitive abilities in facilitating responsivity to suggestions, which need to be investigated more in detail.

The difference between this model and that of Hilgard and Bowers systems is that the PCM does not require an amnesic barrier or weakening of a supervisory system produced by the hypnotic induction; rather, it is through language, which occupies a high abstract level in the hierarchy, and its connections to memory representations of the world and events that hypnotic phenomena are produced. Dissociation in neodissociation models occurs in the

internal apparatus of processing (amnesic barrier for Hilgard, and weakening of the executive control system for Bowers). From PCM perspective, dissociation is from external processing in the aim of achieving goal directed behaviors, thus it is more of a perceptual control model. This is made possible by the interplay of declarative and procedural memory systems and the flexibility of attentional processing deciding what to be represented in STM for conscious awareness.

In both, neodissociation and sociocognitive models, automatic behaviors were assigned a lower level in the hierarchy as over-learned behaviors. It is hard to conceptualize hallucinations, amnesia, and post hypnotic amnesia as over learned behaviors. However, when people forget or hallucinate (or day dream) regularly in their everyday routines, attentional processes are involved in these fantasies and in the forgetting, which could be considered as a mild form of self hypnosis made possible through attentional processes. Furthermore, in the PCM, language belongs to the higher abstract level even though it is automatic. All cognitive functions such as thinking have automatic components to them, thoughts occur to us, all what we do is to focus attention on a topic to bring it in focal awareness, and then thoughts are automatically produced. Automaticity *per se* is not the criteria of distinction between high and low levels in PCM, where highly automatic behaviors such as language could belong to higher abstract systems in the hierarchy, and it is one of the highest achievements in humans.

Language makes possible the creation of the internal mind space (Jaynes, 1976). The CNS has no connections whatsoever with the environment except through our five senses conveyed to the brain as our bodies are experiencing and interacting directly with the environment. Sensations conveyed from the body to the brain via our sensory experience compose the environment for the brain, from which the internal world is constructed and represented in our mind in the form of images with labels assigned to them including representations of the body as an object of perception. Through these verbal representations of the world, HH produce their experience. This model could also explain self hypnosis: if the hypnotist words are not there to guide hypnotic behavior, internal dialog can provide the same function and guide experience.

The PCM differs also in the distinctions it makes between high and low levels in the hierarchy being explained not in terms of the highest controlling the lowest. Sometimes the low level exerts its influence on the high level (as will be explained later). The PCM emphasizes the interplay between abstract (symbolic) vs. procedural (experiential) levels, explicit vs. implicit memory systems, and conscious vs. nonconscious representations. All actions have automatic components to them to varying degrees; with the role of consciousness is the modulation of automatic behaviors to be in tune with context. All this is made possible through memory functions; consciousness and perception are directly

linked to memory put in use for the service of the organism, organizing and re-organizing sets of behaviors necessary for its survival and learning experiences.

Another distinction is that while context occupies the center of consciousness (where representations of the organism remain in the background), the organism operating on the world occupies the center of the nonconscious processes where the context remains in its background symbolically represented in the form of memory images and linguistic labels. From this perspective, consciousness is more linked to the feedback mechanism and the nonconscious to the feed forward mechanism (representing intentions of the organism); both mechanisms are linked in STM leading to the perception of the organism operating on the world. To be is to perceive...

Subjective Experience of Volition

Any model of hypnosis will be incomplete if it doesn't address volitional and motivational aspects of behavior. From the PCM perspective, feedback mechanism can also explain subjective experience of nonvolition in HH subjects and this topic will now be examined. From the previous discussion, we can infer that voluntary actions are shaped by the feed back mechanism. Automatic processes are part of every voluntary act, and while we cannot control them in detail (if you try to think of how you execute procedural operations involved in automatic actions, such as walking or speaking and articulation, the action will

stop) we perceive them as consistent with our intentions and goals as long as the feedback fits what has been fed forward. Feedback from the environment on which we act is important to correct errors, and consciousness of errors is important to allow nonconscious organizations in the modulation of procedures or in the making of better plans.

Executed automatic behaviors are not reflexive, well rehearsed actions; but plans and strategies that unfold in different sequences that are monitored (at every level) and compared at each step to the feedback and modified continuously along the way, with very little conscious awareness of them. Attentional processes are embedded in the fabric of behavioral skills as they are executed albeit non-consciously. Take for example the automatic action of driving a car which is never the same due to different conditions of driving (e.g., the traffic and different street and weather conditions). However, people still drive successfully and adjust to these variations without effort, and only when something unusual happens (e.g., someone jumps in front of the car) that needs drastic change, conscious attention is directed towards it to get more information from context; they become in center stage pushing others to preconscious level. It is at this junction that we experience will and volition because we become conscious of the discrepancy, the change, and the modulation. We cannot feel

will and volition with nonconscious or automatic actions and they are all experienced as nonvoluntary.

In hypnosis, and in the relative absence of feed backward from the environment produced by the narrowing of external attention, no discrepancy to what has been fed forward is detected and no change is required (if it is consistent with the goals, there is a fit). Attention is directed towards the organism itself and bodily perceptions and gradually what has been fed forward is what is perceived, it forms a closed loop. The experience runs smoothly without the modulation required for volitional experience, and consequently the behavior is experienced as nonvoluntary. In LH and MH subjects, the production of full programs is not possible may be due the difficulty of turning inward enough to close the loop so that what has been fed forward is also what is experienced as a realistic perception. Another possibility is that being hypnotized is not consistent with the subject's goal, or because of other reasons such as fears and misconceptions about hypnosis that make them less motivated to respond to suggestions because they fear losing control.

The Role of Motivation

In Kaiser et al. study (1997), both *error detection* waves and RT on the Stroop test remained constant during hypnosis, and the absence of *error evaluation* signals were interpreted in terms of motivational influences on

performance. In this study, motivations correlated significantly with subjective suggestibility scores and were a significant predictor of subjective RE scores in both conditions. Subjects may not be aware of their motivations (or they may not report them for other reasons) as postulated by sociocognitive theorists; however, these motivations showed their influence through the subjects' predictions.

The motivational system does not function separately from other cognitive processes. As a part of the procedural system it is tightly close to the person's experience, it also exerts a biasing effect on cognitive choices. Overt reasoning or judgments were found to be preceded by a nonconscious biasing step that uses a different neural system than the one supporting declarative knowledge. The support for this hypothesis comes from a study comparing normal participants to patients with prefrontal damage on a gambling task (Bechara, Damasio H., Tranel, & Damasio A., 1997). In this study, normal subjects began to choose advantageously even before knowing which strategy worked best, whereas frontal patients continued to make wrong choices even when they knew which strategy worked best. Furthermore, normal subjects generated skin conductance responses (SCR) when they considered a choice that was risky, before knowing explicitly that it was so (signal anxiety?). However, frontal patients never developed SCRs, even though some of them had recognized which choices were

risky. These results were interpreted as indicating nonconscious bias that guides behavior before conscious knowledge does. These nonconscious processes are connected to the persons' past experience and the emotional states connected to it, it aids reasoning, and without its help, overt knowledge may be insufficient to ensure advantageous behaviors for the organism (the heart has reasons that reason needs to learn).

The authors postulated that a sensory representation of a situation that requires making a decision activates two parallel but interacting chains of events (or neural systems):

> "In one, either the sensory representation of the situation or of the facts evoked by it activates neural systems that hold knowledge related to the individual nondeclarative dispositional knowledge related to the individual's previous experience of similar situations. In the other chain of events the representation of the situation generates the overt recall of pertinent facts, for example, various response operations and future outcomes pertaining to a given course of action; and the application of reasoning strategies to facts and options" (pp. 1294).

The description of the second system is very similar to Kirsch and Lynn "response set of the sort if X then Y", which seems more abstract and cognitive in nature that is dependent on declarative memory. It was postulated that the activation of the covert system before the overt reasoning system facilitates efficient processing of knowledge necessary for conscious decision. The measured autonomic responses (SCRs) were assumed to signal nonconscious access to records of previous individual experience, especially of reward and punishment and the emotional states associated with them.

From this study, we can infer that information is processed in parallel in the two systems indicating two feedback systems; one is nonconscious with faster and more efficient capacity, and the other is slower, cognitive with serial processing of information. Kandel also suggested that information is processed in the two memory systems in parallel encoding different aspects of the world separately. The motivational system with its connections to the organism's emotional states and past experiences, and because of its faster capacity, overrides the more cognitive "response sets" thus biasing the choice of goals and behavioral sets available in the individual's repertoire. Furthermore, in any situation we encounter in everyday life, we have a large repertoire of actions to choose from in order to achieve our goals. For example, if one is hungry, he can make a sandwich, go to a restaurant, walk to the kitchen and cook something, open the fridge and look what is inside, etc... It is hardly conceivable that we have one behavior to execute facing any situation (e.g., do behavior X when Y is encountered). The motivational systems can aid the choice of which behavior to be executed, and we may choose differently facing the same situation in two different occasions. Therefore, the triggering mechanism of procedural or cognitive schemas "response sets" is internal and does not happen reflexively by environmental events, it is motivationally enabled. We are active agents on our environment, though we are always late for consciousness in that it always lags

behind (see Libet, 1985). The choice of goals and behaviors has to be guided in a way that is personally and experientially relevant to the organism. Recent studies in experimental animals indicate that long term memory leads to alterations in gene expression and consequently, to alterations in the structure of neural connections between nerve cells in the brain (Kandel, 1999). Because of the plasticity of the brain, structural changes happen throughout life and are likely to shape skills and the character of the individual leading to long lasting changes in mental processing. However, these changes happen more readily early in life due to more plasticity in the brain.

HH subjects were faster in making judgments in the Crawford et al. study (1995). Also, OR and habituation studies may reflect a faster judgment by the covert system concerning task irrelevant stimuli; the motivational system seems to exert its influence using attentional and STM processes deciding what to be represented for conscious awareness. This in turn may prove helpful in understanding the role of nonconscious-involuntary information processing in our everyday life.

To summarize, the PCM perspective suggest the following postulates: Firstly: Hypnotic experience is the obverse of normal functioning that is directly connected to attentional and memory processes; while objects of consciousness are external in the waking state, they are internal in hypnotic and dream states.

Dreams and hypnosis share the same mechanism; with the former being more vivid due to a shutting down of external awareness (almost completely) and concomitant motor responses needed to act on the environment in the wakeful state.

Secondly, HH subjects have stronger verbal connections that facilitate the generation of whole scenarios (images) of experience. Attending to the hypnotist words directly activates images connected to words meanings in long-term memory which are projected back to early sensory cortices as if the event is happening now. However, after processing spreads, irrelevant stimuli are screened out from the STM system allowing goal relevant operations and images to be sufficiently activated in the early cortices leading to subjectively experiencing events in the present. The parallel with the dreaming process is evident where perception of the world is shut down gradually while a stream of thought (self talk) starts as we go to sleep followed by internally generated images becoming active in the hypnagogic state.

The third postulate suggests the existence of both feed forward and feed backward systems to fully account for our perceptual and goal directed experience both in and out of hypnosis. The feed forward is expressed as procedural programs of actions consisting of bodily movements generated from procedural memory (learned skills and past experience) reflecting the organism

intentions which are projected slightly before conscious awareness of it, as indicated by Libet (1985) findings that even voluntary actions are initiated 350 msec before the individual becomes aware of the desire to "want to move". The choice of behaviors is directed and biased by the nonconscious and motivational system fed forward to be compared with the perceptual feedback from the environment as to the results of our actions on the world.

Conscious and effortful attention is required for any action even if it is automatic (Kahneman, & Treisman, 1984)). To be driven automatically with automatic behaviors triggered by environmental stimuli could be harmful and sometimes detrimental to the individual. Without the modulation of conscious attention, a person's actions and perceptions would be out of context. Presenting goals to conscious awareness is important, because the more automatic and the less conscious the action is; the more errors could occur, such as driving on a habitual destination without thinking where one wants to go. On the other hand, nonconscious, nonvolitional automatism is very helpful; it has a vast capacity and accuracy of computational skills and a parallel processing capacity that is lacking in conscious processing. It is fast and accurate in routine matters such as reading among other processes performed in this manner. Shifting to the conscious mode is indispensable for modulating the automatic behaviors because

every situation has something new in it, and we cannot rely completely on automated functioning.

Conscious attentional processes are not the major source of behavior in our lives, but provide the exceptional ones required in novel situations and when things go wrong. The issue is that of goal directed behaviors and perceptual control. All living organisms need a way to perceive what to be controlled, a way to compare that perception with some reference (goal), and some way to correct the difference by acting on the world outside (Powers, 1974). Perception, comparison, and action are basic components of control, and they all draw on memory functions. Both explicit and implicit systems are used to guide actions and the choice of behavioral procedures to control perceptions accordingly.

The PCM perspective proposed here has the advantage of interpreting both hypnotic and everyday behaviors by drawing on the same mechanisms. This can in principle lead to further fruitful testing of other aspects of how hypnotic phenomena can be explained by known neuronal control processes. To be continued……

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Footnotes

1- Because the correlation between hypnotic suggestibility and imaginative suggestibility was very high in this study (r = .72) reaching approximately the test-retest reliability of the Harvard Scale, the associations with hypnotizability after controlling for imaginative suggestibility should be interpreted with caution. However, results of regression analysis are consistent with research findings indicating a strong relationship between hypnotizability and performance on Stroop task. Therefore, these associations may be reflecting a true relationship rather than noise. Consequently, the interpretation of these results is warranted.

Appendix A

Consent Form

CONSENT FORM TO PARTICIPATE IN RESEARCH

Please sign this form after reading the following section:

This is to state that I agree to participate in a program research conducted by Hana Moghrabi, a Ph.D. student in the Department of Psychology of Concordia University.

I have been informed that the purpose of the research is studying the relationship between some cognitive processes and hypnotizability.

I understand that this study involves three sessions, each lasting approximately one hour. In the first session, I will be asked to do some computer and paper and pencil tasks. In the second and third sessions, I will be asked to fill out some questionnaires and to do some other cognitive tasks.

I understand that no discomfort or risks to my well-being are involved in this study.

I understand that the information is confidential in that the researcher will not disclose my identity to others.

I understand that the results of this study may be published anonymously.

I understand that I am free to discontinue my participation in this experiment at any time without any negative consequences.

I HAVE CAREFULLY READ THE ABOVE AND UNDERSTOOD THIS AGREEMENT; I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY.

NAME:_____

SIGNATURE:_____

WITNESS SIGNATURE:_____

DATE:_____

Appendix B

Differential Personality Questionnaire (DPQ)

Auke Tellegen 1978

Differential Personality Questionnaire: Scale Ab
Auke Tellegen, Ph.D.
University of Minnesota, 1978

In this booklet you will find a series of statements a person might use to describe his or her characteristics. Each statement is followed by two choices--True and false. Read the statement and decide which choice better describes you. Then circle your answer beside each statement.
Please answer every statement, even if you are not completely sure of the answer. Read each statement carefully, but do not spend too much time deciding on the answer.

1.	Sometimes I feel and experience things as I did when I was a child.	**True**	**False**
2.	I can be greatly moved by eloquent or poetic language.	**True**	**False**
3.	While watching a movie, a television show or a play, I may become so involved that I forget about myself and my surroundings and experience the story as if it were real and as if I were taking part in it.	**True**	**False**
4.	If I stare at a picture and then look away from it, I can sometimes "see" an image of the picture, almost as if I were still looking at it.	**True**	**False**
5.	Sometimes I feel as if my mind could envelop the whole world.	**True**	**False**
6.	I like to watch cloud shapes change in the sky.	**True**	**False**
7.	If I wish, I can imagine (or daydream) some things so vividly that they hold my attention as a good movie or story does.	**True**	**False**

8.	I think I really know what some people mean when they talk about mystical experiences.	**True**	**False**
9.	I sometimes "step outside" my usual self and experience an entirely different state of being.	**True**	**False**
10.	Textures--such as wool, sand, wood--sometimes remind me of colors or music.	**True**	**False**
11.	Sometimes I experience things as if they were doubly real.	**True**	**False**
12.	When I listen to music, I can get so caught up in it that I don't notice anything else.	**True**	**False**
13.	If I wish, I can imagine that my body is so heavy that I could not move it if I wanted to.	**True**	**False**
14.	I can often somehow sense the presence of another person before I actually see of hear him or her.	**True**	**False**
15.	The crackle and flames of a wood fire stimulate my imagination.	**True**	**False**
16.	It is sometimes possible for me to be completely immersed in nature or in art and to feel as if my whole state of consciousness has somehow been temporarily altered.	**True**	**False**
17.	Different colors have distinctive and special meanings for me.	**True**	**False**
18.	I am able to wander off into my own thoughts while doing a routine task and actually forget that I am doing the task, and then find a few minutes later that I	**True**	**False**

have completed it.

19.	I can sometimes recollect certain past experiences in my life with such clarity and vividness that it is like living them again or almost so.	**True**	**False**
20.	Things that might seem meaningless to others often make sense to me.	**True**	**False**
21.	While acting in a play, I think I could really feel the emotions of the character and "become" him or her for the time being, forgetting both myself and the audience.	**True**	**False**
22.	My thoughts often don't occur as words but as visual images.	**True**	**False**
23.	I often take delight in small things (like the five-pointed star shape that appears when you cut an apple across the core or the colors in soap bubbles.	**True**	**False**
24.	When listening to organ music or other powerful music, I sometimes feel as if I'm being lifted into the air.	**True**	**False**
25.	Sometimes I can change noise into music by the way I listen to it.	**True**	**False**
26.	Some of my most vivid memories are called up by scents and smells.	**True**	**False**
27.	Certain pieces of music remind me of pictures or moving patterns of colors.	**True**	**False**
28.	I often know what someone is going to say before he or she says it.	**True**	**False**
29.	I often have "physical memories"; for	**True**	**False**

example, after I've been swimming I may still feel as if I'm still in the water.

30. The sound of a voice can be so fascinating to me that I can just go on listening to it. **True** **False**

31. At times I sometimes feel the presence of someone who is not physically there. **True** **False**

32. Sometimes thoughts and images come to me without the slightest effort on my part. **True** **False**

33. I find that different odors have different colors. **True** **False**

34. I can be deeply moved by a sunset. **True** **False**

Appendix C

Individuel Differences Questionnaire (IDQ)

(Paivio, 1971)

Individual Differences Questionnaire
(From Paivio, 1971)

Name: _____
Date: _____

The statements on the following pages represent ways of thinking, studying and problem solving. No two statements are exactly alike, so consider each statement carefully before answering. You are asked to rate each item on a 5-point scale which relates to how characteristic the statement is of you. Circling a rating of -2 indicates that the statement is extremely uncharacteristic of you, a rating of +2 indicates that the statement is extremely characteristic of you, a rating of 0 indicates that the statement is neither characteristic nor uncharacteristic of you.
It is important that you answer as frankly and as honestly as you can. Your answers will be kept in the strictest confidence.

	-2	-1	0	+1	+2
	Extremely Uncharacteristic				Extremely Characteristic
1. Listening to someone recount their experiences does not usually arouse mental pictures of the incidents being described.	-2	-1	0	+1	+2
2. By using mental pictures of the elements of a problem, I am often able to arrive at a solution.	-2	-1	0	+1	+2
3. I enjoy visual arts, such as painting, more than reading.	-2	-1	0	+1	+2
4. My daydreams are so vivid I feel as though I actually experience the scene.	-2	-1	0	+1	+2
5. I do not have a vivid imagination.	-2	-1	0	+1	+2
6. I can easily picture moving objects in my mind.	-2	-1	0	+1	+2
7. I can form mental pictures to almost any word.	-2	-1	0	+1	+2

8.	I have only vague impressions of scenes I have experienced.	-2	-1	0	+1	+2
9.	I think that most people think in terms of mental pictures whether they are completely aware of it or not.	-2	-1	0	+1	+2
10.	My powers of imagination are higher than average.	-2	-1	0	+1	+2
11.	I can close my eyes and easily picture a scene I have experienced.	-2	-1	0	+1	+2
12.	When someone describes something that happens to them I find myself vividly imagining the events that happened.	-2	-1	0	+1	+2
13.	I seldom dream.	-2	-1	0	+1	+2
14.	I never use mental pictures or images when trying to solve problems.	-2	-1	0	+1	+2
15.	I find it difficult to form a mental picture of anything.	-2	-1	0	+1	+2
16.	My dreams are extremely vivid.	-2	-1	0	+1	+2
17.	My thinking often consists of mental pictures or images.	-2	-1	0	+1	+2
18.	My daydreams are rather indistinct and hazy.	-2	-1	0	+1	+2
19.	I enjoy the use of mental pictures to reminisce.	-2	-1	0	+1	+2
20.	I often use mental images or pictures to help me remember things.	-2	-1	0	+1	+2
21.	I do not form a mental picture of people or places while reading of them.	-2	-1	0	+1	+2

Appendix D

Hypnotic Response Expectancy Questionnaire

Hypnotic Response Expectancy Questionnaire

This questionnaire is a measure of your motivation and expectations to experience some suggestions behaviorally and subjectively. Please rate your behavioral and subjective expectations, confidence, and motivation to experience each suggestion. (a) Pass –Fail (b) Behavioral expectations reflect whether you expect to do the behaviors called for by the suggestion. (c) Subjective expectations indicate to which extent you expect to have the subjective feelings called for by the suggestions. (d) Effort. (e) Confidence. (f) Motivation to have the experience

Please rate your answers according to the following scales:

(a) Indicate whether you will pass or fail the item as explained to you: Yes = Pass, No = Fail

(b) Behavioral 0-------1-------2--------3-------4
not at all to a great extent

(c) Subjective 0-------1-------2--------3-------4
not at all to a great extent

(d) Effort 0-------1-------2--------3-------4
not at all to a great extent

(e) Confidence 0-------1-------2--------3-------4
very doubtful extremely confident

(f) Motivation 0-------1-------2--------3-------4
not at all to a great extent

1) You will be told that your eyelids will feel very heavy and that they will close by themselves. How do you expect to respond?

a) My eyes will be totally closed by that time	Yes No
b) My eyes will be totally closed by that time	0-----1-----2-----3-----4
c) Subjective feelings eyelids becoming heavy	0-----1-----2-----3-----4
d) The effort needed to do the suggestion	0-----1-----2-----3-----4
e) Level of confidence in your expectation.	0-----1-----2-----3-----4
f) How much would you like to respond?	0-----1-----2-----3-----4

2) You will be told to extend your left arm straight in front of you, and to feel it becoming very heavy as though a weight were pulling the hand and arm down. How do you expect to respond:

	Yes No
a) I expect my hand to go down	
b) I expect my hand to go down	0-----1-----2-----3-----4
c) Actual feelings of hand heaviness	0-----1-----2-----3-----4
d) The effort needed to do the suggestion	0-----1-----2-----3-----4
e) Level of confidence in your expectation.	0-----1-----2-----3-----4
f) How much would you like to respond?	0-----1-----2-----3-----4

3) You will be told that your right hand and arm feel very heavy that you cannot lift it up, and then you will be asked to try to lift your hand up. How do you expect to respond?

	Yes No
a) I will ***not*** be able to lift my arm	
b) I will ***not*** be able to lift my hand	0-----1-----2-----3-----4
c) Actual feelings of heaviness in my hand	0-----1-----2-----3-----4
d) Voluntary effort needed to do the suggestion	0-----1-----2-----3-----4
e) Level of confidence in your expectation.	0-----1-----2-----3-----4
f) How much would you like to respond?	0-----1-----2-----3-----4

4) You will be told to interlock your fingers, will be told that your fingers will become tightly interlocked. Then you will be asked to try to take your hands apart. How do you expect to respond?

	Yes No
a) I will ***not*** be able to unlock my fingers	
b) I will ***not*** be able to unlock my fingers	0-----1-----2-----3-----4
c) The effort needed to do the suggestion	0-----1-----2-----3-----4
d) Actual feeling of hands locking	0-----1-----2-----3-----4
e) Level of confidence in your expectation.	0-----1-----2-----3-----4
f) How much would you like to respond?	0-----1-----2-----3-----4

5) You will be asked to extend your left arm straight out and make a fist, told to notice it becoming stiff, and then told to try to bend it. How do you expect to respond:

	Yes No
a) I will ***not*** be able to bend my arm	
b) I will ***not*** be able to bend my arm	0-----1-----2-----3-----4
c) The effort needed to do the suggestion	0-----1-----2-----3-----4

d) Actual feeling of rigidity 0-----1-----2-----3-----4
e) Level of confidence in your expectation. 0-----1-----2-----3-----4
f) How much would you like to respond? 0-----1-----2-----3-----4

6) You will be asked to hold your hands out in front of you about a foot apart and then told to imagine a force pulling your hands toward each other. How do you expect to respond?

	Yes	No
a) My hands will move toward each other		
b) My hands will move toward each other.	0-----1-----2-----3-----4	
c) The effort needed to do the suggestion	0-----1-----2-----3-----4	
d) Actual feeling of a force pulling my hands	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you like to respond?	0-----1-----2-----3-----4	

7) You will be asked to think how hard it might be to shake your head to indicate "no", and then you will be asked to try to shake your head "no". How do you expect to respond:

	Yes	No
a) I will ***not*** be able to shake my head "no"		
b) I will ***not*** be able to shake my head "no"	0-----1-----2-----3-----4	
c) The effort needed to do the suggestion	0-----1-----2-----3-----4	
d) Actual feeling of inability to shake my head	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you hope to experience	0-----1-----2-----3-----4	

8) You will be asked to become aware of the buzzing of a fly which will be said to become annoying to you, and then you will be told to shoo it away. How do you expect to respond?

	Yes	No
a) I will hear the fly and try to get rid of it		
b) I will make a movement to get rid of it	0-----1-----2-----3-----4	
c) The effort needed to do the suggestion	0-----1-----2-----3-----4	
d) Actual hearing of fly buzzing and being annoyed	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you hope to experience	0-----1-----2-----3-----4	

9) You will be told that your eyelids were so tightly closed that you could not open them. And then you will be told to try to open your eyes. How do you expect to respond?

a) I will ***not*** be able to open my eyes	Yes	No
b) I will ***not*** be able to open my eyes	0-----1-----2-----3-----4	
c) The effort needed to do the suggestion	0-----1-----2-----3-----4	
d) Actual feeling of eyelids glued	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you hope to do so?	0-----1-----2-----3-----4	

10) You will be told to imagine biting a piece of lemon, and then you will be told that you will experience a sour taste in your mouth. How do you expect to respond:

a) I will experience the taste and I will grimace	Yes	No
b) I will grimace or make any mouth movement	0-----1-----2-----3-----4	
c) The effort needed to make the movement	0-----1-----2-----3-----4	
d) Actual feeling of sour taste in my mouth	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you hope to experience	0-----1-----2-----3-----4	

11) You will be told that after you open your eyes, you will forget all what had happened during the session. Later on, you will be asked to write down all what had happened, how do you expect to respond?

a) I will **not** be able to remember 4 happenings	Yes	No
b) I will **not** be able to remember 4 happenings	0-----1-----2-----3-----4	
c) Forgetting will be effortless	0-----1-----2-----3-----4	
d) Actual inability to remember, blank feeling	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you hope to do so?	0-----1-----2-----3-----4	

12) You will be told that after you open your eyes, you would hear a tapping noise at which time you will reach down and touch your left ankle. How do expect to respond when you hear the tapping:

a) I will reach down and touch my ankle	Yes	No
b) I will reach down and touch my ankle	0-----1-----2-----3-----4	
c) The effort needed to do the suggestion	0-----1-----2-----3-----4	
d) Actually feeling the compulsion to touch ankle	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you hope to do so?	0-----1-----2-----3-----4	

Appendix E

Harvard Group Scale for Hypnotic Susceptibility: FORM A

HARVARD GROUP HYPNOSIS FORM A: SCRIPT
MAIN PROCEDURES

Today, you will participate is a session of the Harvard Group Scale of Hypnotic Susceptibility, Form A. This scale has been used for many years and can be as effective as individual hypnosis.

Before we start, I would like you to fill out the Response Expectancy Questionnaire, which is a measure for your expectation about how you will respond to suggestions. It is also a measure for your motivation, and confidence in expectation. In the questionnaire, you will find a brief description of what you will be asked to do, read it carefully and rate your responses accordingly. If you have any questions about the items, ask me and I will clarify it for you. When you finish, relax until everyone finish their work. Please don't open the second questionnaire (scoring booklet) until I tell you to do that.

After all subjects finish the task

Now, I would like to mention an important distinction between instruction and suggestion. An instruction is something like "Hold your right arm straight out at shoulder height". A suggestion is something like "Your hand is getting heavier and heavier". Please, follow the instructions. Whether you respond to the suggestions, however, will depend on amongst other things your Hypnotizability, and how deeply you are concentrating.

Please turn off all pagers, cell phones, and beepers of all sorts.

If you have gum or candy in your mouth, this may be a good time to dispose of it.

Please push back from the table a little more than arm's length and space out so that you don't bump into the table or your neighbor.

I ask that once you have closed your eyes, that you keep them closed for the duration of this session, unless instructed to do otherwise. This is so that everyone can be comfortable and free to experience hypnosis.

You may respond to all or none of the suggestions. If you find yourself responding to some suggestions and then you stop don't assume you've stopped responding. If you do not experience a particular suggestion or suggestions, it does not mean that you are not hypnotized. You may not have a noticeable experience for one or more suggestions and then experience the next few. You may use this time to become more deeply relaxed and focused on the suggestion.

On occasion you may hear noises from adjacent rooms. This also does not mean that you are not hypnotized. In fact, you may be acutely aware of your surroundings when hypnotized. You may use the noise as a cue to redirect your attention to my voice. Also, during the hypnosis you may feel uncomfortable. Feel free to adjust your position, and to cough or scratch if necessary. This will not disturb the hypnosis. Are there any questions?
Is everyone ready to experience hypnosis? Great!
I will dim the lights so that you can relax better. Now we will proceed with the hypnosis.

1) EYE CLOSURE

Now I want you to seat yourself comfortably and rest your hands in your lap. That's right; rest your hand in your lap. Now look at your hands and pick a spot on either hand and focus on it. It doesn't matter what spot you choose, just select some spot to focus on. I shall refer to the spot that you have chosen as the target. Hands relaxed.... just looking at the target. I'm about to give you some instructions that will help you to relax and gradually to enter a state of hypnosis.

Just relax and make yourself comfortable. I want you to look steadily at the target and while keeping your eyes upon it, to listen to what I say. Your ability to be hypnotized depends partly on your willingness to cooperate and partly on your ability to concentrate on the target and upon my words. You can be hypnotized only if you are willing. It is assumed that you are willing and that you are doing your best to cooperate by concentrating on the target and listening to my words, letting happen whatever is going to take place. Just let it happen. If you pay close attention to what I tell you, and think of the things I tell you to think about, you can easily experience what it is like to be hypnotized. There is nothing fearful or mysterious about hypnosis. It is a perfectly normal consequence of certain psychological principles. It is merely a state of strong interest in some particular thing. In a sense you are hypnotized anytime you see a good show and forget you are part of the audience, but instead feel you are part of the story. Many people report that when becoming hypnotized it feels at first like falling asleep but with the difference that somehow or other, they keep hearing my voice as a sort of background to whatever experience they might have. In some ways hypnosis is like sleep walking, however, hypnosis is an individual experience and is just not alike for everyone. In a sense, the hypnotized person is like a sleepwalker for he can carry out various complex activities while remaining hypnotized. All I ask of you is to keep up your attention and interest and continue to cooperate as you have been cooperating. Nothing will be done that will cause you any embarrassment. Most people find that it is a most interesting experience. (Time: 3' 35")

Just relax, and keep your eyes on the target. Look at it as steadily as you can. Should your eyes wander away from it, that will be all right.... just bring your eyes back to it. After a while, you may find that the target gets blurry, or perhaps moves about, or again changes color. That is all right. Should you get

sleepy, that will be fine too. Whatever happens let it happen and keep staring at the target for awhile. There will come a time, however, when your eyes will be so tired, feel so heavy, that you will be unable to keep them open any longer and they will close perhaps quite involuntarily. When this happens, just let it take place. (Time: 1' 10")

As I continue to talk, you will find that you become more and more relaxed. But not all people respond at the same rate to what I have to say. Some people's eyes will close before others. When the time comes that your eyes have closed, just let them remain closed. You may find that I shall still give suggestions for your eyes to close. These suggestions will not bother you. They will be for other people. Giving these suggestions to other people will not disturb you but simply allow you to relax more and more.

You will find that you can relax completely, but at the same time sit up comfortably in you chair without effort. You will be able to shift your position to make yourself comfortable when needed without it disturbing you. Now just let yourself to relax completely. Relax every muscle in your body. Relax the muscles of your legs.... Relax the muscles of your feet.... Relax the muscles of your arms.... Relax the muscles of your hands.... of your fingers.... Relax the muscles of your chest, of your neck.... Relax all the muscles of your body.... Let yourself be limp. Limp. Limp. Relax more and more, more and more. Relax completely. Relax completely. Relax completely. (Time 2' 15")

As you relax more and more, a feeling of heaviness is perhaps coming into your body. A feeling of heaviness is coming into you legs and your arms.... into your feet and into your hands.... into your whole body. Your legs feel heavy and limp, heavy and limp.... Your arms are heavy, heavy.... Your whole body feels heavy, heavier and heavier. Like lead. Your eyelids feel especially heavy....heavy and tired. You are beginning to feel drowsy, drowsy and sleepy. Your breathing

is becoming slow and regular, slow and regular. You're getting more and more comfortable, more and more relaxed while your eyelids become heavier and heavier, more and more tired and heavy. (Time: 1' 25")

Your eyes are tired from staring. The heaviness in your eyelids is increasing. Soon you will not be able to keep your eyelids open. Soon your eyelids will close of themselves. Your eyelids will be too heavy to keep open. Your eyes are tired from staring. Your eyes are becoming wet from straining. You are becoming increasingly very relaxed and comfortable. The strain in your eyes is becoming greater and greater, greater and greater. It would be so nice to close your eyes, to relax completely and just listen sleepily to my voice talking to you. You would like to close your eyes and relax completely. Relax completely. You will soon reach your limit. The strain will be so great, your eyes will be so tired, your lids will become so heavy, and your eyes will close of themselves, close of themselves. (Time: 1' 20")

Your eyelids are getting heavy, very heavy. You are relaxed, very relaxed. There is a pleasant feeling of warmth and heaviness all through you body. You are very relaxed comfortable. Relaxed and comfortable.... Relax more and more.... Listen only to my voice. Just pay attention to nothing else but my voice. Your eyes are getting blurred. You are having difficulty seeing. Your eyes are straining. The strain is getting greater and greater. Greater and greater. (Time: 50")

Your lids are heavy, heavy as lead, getting heavier and heavier, heavier and heavier. They are pushing down, down, down. Your eyelids seem weighted, weighted with lead. heavy as lead.... Your eyes are blinking, blinking, blinking....closing,.. closing. (Time 35")

Your eyes may have closed by now, and if they have not, they would soon close of themselves. But there is no need to strain them any more. Even if your eyes have not closed fully as yet, you have concentrated well upon the target and

have become very relaxed and conformable. At this time, you may just let your eyes close. That's it, eyes completely closed. Close your eyes now. (Time 35")

You are now comfortably relaxed, but you are going to relax even more, much more. Your eyes are now closed. You will keep your eyes closed until I tell you otherwise or I ask you to awaken..... You feel very relaxed and comfortable. Just keep listening to my voice. Pay close attention to it. Keep your thoughts on what I am saying....Just listen. You are going to start entering hypnosis. Soon you will be hypnotized, but you will continue to hear me. You will not awaken until I ask you to do so. I shall now begin to count. At each count you will feel yourself going down, down, into a deep comfortable, a deep hypnotic state. A state in which you will be able to do all sorts of things I ask you to do.
One.... you will be going into a deep hypnotic state.... Two.... down, down, deeper in hypnosis. Three....four.... more and more, deeper in hypnosis. Five....six....seven....you are sinking, sinking deeper and deeper into hypnosis. Nothing will disturb you. Pay attention only to my voice and only to such things that I call to your attention. I would like you to continue to pay attention to my voice and the things I tell you.... Eight.... nine.... You will always hear me, no matter how deeply hypnotized you feel yourself to be... deeply hypnotized. Nothing will disturb you. You are going to experience many things that I will ask you to experience. Ten.... deeply hypnotized....! You will not awaken until I ask you to do so. You are deeply in a hypnotic state, in which you will have the experiences that I will soon describe to you. (Time 3' 40")

2) HAND LOWERING (LEFT HAND) (Total time 5' 05")

As you become even more relaxed and calm, it will not disturb you to make yourself comfortable in your chair and put your head in a comfortable position.

Now that you are very relaxed and comfortable, listening with full attention to my voice, I'm going to help you learn more about how your thoughts effect your actions in this state. Not all people experience just the same things in hypnosis, and perhaps you will not have all the experiences that I will describe to you. That will be all right. But you will have at least some of the experiences and you will find these interesting. You just experience whatever you can. Pay close attention to whatever I tell you and watch what happens. Just let happen whatever you find is happening even if it is not what you expect.

Please extend your left arm straight out in front of you up in the air with the palm of your hand down. Left arm straight out in front of you.... That's it, left arm straight out in front of you.... Palm down. I want you now to pay close attention to this hand, the feelings in it, and what is happening to it. As you pay attention to it, you are more aware of it than you have been. You notice if it is warm or cool. Whether there is a little tingling in it. Whether there is a tendency for the fingers to twitch ever so slightly.... That's right, I want you to pay close attention to this hand because something very interesting is about to happen to it. It is beginning to get heavy... Heavier and heavier... as though a weight were pulling the arm and the hand down... You can picture a weight pulling on it... and as it feels heavier and heavier, it begins to move... As if something were forcing it down.... A little bit down.... More and more down... down... And as I count it gets heavier and heavier, and goes down more and more... One, down... Two, down... Three, down.... Four, down, more and more down.... Five, down.... Six, down... Seven.... Eight.... Heavier and heavier, down, and more and more. Nine... Down...ten.... Heavier and heavier.... Down more and more. (Allow 10")

That's fine.... Just let your hand go back to its original resting position and relax. Your hand back to its original resting position and relax. You must have noticed how heavy and tired the hand and arm felt. Much more so that it

ordinarily would if you had held it out that way for a little while. You probably noticed how something seemed to be pulling it down. Now just relax, your hand and arm are quite comfortable again. Quite comfortable again. There.... Just relax. Relax.

3)ARM IMMOBILIZATION (RIGHT ARM) (Total time 2' 55"

You are very relaxed. The general heaviness you have felt from time to time, you now feel over your entire body. Now I want you to pay close attention to your right arm and hand.... Your right arm and hand share in the feeling of heaviness. How heavy your right hand feels... And note that as you think about this heaviness in your hand and arm, the heaviness seems to grow even more.... Now your arm is getting heavy.... Very heavy. Now your hand is getting heavy.... So heavy.... Like lead.... Perhaps a little later you would like to see how heavy your hand is...it seems much too heavy to lift.... But perhaps in spite of being so heavy, you could lift it a little, although it may now be too heavy even for that... Why don't you see how heavy it is... Just try to lift your hand up, just try. Just try to lift your hand up. Just try... (Allow 10")

That's fine. Stop trying. Just relax. You notice that when you tried to lift it there was some resistance because of the relaxed state that you are in. but now you can just rest your hand again. Your hand and arm feel normal again. They are no longer heavy. You could lift them now if you wanted to, but don't try now. Just relax.... Relax completely. Relax. Just relax.

4) FINGERS LOCK (Total time 1' 40")

Now let us try something else. Put your fingers together. Interlock your fingers together. Interlock your fingers and press your hands tightly together. That's it. Put your fingers together, interlock your fingers and press your hand

tightly together. Interlock tightly.... Hands pressed tightly together. Notice how your fingers are becoming tightly interlocked together, more and more tightly interlocked together... So tightly interlocked together that you wonder very much if you could take your fingers and hands apart. Your fingers are interlocked, tightly interlocked.... And I want you to try to take your hands apart... Just try. ... (Allow 10")

That's right. Stop trying and relax. You notice how hard it was to get started to take them apart. Your hands are no longer tightly clasped together... You can now take them apart. Now return your hands to their resting position and relax. Hand to their resting position and relax.... Just relax.

5) ARM RIGIDITY (Total time 2' 25")

Please extend your left arm straight out in front of you up in the air, and make a fist. Arm straight out in front of you. That's right. Straight out and make a fist. Arm straight out, a tight fist.... Make a tight fist. I want you to pay attention to this arm and imagine that it is becoming stiff... stiffer and stiffer... very stiff.... And now you notice that something is happening to your arm... You notice a feeling of stiffness coming into it... It is becoming stiff.... More and more stiff.... Rigid.... Like a bar of iron.... And you know how difficult.... How impossible it is to bend a bar of iron like your arm... See how much your arm is like a bar of iron...Test how stiff and rigid it is.... Try to bend it.... Try. ... (Allow 10")

That's good. Now just stop trying to bend your arm and relax. Stop trying to bend your arm and relax. I want you to experience many things. You felt the creeping stiffness that.... That you had to exert a good deal of effort to do something that would normally be very easy. But your arm is not stiff any longer. Just place your arm back in resting position.... Back in resting position.

Just relax, and as your arm relaxes, let your whole body relax. As your arm relaxes let your whole body relax.

6) MOVING HANDS (TOGETHER) (Total time 1' 45")

Please hold both hands up in the air, straight out in front of you, palms facing inward.... Palms facing toward each other. Hold your hands about a foot apart... about a foot apart. Both arms straight out in front of you, hands about a foot apart.... Palms facing inward.... About a foot apart.

Now I want you to imagine a force attracting your hands toward each other, pulling them together. As you think of this force pulling your hands together, they will move together, slowly at first, but they will move closer together, closer and closer together, as though a force was acting on them.... Moving.... Moving.... Closer... closer... (Allow 10" without further suggestion)

That's fine. You see again that thinking about a movement causes a tendency to make it. Now place you hands back in their resting position and relax...your hands back in their resting position and relax.

7) COMMUNICATION INHIBITION (Total time 1' 25")

You are very relaxed now.... Deeply relaxed... Think about how hard it might be to communicate while so deeply relaxed.... Perhaps as hard as when asleep... I wonder whether you could shake your head to indicate "no". I really don't think you could... You may try a little later to shake your head "no" when I tell you to.... But I think you will find it <u>quite</u> difficult... Why don't you try to shake your head "no" now.... <u>Just try</u> to shake it... (Allow 10")

That' all right.... Stop trying and relax. You see again how you have to make an effort to do something normally as easy as shaking your head. You can

shake it to indicate "no" much more easily now. Shake your head easily now... That's right, now relax, just relax.

8) HALLUCINATION (FLY) (Total time 1' 30")

I'm sure that you have paid so close attention to what we have been doing that you have not noticed the fly which has been buzzing about you... But now that I call your attention to it you become increasingly aware of this fly which is going round and round about your head.... Nearer and nearer to you.... Buzzing annoyingly... Hear the buzz getting louder as he keeps darting at you. You don't care much for this fly...You would like to shoot it away.... Get rid of it... It annoys you. Go ahead and get rid of it if you want to... (Allow 10")

There, it's going away... It's gone.... And you are no longer annoyed...no more fly. Just relax, relax completely. Relax.... Just relax.

9) EYE CATALEPSY (Total time 2')

You have had your eyes closed for a long time while you have remained relaxed. They are by now tightly closed, tightly shut... In a few moments I shall ask you to try to open your eyes. When you are told to try, most likely your eyes will feel as if they were glued together.... Tightly glued shut. Even if you were able to open you eyes, you would, of course, only do so momentarily and then immediately close them again and relax, so as not to disturb your concentration. But I doubt that you will be able, even momentarily, to open your eyes. They're so tightly closed that you could not open them. Perhaps you would soon like to try to open your eyes momentarily, in spite of them feeling so heavy and so completely.... So tightly closed. Just try.... Try to open your eyes... (Allow 10")

All right, stop trying. Now again allow your eyes to become tightly shut. Your eyes tightly shut. You have had a chance to feel your eyes tightly shut. Now

relax, your eyes are normal again, but just keep them closed and relax. Normal again.... Just keep them closed and relaxed. Relaxed and shut.

10) Taste Hallucination (Sour Taste)

This time, I would like you to think of biting on a piece of lemon. Imagine yourself biting the lemon and tasting the lemon juice flowing in your mouth... it is very sour. Notice that as you think of this sour taste you can actually begin to experience a sour taste... It may be faint at first, but it will grow... and grow... (PAUSE). Now you begin to notice a sour taste in your mouth... the sour taste is increasing... the lemon juice is sour... very sour...It will get stronger... it often takes a few moments for such a taste to reach its full strength... it is now getting stronger... stronger... (PAUSE)

That's fine... but note that the sour taste is going away and your mouth feels just as it did before I mentioned any tastes at all... there, it's quite normal now... just continue to relax...

11) POST-HYPNOTIC SUGGESTION (TOUCHING LEFT ANKLE);

12) AMNESIA

(Total time 3' 35")

Remain deeply relaxed and pay close attention to what I'm going to tell you next. In a moment I shall begin counting backwards from twenty to one. You will gradually become more alert, but for most of the count you will still remain relaxed. By the time I reach "five" you will open your eyes but you will remain very relaxed. When I get to "one" you will be fully alert and to what is happening without using your imagination. You probably will have the impression that you have been dreaming because you will have difficulty remembering all the things I have told you and all the things that you did or felt. In fact you will find it to be

so much of an effort to recall any of these things that you will have no wish to do so. It will be much easier simply to forget everything until I tell you that you can remember. You will remember nothing of what has happened until I say to you "now you can remember everything". You will not remember anything until then. After you open eyes you will feel fine. You will feel only relaxed and refreshed. I shall now count backwards from twenty, and at "five", not sooner, you will open your eyes but not be fully alert until I say "one". At "one", you will be fully alert... A little later you will here a tapping noise like this... (Demonstrate, tap, tap).

When you here the tapping noise you will reach down and touch your left ankle. You will touch your left ankle but forget that I told you to do so, just as you will forget the other things, until I tell you "now you can remember everything". Ready... Now: 10, 9, 8, 7, 6, half way, 5, 4, 3, 2, 1. Fully alert. Fully alert. Any remaining relaxation which you may feel will quickly pass... (**A distinct tapping noise is now to be made.** Then allow 10" before continuing.)

TESTING

Now please take you response booklet, and turn to the second page of the booklet. Do not turn to the third page until I specifically instruct you to do so later. On the second page, please write down briefly, in your own words, a list of things that happened since you began looking in front of you. You should not go into much detail here on the particular way in which you responded. But please try to remember all the different things that you were asked to do. You will now be given three minutes to write out this information. At the end of the three minutes you will be asked a number of more specific questions regarding your experiences. (Pause 2 minutes).

Please complete your list in one more minute. If you have already completed your list, spend the next minute trying to recall if there was anything else that you may have neglected to mention. (Pause one more minute).

All right. Now listen carefully to my words. Now you can remember everything. Please turn to page three and write down a list of anything else that you remember now that you could not remember previously. You will be given two minutes more to write out this information. (Pause two minutes).

Now please turn to page four and answer the questions in the remainder of the booklet. Use your own judgment if questions seem ambiguous.

(Collect booklets at the end of the session).

Appendix F

Scoring Booklet for the Hypnosis Session

Scoring Booklet
For
The Hypnosis Session

Name:_____ Date:_____

Subject #:_____ Experimenter:_____ Score:_____

Summery of Scores

	Behavioral	Subjective
1. Eye closure		
2. Hand lowering		
3. Arm Immobilization (Right Arm)		
4. Finger Lock		
5. Arm Rigidity		
6. Moving Hands Together		
7. Communication Inhibition		
8. Auditory Hallucination (Fly)		
9. Eye Catalepsy		
10. Taste Hallucination		
11. Post hypnotic suggestion		
12. Post hypnotic amnesia		

Total: _____ _____

Response Booklet
Of
Hypnotic susceptibility

PLEASE SUPPLY THE INFORMATION REQUESTED BELOW

Name: _____

Age: _____
Date:_____

Occupation: _____ Major: _____

First Language: _____

Have you ever been hypnotized? Circle: Yes No
If so, please cite the circumstances and describe your experiences. Please be brief:

DO NOT OPEN THIS BOOKLET until the experimenter specifically Instructs you to do so.

Please write down briefly in your own words ***a list*** of the things that happened since you began the session. Do not go in detail. Spend three minutes, no longer, in writing your reply.

Please **DO NOT TURN THIS PAGE** until the experimenter specifically Instructs you to do so.

Please **DO NOT RETURN TO PAGE 2**

On this page write down a list of anything else that you now remember that you did not remember previously. Please do not go into detail. Spend two minutes, no longer, in writing out your reply.

Please **DO NOT TURN THIS PAGE** until the experimenter specifically Instructs you to do so.

PLEASE DO NOT RETURN TO EARLIER PAGES.

RESPONSES

Listed below in chronological order are the ten specific happenings which were suggested to you during this session. We wish you to estimate whether or not you responded to the ten suggestions.

It is understood that your estimates may in some cases not be as accurate as you might like it to be and that you might even have to guess. But we want you to make whatever you feel to be your ***best estimates*** regardless. Please answer every question as best as you can.

Beneath the description of each suggestion are sets of responses, labeled a, b, c, and d. Please circle the answer that describes your experience according to the following criteria:

(a) Whether an onlooker would have observed that you passed the item (Yes =
Pass, No = Fail)
b) Whether an onlooker would have observed that you did or did not make the behavior called for in the suggestion (0 = not at all; 4 = completely)
c) Rate the extent of voluntary effort used to execute the behavior called for by suggestion (0 = totally effortless; 4 = total voluntary effort).
d)Rate your subjective experience of the behavior called for by suggestion (0 = did not feel anything; 4 = felt as real).
e) To which extent did your experience match your expectations? (0 = not at all; 4 = total match)

1) Eye Closure:
You were told that your eyelids becoming heavy and they will close by themselves, would you estimate that an *onlooker* would have observed that your eyes were closed (before you were asked to close your eyes if they weren't closed yet)

a) My eyes were totally closed by that time	Yes No
b) My eyes were totally closed by that time	0-----1-----2-----3-----4
c) Voluntary effort exerted to close eyes	0-----1-----2-----3-----4
d) Subjective feelings eyelids becoming heavy	0-----1-----2-----3-----4
e) Did your expectation match your experience?	0-----1-----2-----3-----4

2) Hand Lowering (Left Hand)

You were told to extend your left arm straight and feel it becoming heavy as though a weight were pulling the hand and arm down. Would you estimate that an *onlooker* would have observed that your hand lowered at least six inches (before you were told to let your hand down deliberately):

a) My hand lowered at least 6 inches by then	Yes No
b) My hand lowered at least 6 inches by then.	0-----1-----2-----3-----4
c) Voluntary effort exerted to lower my hand	0-----1-----2-----3-----4
d) Subjective feelings of heaviness	0-----1-----2-----3-----4
e) My expectation matched my experience	0-----1-----2-----3-----4

3) Arm Immobilization (Right Arm)

You were next told how heavy your right hand and arm felt and then told to try to lift your hand up. Would you estimate that an *onlooker* would have observed that your you ***did not*** lift your hand and arm up at least one inch (before you were told to stop trying)

a) I ***did not*** lift my hand at least 1 inch by then	Yes No
b) I ***did not*** lift my hand at least 1 inch by then	0-----1-----2-----3-----4
c) Voluntary effort exerted not to move my hand	0-----1-----2-----3-----4
d) Subjective feelings of arm heaviness	0-----1-----2-----3-----4
e) My expectation matched my experience	0-----1-----2-----3-----4

4) Finger Lock

You were next told to interlock your fingers, told how your fingers would become tightly interlocked, and then told to take your hands apart. Would you estimate that an *onlooker* would have observed that your fingers were incompletely separated (before you were told to stop trying o make them apart)?

a) My fingers were incompletely separated	Yes No
b) My fingers were incompletely separated	0-----1-----2-----3-----4

c) Voluntary effort exerted to keep fingers locked 0-----1-----2-----3-----4
d) Subjective feeling of hands locking 0-----1-----2-----3-----4
e) My expectations matched my experience 0-----1-----2-----3-----4

5) Arm Rigidity (Left)

You were next told to extend your left arm straight out and make a fist, told to notice it becoming stiff, and then told to try to bend it. Would you estimate that an *onlooker* would have observed that there was less than two inches of arm bending (before you were told to stop trying)

a) My arm was bent ***less*** than 2 inches by then Yes No
b) My arm was bent less than 2 inches by then 0-----1-----2-----3-----4
c) Voluntary effort **not** to bend my arm 0-----1-----2-----3-----4
d) Subjective feeling of arm rigidity 0-----1-----2-----3-----4
e) My expectations matched my experience 0-----1-----2-----3-----4

6) Moving Hands Together

You were next told to hold your hands out in front of you about a foot apart and then told to imagine a force pulling your hands together. Would you estimate that an *onlooker* would have observed that your hands were not over six inches apart (before you were told to return your hands to their resting position)?

a) My hands ***weren't*** more than 6 inches apart Yes No
b) My hands weren't more than 6 inches apart 0-----1-----2-----3-----4
c) Voluntary effort to move hands together 0-----1-----2-----3-----4
d) Subjective feeling of force pulling the hands? 0-----1-----2-----3-----4
e) My expectations matched my experience 0-----1-----2-----3-----4

7) Communication Immobilization

You were next told to think how hard it might be to shake your head to indicate "no", and then told to try. Would you estimate that an *onlooker* would have observed you making a recognizable shake of the head "no" (that is before you were told to stop trying)?

a) I did ***not*** recognizably shake my head Yes No
b) I did ***not*** recognizably shake my head 0-----1-----2-----3-----4
c) Effort exerted **not** to shake head 0-----1-----2-----3-----4
d) Subjective feelings of inability to shake head 0-----1-----2-----3-----4
e) My expectations matched my experience 0-----1-----2-----3-----4

8) Experiencing of Fly

You were next told to become aware of the buzzing of a fly which was said to become annoying, and then you were told to shoo it away. Would you estimate that an *onlooker* would have observed you making any grimacing, any movement, and any outward acknowledgement of an effect (regardless of what it was like subjectively)?

a) I did make some outward acknowledgement	Yes No
b) I did make some outward acknowledgement	0-----1-----2-----3-----4
c) Voluntary effort exerted to do the movement	0-----1-----2-----3-----4
d) Subjective feelings of hearing the fly buzzing	0-----1-----2-----3-----4
e) My expectations matched my experience	0-----1-----2-----3-----4

9) Eye Catalepsy

You were told that your eyelids were so tightly closed that you could not open them, and then you were told to try to do so. Would you estimate that an *onlooker* would have observed that your eyes remained closed (before you were told to stop trying)?

a) My eyes remained closed	Yes No
b) My eyes remained closed	0-----1-----2-----3-----4
c) Voluntary effort exerted not to open my eyes	0-----1-----2-----3-----4
d) Subjective feeling of eyelids tightly closed	0-----1-----2-----3-----4
e) My expectations matched my experience	0-----1-----2-----3-----4

10) Experiencing Sour Taste

You were then told to imagine biting on a lemon, and then told you will experience a sour taste. Would you estimate that an *onlooker* would have observed you making any grimace or mouth movement indicating having the experience (before you were told that everything is back to normal)

a) I had a sour taste, grimaced, swallowed.	Yes No
b) I grimaced, swallowed, or did any movement	0-----1-----2-----3-----4
c) Voluntary effort to grimace, swallow, etc...	0-----1-----2-----3-----4
d) Subjective feeling of sour taste	0-----1-----2-----3-----4
e) My expectations matched my experience	0-----1-----2-----3-----4

11) Post-Hypnotic Amnesia

You were told that after you open your eyes, you would forget all what happened during the session. Later, you were told to write down what happened, how would you estimate your response to this suggestion?

a) I was *not* able to write at least 4 happenings	Yes No
b) I was *not* able to write at least 4 happenings	0-----1-----2-----3-----4
c) Voluntary effort exerted to forget	0-----1-----2-----3-----4
d) Subjectively, I couldn't recall anything	0-----1-----2-----3-----4
e) My expectations matched my experience	0-----1-----2-----3-----4

12) Post-Hypnotic Suggestion (Touching Left Ankle)

You were next told that after you open your eyes, you would hear a tapping noise at which time you would reach down and touch your left ankle. You were further told that you forget that you were told so. Would you estimate that an *onlooker* would have observed both that you reached down and touched your left ankle or that you made any movement to do so?

a) I made at least a partial movement to touch ankle	Yes No
b) I made at least a partial movement to touch ankle	0-----1-----2-----3-----4
c) Voluntary effort exerted to touch my ankle	0-----1-----2-----3-----4
d) I felt subjectively compelled to touch my ankle	0-----1-----2-----3-----4
e) My expectations matched my experience	0-----1-----2-----3-----4

Appendix G

Response Expectancy Questionnaire

Imagination Condition

Response Expectancy Questionnaire

This questionnaire is a measure of your motivation and expectations to experience some suggestions behaviorally and subjectively. Please rate your behavioral and subjective expectations, confidence, and motivation to experience each suggestion. (a) Behavioral expectations reflect whether you expect to do the behaviors called for by the suggestion. (b) Subjective expectations indicate to which extent you expect to have the subjective feelings called for by the suggestions.
Please rate your answers according to the following scales:

(a) Indicate whether you will pass or fail the item as explained to you: Yes = Pass, No = Fail

(b) Behavioral 0-------1-------2--------3-------4
not done at all completely done

(c) Subjective 0-------1-------2--------3-------4
not at all to a great extent

(d) Effort 0-------1-------2--------3-------4
no effort at all total voluntary effort

(e) Confidence 0-------1-------2--------3-------4
very doubtful to a great extent

(f) Motivation 0-------1-------2--------3-------4
not at all to a great extent

1) You will be told to think of your head falling forward, becoming limp, relaxed, and falling forward. How do you expect your behavior to be?

	Yes No
a) I expect my head to fall forward	
b) I expect my head to fall forward	0-----1-----2-----3-----4
c) The effort needed to do the suggestion	0-----1-----2-----3-----4
d) Actual feelings of head falling down	0-----1-----2-----3-----4
e) Level of confidence in your expectation.	0-----1-----2-----3-----4
f) How much would you like to respond?	0-----1-----2-----3-----4

2) You will be told to extend your left arm straight in front of you, and to feel it becoming very heavy as though a weight were pulling the hand and arm down. How do you expect to respond:

a) I expect my hand to go down	Yes	No
b) I expect my hand to go down	0-----1-----2-----3-----4	
c) Actual feelings of hand heaviness	0-----1-----2-----3-----4	
d) The effort needed to do the suggestion	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you like to respond?	0-----1-----2-----3-----4	

3) You will be told that your right hand and arm feel very heavy that you cannot lift it up, and then you will be asked to try to lift your hand up. How do you expect to respond?

a) I will ***not*** be able to lift my arm	Yes	No
b) I will ***not*** be able to lift my hand	0-----1-----2-----3-----4	
c) Actual feelings of heaviness in my hand	0-----1-----2-----3-----4	
d) Voluntary effort needed to do the suggestion	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you like to respond?	0-----1-----2-----3-----4	

4) You will be told to interlock your fingers, will be told that your fingers will become tightly interlocked. Then you will be asked to try to take your hands apart. How do you expect to respond?

a) I will ***not*** be able to unlock my fingers	Yes	No
b) I will ***not*** be able to unlock my fingers	0-----1-----2-----3-----4	
c) The effort needed to do the suggestion	0-----1-----2-----3-----4	
d) Actual feeling of hands locking	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you like to respond?	0-----1-----2-----3-----4	

5) You will be asked to extend your left arm straight out and make a fist, told to notice it becoming stiff, and then told to try to bend it. How do you expect to respond:

a) I will ***not*** be able to bend my arm	Yes	No
b) I will ***not*** be able to bend my arm	0-----1-----2-----3-----4	
c) The effort needed to do the suggestion	0-----1-----2-----3-----4	
d) Actual feeling of rigidity	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you like to respond?	0-----1-----2-----3-----4	

6) You will be asked to hold your hands out in front of you about a foot apart and then told to imagine a force pulling your hands toward each other. How do you expect to respond?

	Yes	No
a) My hands will move toward each other		
b) My hands will move toward each other.	0-----1-----2-----3-----4	
c) The effort needed to do the suggestion	0-----1-----2-----3-----4	
d) Actual feeling of a force pulling my hands	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you like to respond?	0-----1-----2-----3-----4	

8) You will be asked to think how hard it might be to shake your head to indicate "no", and then you will be asked to try to shake your head "no". How do you expect to respond:

	Yes	No
a) I will ***not*** be able to shake my head "no"		
b) I will ***not*** be able to shake my head "no"	0-----1-----2-----3-----4	
c) The effort needed to do the suggestion	0-----1-----2-----3-----4	
d) Actual feeling of inability to shake my head	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you hope to experience	0-----1-----2-----3-----4	

8) You will be asked to become aware of the buzzing of a fly which will be said to become annoying to you, and then you will be told to shoo it away. How do you expect to respond?

	Yes	No
a) I will hear the fly and try to get rid of it		
b) I will make a movement to get rid of it	0-----1-----2-----3-----4	
c) The effort needed to do the suggestion	0-----1-----2-----3-----4	
d) Actual hearing of fly buzzing and being annoyed	0-----1-----2-----3-----4	
e) Level of confidence in your expectation.	0-----1-----2-----3-----4	
f) How much would you hope to experience	0-----1-----2-----3-----4	

11) You will be told that your eyelids were so tightly closed that you could not open them. And then you will be told to try to open your eyes. How do you expect to respond?

	Yes	No
a) I will ***not*** be able to open my eyes		
b) I will ***not*** be able to open my eyes	0-----1-----2-----3-----4	
c) The effort needed to do the suggestion	0-----1-----2-----3-----4	

d) Actual feeling of eyelids glued 0-----1-----2-----3-----4
e) Level of confidence in your expectation. 0-----1-----2-----3-----4
f) How much would you hope to do so? 0-----1-----2-----3-----4

12) You will be told to imagine biting a piece of lemon, and then you will be told that you will experience a sour taste in your mouth. How do you expect to respond:

a) I will experience the taste and I will grimace Yes No
b) I will grimace or make any mouth movement 0-----1-----2-----3-----4
c) The effort needed to make the movement 0-----1-----2-----3-----4
d) Actual feeling of sour taste in my mouth 0-----1-----2-----3-----4
e) Level of confidence in your expectation. 0-----1-----2-----3-----4
f) How much would you hope to experience 0-----1-----2-----3-----4

11) You will be told that after you open your eyes, you will forget all what had happened during the session. Later on, you will be asked to write down all what had happened, how do you expect to respond?

a) I will **not** be able to remember 4 happenings Yes No
b) I will **not** be able to remember 4 happenings 0-----1-----2-----3-----4
c) Forgetting will be effortless 0-----1-----2-----3-----4
d) Actual inability to remember, blank feeling 0-----1-----2-----3-----4
e) Level of confidence in your expectation. 0-----1-----2-----3-----4
f) How much would you hope to do so? 0-----1-----2-----3-----4

12) You will be told that after you open your eyes, you would hear a tapping noise at which time you will reach down and touch your left ankle. How do expect to respond when you hear the tapping:

a) I will reach down and touch my ankle Yes No
b) I will reach down and touch my ankle 0-----1-----2-----3-----4
c) The effort needed to do the suggestion 0-----1-----2-----3-----4
d) Actually feeling the compulsion to touch ankle 0-----1-----2-----3-----4
e) Level of confidence in your expectation. 0-----1-----2-----3-----4
f) How much would you hope to do so? 0-----1-----2-----3-----4

Please choose one of the suggestions that you expected to respond to positively, and a second suggestion that you expected **not** to respond to, and then write down how you came to this expectation. That is, on what basis did you rate your expectation? Please write in point form. Take 5 minutes to write it down.

Appendix H

Modified Version of the

Harvard Group Scale for Hypnotic Susceptibility

(The following instructions are presented VERBATIM.)

Instructions for the imagination group:

What we will be doing today is a test of your imaginative ability. More precisely, we are interested in assessing your ability to use your imagination to experience various suggestions that will be described to you. Please listen carefully to what I will tell you and do your best to experience the events that are suggested to you.

Before we start, I would like you to fill out the Response Expectancy Questionnaire, which is a measure for your expectations about how you will respond. Also, there is a measure for your motivation, and confidence in expectation. In the questionnaire, you will find a brief description of what you will be asked to do, read it carefully and rate your responses accordingly. If you have any questions about the items, ask me and I will clarify it for you. When you finish, relax until everyone finish their work. Please don't open the second questionnaire (scoring booklet) until I tell you to do that. (Wait until all participants finish filling out the questionnaires)

Before we start, I would like to mention an important distinction between instruction and suggestion. An instruction is something like "Hold your right arm straight out at shoulder height". A suggestion is something like "Your hand is getting heavier and heavier". Please, follow the instructions. Whether you respond to the suggestions, however, will depend on amongst other things your suggestibility, and the strength of your imagination

Please turn off all pagers, cell phones, and beepers of all sorts.

If you have gum or candy in your mouth, this may be a good time to dispose of it. Please push back from the table a little more than arm's length and space out so that you don't bump into the table or your neighbor.

I ask that once you have closed your eyes, that you keep them closed for the duration of the e comfortable and less distracted by watching what other people are doing. In fact, I will not even be observing your responses

You may respond to all or none of the suggestions. If you find yourself responding to some suggestions and then you stop don't assume you've stopped responding. If you do not experience a particular suggestion or suggestions, it does not mean that you are not going to respond to others. You may not have a noticeable experience for one or more suggestions and then experience the next few. You may use this time to become more deeply relaxed and focused on the suggestion.

On occasion you may hear noises from adjacent rooms. This also does not mean that you are not concentrating. In fact, you may be aware of your surroundings while concentrating on what I am saying to you. You may use the noise as a cue to redirect your attention to my voice. Also, during the session you may feel uncomfortable. Feel free to adjust your position, and to cough or scratch if necessary. This will not disturb your concentration. Are there any questions? Is everyone ready to start the session? Great! Let us start.

1) HEAD FALLING (Total time: 3'30")

To begin with, I want you to experience how it feels to respond to suggestions by using your imagination. Now, if you please sit up straight in your chair.... Close your eyes and relax; continue, however, to sit up straight. That's right. Eyes closed and sit up straight. Please stay in that position with your eyes closed, while at the same time letting yourself relax (Allow 30" to pass.) Eyes closed...sitting up straight in your chair...with your eyes closed.

In a moment I shall ask you to think of your head falling forward. As you know, thinking of a movement and making a movement are closely related. Soon after you think of your head falling forward you will experience a tendency to make the movement. You will find your head actually falling forward, more and more forward, until your head will fall so far forward that it will hang limply on your neck.

You can see how thinking about a movement produces a tendency to make the movement. You learn to give expression to your action tendencies by using your imagination. At this point you have the idea of what it means to accept to act upon suggestions. So, all you need to do is to keep your eyes closed, relax, and try to imagine the experiences that is described to you.

Now... seat yourself comfortably and rest your hands in your lap. That's right.... Sit comfortably... hands in your lap... and listen carefully to what I say. Your ability to act on and express the suggestion that I will tell you about depends partly on your willingness to cooperate and partly on your ability to use your imagination while listening to my words. I would like to remind you to do your best to imagine what I will tell you soon. I assume that you are willing and that you will do your best to imagine things as clear as possible.

In general people use their imagination whenever they want to make scenarios about future events, or when they want to enjoy contemplating possible outcomes of some events, or when they wish something to happen; that is wishful thinking.

Many people report that when they imagine things, it feels like real to them. They report enjoying the relaxation and the fantasies they compose while imagining things. People with strong imagination may experience vividly what they are imagining at the moment. However, imagination is an individual experience and it is just not the same for everyone. In a sense, people may vary

on the extent to which they are able to imagine things vividly. All I ask of you is to keep up your attention and interest and continue to cooperate as you have been cooperating. Most people find imagination as a relaxing and quite a fascinating and creative experience.

Now, I want you to think of your head falling forward.... More and more forward.... Your head is falling forward... falling forward... More and more forward... Your head is falling more and more forward... falling more and more forward.... Your head is going forward... drooping down... down... limp and relaxed.... Your head is drooping... swaying... falling forward... falling forward... falling forward... falling, swaying... drooping... limp... relaxed... forward... forward... falling... falling... falling.... Now!

2) HAND LOWERING (LEFT HAND) (Total time 5' 05")

As you become even more relaxed and calm, it will not disturb you to make yourself comfortable in your chair and put your head in a comfortable position.

Now that you are very relaxed and comfortable, listening with full attention to what I say, I'm going to help you learn more about how your thoughts effect your actions. Not all people experience just the same things in the same situation. Perhaps you will not have all the experience that I will describe to you. That will be all right. But you will have at least some of the experiences and you will find these interesting. You just experience whatever you can. Pay close attention to whatever I tell you and watch what happens. Just let happen whatever you find is happening even if it is not what you expect.

Please extend your left arm straight out in front of you up in the air with the palm of your hand down. Left arm straight out in front of you.... Straight out, up in the air with the palm of your hand down. That's it, left arm straight out in

front of you.... Palm down. I want you now to pay close attention to this hand, the feelings in it, and what is happening to it. As you pay attention to it, you are more aware of it than you have been. You notice if it is warm or cool. Whether there is a little tingling in it. Whether there is a tendency for the fingers to twitch ever so slightly.... That's right. I want you to pay close attention to this hand because something very interesting is about to happen to it. It is beginning to get heavy... Heavier and heavier... as though a weight were pulling the arm and the hand down... You can picture a weight pulling on it... and as it feels heavier and heavier it begins to move... As if something were forcing it down.... A little bit down.... More and more down... down... And as I count it gets heavier and heavier, and goes down more and more... One, down... Two, down... Three, down.... Four, down, more and more down.... Five, down.... Six, down... Seven.... Eight.... Heavier and heavier, down, and more and more. Nine... Down...ten.... Heavier and heavier.... Down more and more. (Allow 10")

That's fine.... Just let your hand go back to its original resting position and relax. Your hand back to its original resting position and relax. You must have noticed how heavy and tired the hand and arm felt. Much more so that it ordinarily would if you had held it out that way for a little while. You probably noticed how something seemed to be pulling it down. Now just relax, your hand and arm are quite comfortable again. Quite comfortable again. There.... Just relax. Relax.

3) ARM IMMOBILIZATION (RIGHT ARM) (Total time 2' 55")

You are very relaxed. The general heaviness you have felt from time to time, you now feel over your entire body. Now I want you to pay close attention to your right arm and hand.... Your right arm and hand share in the feeling of heaviness. How heavy your right hand feels... And note that as you think about

this heaviness in your hand and arm, the heaviness seems to grow even more.... Now your arm is getting heavy.... Very heavy. Now your hand is getting heavy.... So heavy.... Like lead. Perhaps a little later you would like to see how heavy your hand is...it seems much too heavy to lift.... But perhaps in spite of being so heavy, you could lift it a little, although it may now be too heavy even for that... Why don't you see how heavy it is... Just try to lift your hand up, just try. Just try to lift your hand up. Just try... (Allow 10")

That's fine. Stop trying. Just relax. You notice that when you tried to lift it there was some resistance because of the relaxed state that you are in. but now you can just rest your hand again. Your hand and arm feel normal again. They are no longer heavy. You could lift them now if you wanted to, but don't try now. Just relax.... Relax completely. Relax. Just relax.

4) FINGER LOCK (Total time 1' 40")

Now let us try something else. Put your fingers together. Interlock your fingers together. Interlock your fingers and press your hands tightly together. That's it. Put your fingers together, interlock your fingers and press your hand tightly together. Interlock tightly.... Hands pressed tightly together. Notice how your fingers are becoming tightly interlocked together, more and more tightly interlocked together... So tightly interlocked together that you wonder very much if you could take your fingers and hands apart. Your fingers are interlocked, tightly interlocked.... And I want you to try to take your hands apart... Just try. ... (Allow 10")

That's right. Stop trying and relax. You notice how hard it was to get started to take them apart. Your hands are no longer tightly clasped together... You can now take them apart. Now return your hands to their resting position and relax. Hand to their resting position and relax.... Just relax.

5) ARM RIGIDITY (Total time 2' 25")

Please extend your left arm straight out in front of you up in the air, and make a fist. Arm straight out in front of you. That's right. Straight out and make a fist. Arm straight out, a tight fist.... Make a tight fist. I want you to pay attention to this arm and imagine that it is becoming stiff... stiffer and stiffer... very stiff.... And now you notice that something is happening to your arm... You notice a feeling of stiffness coming into it... It is becoming stiff.... More and more stiff.... Rigid.... Like a bar of iron.... And you know how difficult.... How impossible it is to bend a bar of iron like your arm... See how much your arm is like a bar of iron...Test how stiff and rigid it is.... Try to bend it.... Try. ... (Allow 10")

That's good. Now just stop trying to bend your arm and relax. Stop trying to bend your arm and relax. I want you to experience many things. You felt the creeping stiffness .... That you had to exert a good deal of effort to do something that would normally be very easy. But your arm is not stiff any longer. Just place your arm back in resting position.... Back in resting position. Just relax, and as your arm relaxes, let your whole body relax. As your arm relaxes let your whole body relax.

6) MOVING HANDS (TOGETHER) (Total time 1' 45")

Please hold both hands up in the air, straight out in front of you, palms facing inward.... Palms facing toward each other. Hold your hands about a foot apart... about a foot apart. Both arms straight out in front of you, hands about a foot apart.... Palms facing inward.... About a foot apart.

Now I want you to imagine a force attracting your hand toward each other, pulling them together. As you think of this force pulling your hands together, they will move together, slowly at first, but they will move closer together, closer and closer together, as though a force was acting on them.... Moving.... Moving.... Closer... closer...(Allow 10")

That's fine. You see again that thinking about a movement causes a tendency to make it. Now place you hands back in their resting position and relax...your hands back in their resting position and relax.

7) COMMUNICATION INHIBITION (Total time 1' 25")

You are very relaxed now.... Deeply relaxed... Think about how hard it might be to communicate while so deeply relaxed.... Perhaps as hard as when asleep... I wonder whether you could shake your head to indicate "no". I really don't think you could... You may try a little later to shake your head "no" when I tell you to.... But I think you will find it quite difficult... Why don't you try to shake your head "no" now.... Just try to shake it... (Allow 10")

That' all right.... Stop trying and relax. You see again how you have to make an effort to do something normally as easy as shaking your head. You can shake it to indicate "no" much more easily now. Shake your head easily now... That's right, now relax, just relax.

8) HALLUCINATION (FLY) (Total time 1' 30")

I'm sure that you have paid so close attention to what we have been doing that you have not noticed the fly which has been buzzing about you... But now that I call your attention to it you become increasingly aware of this fly which is going round and round about your head.... Nearer and nearer to you.... Buzzing annoyingly... Hear the buzz getting louder as he keeps darting at you. You don't care much for this fly...You would like to shoot it away.... Get rid of it... It annoys you. Go ahead and get rid of it if you want to... (Allow 10")

There, it's going away... It's gone.... And you are no longer annoyed...no more fly. Just relax, relax completely. Relax.... Just relax.

9) EYE CATALEPSY (Total time 2')

You have had your eyes closed for a long time while you have remained relaxed. They are by now tightly closed, tightly shut... In a few moments I shall ask you to try to open your eyes. When you are told to try, most likely your eyes will feel as if they were glued together.... Tightly glued shut. Even if you were able to open you eyes, you would, of course, only do so momentarily and then immediately close them again and relax, so as not to disturb your concentration. But I doubt that you will be able, even momentarily, to open your eyes. They're so tightly closed that you could not open them. Perhaps you would soon like to try to open your eyes momentarily, in spite of them feeling so heavy and so completely.... So tightly closed. Just try.... Try to open your eyes... (Allow 10")

All right, stop trying. Now again allow your eyes to become tightly shut. Your eyes tightly shut. You have had a chance to feel your eyes tightly shut. Now relax, your eyes are normal again, but just keep them closed and relax. Normal again.... Just keep them closed and relaxed. Relaxed and shut.

10) Taste Hallucination (Sweet taste)

This time, I would like you to think of something sweet. Imagine that you have something sweet tasting in your mouth, like a little candy... move it in your mouth from side to side as you taste it. Notice that as you think of this sweet taste you can actually begin to experience a sweet taste... It may be faint at first, but it will grow... and grow... (PAUSE) Now you begin to notice a sweet taste in your mouth... the sweet taste is increasing... sweeter and sweeter...It will get stronger... it often takes a few moments for such a taste to reach its full strength... it is now getting stronger... stronger... (PAUSE)

That's fine... but note that the sweet taste is going away and your mouth feels just as it did before I mentioned any tastes at all... there, it's quite normal now... just continue to relax...

11) POST-HYPNOTIC SUGGESTION (TOUCHING LEFT ANKLE)

12) AMNESIA (Total time 3' 35")

Remain deeply relaxed and pay close attention to what I'm going to tell you next. In a moment I shall begin counting backwards from ten to one. You will gradually become more alert, but for most of the count you will still remain relaxed. By the time I reach "five" you will open your eyes but you will remain very relaxed. When I get to "one" you will be fully alert to what is happening around you. You probably will have the impression that you have been dreaming because you will have difficulty remembering all the things I have told you and all the things that you did or felt. In fact you will find it to be so much of an effort to recall any of these things that you will have no wish to do so. It will be much easier simply to forget everything until I tell you that you can remember. You will remember nothing of what has happened until I say to you "now you can remember everything". You will not remember anything until then. After you open eyes you will feel fine. You will have no headache or any after effects. I shall now count backwards from twenty, and at "five", not sooner, you will open your eyes and when I say "one", you will be fully alert. At "one", you will be fully alert... A little later you will here a tapping noise like this <tap, tap>.

When you here the tapping noise you will reach down and touch your left ankle. You will touch your left ankle but forget that I told you to do so, just as you will forget the other things, until I tell you "now you can remember everything". Ready... Now: 10, 9, 8, 7, 6, 5, open your eyes, 4, 3, 2, 1. Fully alert.

Fully alert. Any remaining relaxation which you may feel will quickly pass... < tap, tap>. (Pause10")

TESTING

Now please take you response booklet, break the seal, and turn to the second page of the booklet. Do not turn to the third page until I specifically instruct you to do so later. On the second page, please write down briefly, in your own words, a list of things that happened since you began looking in front of you. You should not go into much detail here on the particular way in which you responded. But please try to remember all the different things that you were asked to do. You will now be given three minutes to write out this information. At the end of the three minutes you will be asked a number of more specific questions regarding your experiences. (Pause 2 minutes).

Please complete your list in one more minute. If you have already completed your list, spend the next minute trying to recall if there was anything else that you may have neglected to mention. (Pause one minute).

All right. Now listen carefully to my words. Now you can remember everything. Please turn to page three and write down a list of anything you remember now that you could not remember previously. You will be given two minutes more to write out this information. (Pause two minutes).

Now please turn to page four and answer the questions in the remainder of the booklet. Use your own judgment where questions are ambiguous.

(Collect questionnaires)

Appendix I

Scoring Booklet

for the Imagination Condition

Scoring Booklet
For
Imaginative Responding

Name:_____ Date:_____

Subject #:_____ Experimenter:_____ Score:_____

Summery of Scores

	Behavioral	Subjective
1. Head Falling		
2. Hand lowering		
3. Arm Immobilization (Right Arm)		
4. Finger Lock		
5. Arm Rigidity		
6. Moving Hands Together		
7. Communication Inhibition		
8. Auditory Hallucination (Fly)		
9. Eye Catalepsy		
10. Taste Hallucination		
11. Post hypnotic suggestion		
12. Post hypnotic amnesia		

Total: _____ _____

Response Booklet
Of
Imaginative suggestibility

PLEASE SUPPLY THE INFORMATION REQUESTED BELOW

Name: _____

Age: _____ **Date:**

_____

Occupation: _____ Major: _____

First Language: _____

DO NOT OPEN THIS BOOKLET until the experimenter specifically Instructs you to do so.

Please write down briefly in your own words ***a list*** of the things that happened since you began the session. Do not go in detail. Spend three minutes, no longer, in writing your reply.

Please **DO NOT TURN THIS PAGE** until the experimenter specifically Instructs you to do so.

Please **DO NOT RETURN TO PAGE 2**

On this page write down a list of anything else that you now remember that you did not remember previously. Please do not go into detail. Spend two minutes, no longer, in writing out your reply.

Please **DO NOT TURN THIS PAGE** until the experimenter specifically Instructs you to do so.

PLEASE DO NOT RETURN TO EARLIER PAGES.

RESPONSES

Listed below in chronological order are the twelve specific happenings which were suggested to you during this session. We wish you to estimate whether or not you responded to the ten suggestions.

It is understood that your estimates may in some cases not be as accurate as you might like it to be and that you might even have to guess. But we want you to make whatever you feel to be your ***best estimates*** regardless. Please answer every question as best as you can.

Beneath the description of each suggestion are sets of responses, labeled a, b, c, and d. Please circle the answer that describes your experience according to the following criteria:

(b) Whether an onlooker would have observed that you passed the item described to you (Yes = Pass, No = Fail)
b) Whether an onlooker would have observed that you did or did not make the behavior called for in the suggestion (0 = not at all; 4 = completely)
c) Rate the extent of voluntary effort used to execute the behavior called for by suggestion (0 = totally effortless; 4 = total voluntary effort).
d) Rate your subjective experience of the behavior called for by suggestion (0 = did not feel anything; 4 = felt as real).
e) To which extent did your experience match your expectations? (0 = not at all; 4 = total match

1) Head Falling

You were told to think of your head falling forward, becoming limp, relaxed and falling forward. Would you estimate that an *onlooker* would have observed that your head moved forward (before the time you were told to sit back comfortably):

	Yes No
a) My head fell at least half way down	
b) My head fell at least half way down.	0-----1-----2-----3-----4
c) Voluntary effort exerted to move head forward	0-----1-----2-----3-----4
d) Subjective feelings of head falling forward	0-----1-----2-----3-----4
e) Did your expectation match your experience?	0-----1-----2-----3-----4

2) Hand Lowering (Left Hand)

You were told to extend your left arm straight and feel it becoming heavy as though a weight were pulling the hand and arm down. Would you estimate that an *onlooker* would have observed that your hand lowered at least six inches (before you were told to let your hand down deliberately):

	Yes No
a) My hand lowered at least 6 inches by then	0-----1-----2-----3-----4
b) My hand lowered at least 6 inches by then.	0-----1-----2-----3-----4
c) Voluntary effort exerted to lower my hand	0-----1-----2-----3-----4
d) Subjective feelings of heaviness	0-----1-----2-----3-----4
e) My expectation matched my experience	0-----1-----2-----3-----4

13) Arm Immobilization (Right Arm)

You were next told how heavy your right hand and arm felt and then told to try to lift your hand up. Would you estimate that an *onlooker* would have observed that your you ***did not*** lift your hand and arm up at least one inch (before you were told to stop trying)

	Yes No
a) I ***did not*** lift my hand at least 1 inch by then	0-----1-----2-----3-----4
b) I ***did not*** lift my hand at least 1 inch by then	0-----1-----2-----3-----4
c) Voluntary effort exerted not to move my hand	0-----1-----2-----3-----4
d) Subjective feelings of arm heaviness	0-----1-----2-----3-----4
e) My expectation matched my experience	0-----1-----2-----3-----4

14) Finger Lock

You were next told to interlock your fingers, told how your fingers would become tightly interlocked, and then told to take your hands apart. Would you estimate that an *onlooker* would have observed that your fingers were incompletely separated (before you were told to stop trying o make them apart)?

	Yes No
a) My fingers were incompletely separated	0-----1-----2-----3-----4
b) My fingers were incompletely separated	0-----1-----2-----3-----4
c) Voluntary effort exerted to keep fingers locked	0-----1-----2-----3-----4
d) Subjective feeling of hands locking	0-----1-----2-----3-----4
e) My expectations matched my experience	0-----1-----2-----3-----4

15) Arm Rigidity (Left)

You were next told to extend your left arm straight out and make a fist, told to notice it becoming stiff, and then told to try to bend it. Would you estimate that

an *onlooker* would have observed that there was less than two inches of arm bending (before you were told to stop trying)

a) My arm was bent ***less*** than 2 inches by then	Yes No
b) My arm was bent less than 2 inches by then	0-----1-----2-----3-----4
c) Voluntary effort **not** to bend my arm	0-----1-----2-----3-----4
d) Subjective feeling of arm rigidity	0-----1-----2-----3-----4
e) My expectations matched my experience	0-----1-----2-----3-----4

16) Moving Hands Together

You were next told to hold your hands out in front of you about a foot apart and then told to imagine a force pulling your hands together. Would you estimate that an *onlooker* would have observed that your hands were not over six inches apart (before you were told to return your hands to their resting position)?

a) My hands ***weren't*** more than 6 inches apart	Yes No
b) My hands weren't more than 6 inches apart	0-----1-----2-----3-----4
c) Voluntary effort to move hands together	0-----1-----2-----3-----4
d) Subjective feeling of force pulling the hands?	0-----1-----2-----3-----4
e) My expectations matched my experience	0-----1-----2-----3-----4

17) Communication Immobilization

You were next told to think how hard it might be to shake your head to indicate "no", and then told to try. Would you estimate that an *onlooker* would have observed you making a recognizable shake of the head "no" (that is before you were told to stop trying)?

a) I did ***not*** recognizably shake my head	Yes No
b) I did ***not*** recognizably shake my head	0-----1-----2-----3-----4
c) Effort exerted **not** to shake head	0-----1-----2-----3-----4
d) Subjective feelings of inability to shake head	0-----1-----2-----3-----4
e) My expectations matched my experience	0-----1-----2-----3-----4

18) Experiencing of Fly

You were next told to become aware of the buzzing of a fly which was said to become annoying, and then you were told to shoo it away. Would you estimate that an *onlooker* would have observed you making any grimacing, any movement, and any outward acknowledgement of an effect (regardless of what it was like subjectively)?

a) I did make some outward acknowledgement	Yes	No
b) I did make some outward acknowledgement	0-----1-----2-----3-----4	
c) Voluntary effort exerted to do the movement	0-----1-----2-----3-----4	
d) Subjective feelings of hearing the fly buzzing	0-----1-----2-----3-----4	
e) My expectations matched my experience	0-----1-----2-----3-----4	

19) Eye Catalepsy

You were told that your eyelids were so tightly closed that you could not open them, and then you were told to try to do so. Would you estimate that an *onlooker* would have observed that your eyes remained closed (before you were told to stop trying)?

a) My eyes remained closed	Yes	No
b) My eyes remained closed	0-----1-----2-----3-----4	
c) Voluntary effort exerted not to open my eyes	0-----1-----2-----3-----4	
d) Subjective feeling of eyelids tightly closed	0-----1-----2-----3-----4	
e) My expectations matched my experience	0-----1-----2-----3-----4	

20) Experiencing Sour Taste

You were then told to imagine biting on a lemon, and then told you will experience a sour taste. Would you estimate that an *onlooker* would have observed you making any grimace or mouth movement indicating having the experience (before you were told that everything is back to normal)

a) I had a sour taste, grimaced, swallowed.	Yes	No
b) I grimaced, swallowed, or did any movement	0-----1-----2-----3-----4	
c) Voluntary effort to grimace, swallow, etc...	0-----1-----2-----3-----4	
d) Subjective feeling of sour taste	0-----1-----2-----3-----4	
e) My expectations matched my experience	0-----1-----2-----3-----4	

21) Post-Hypnotic Amnesia

You were told that after you open your eyes, you would forget all what happened during the session. Later, you were told to write down what happened, how would you estimate your response to this suggestion?

a) I was *not* able to write at least 4 happenings	Yes	No
b) I was *not* able to write at least 4 happenings	0-----1-----2-----3-----4	
c) Voluntary effort exerted to forget	0-----1-----2-----3-----4	

d) Subjectively, I couldn't recall anything 0-----1-----2-----3-----4
e) My expectations matched my experience 0-----1-----2-----3-----4

22) Post-Hypnotic Suggestion (Touching Left Ankle)

You were next told that after you open your eyes, you would hear a tapping noise at which time you would reach down and touch your left ankle. You were further told that you forget that you were told so. Would you estimate that an *onlooker* would have observed both that you reached down and touched your left ankle or that you made any movement to do so?

a) I made at least a partial movement to touch ankle Yes No
b) I made at least a partial movement to touch ankle 0-----1-----2-----3-----4
c) Voluntary effort exerted to touch my ankle 0-----1-----2-----3-----4
d) I felt subjectively compelled to touch my ankle 0-----1-----2-----3-----4
e) My expectations matched my experience 0-----1-----2-----3-----4

Appendix J

Instructions for the Neuropsychological Tests

Procedure and Instructions; Session #1

Thank you for coming today. My name is Hana Moghrabi, and I am Ph.D. student in psychology. This study is concerned with the assessment of some cognitive factors. More precisely, we are interested in the relationship between these factors and Hypnotizability. Before we begin, please read and sign the consent form.

Now we will do some cognitive tests. Before we start, do you have any questions?

Presentation of the study tests:

THE STROOP TEST

Apple Computer Stroop Test File-Record Subject Information.

Here as it says on the instructions you will see a word or a series of xxxxs appearing at the center of the screen in one of four colors: Red, Blue, Green, or Yellow. Your task is to identify the color of the print as quickly as possible by pressing one of the responding color keys. Are you ready for the practice trials? Click the mouse to begin.

When subject finishes the practice trials:

Now, this is the experiment part. You will not get feedback from the computer this time when you make a mistake so be careful and remember to respond as

quickly as you can. If I find you slowing down, I will remind to go faster. Are you are ready to start? When you are ready, click the mouse to begin.

Subjects were prompted three times, at equal intervals to go faster.

Digit Span (DS)

Instructions for Digit Forward

Now I am going to say some numbers. Listen carefully, and when I am through, I want you to say them right after me. Just say what I say.

Instructions for Digit Backward

Now I am going to say some more numbers. But this time when I stop, I want you to say them backward. For example, if I say 7-9-1, what would you say?

If the examinee responds correctly: That's right (proceed to trial 1, item 1)

If the examinee responds incorrectly, provide the correct response and say:

No, you would say 9-1-7. I said 7-1-9, so to say it backward, you want to say 9-1-7. Now try these numbers. Remember, you are to say them backward: 3-4-8.

SELF ORDERED POINTING TEST (SOPT):

(BINDER OPEN TO FIRST PAGE OF 10-ITEM SET RECORD SHEET)

Look, here are ten abstract designs. I have pages with the same designs but they are in different places each time. See, this one is up here (point), but now it is down here (point in second page). I want you to point at one design on each

page. Once you point to the design, you cannot choose it again. Do you understand? Point to a design on this page.

(BLANK PAGE START FROM BEGINNING AGAIN)

Now we are going to do it again with different one than the last time. Remember that once you point at one design you cannot choose it again. Point to a design on this page.

Target Search Task (D2):

Time required for reaction time:

(HAND SUBJECT PART A SHEET. STOP WATCH REQUIRED)

On this sheet, a target is shown in example. Your task is to find this target among similar symbols of line 1 and to cancel them out (by making a vertical line with the pencil). You have to start when I tell you and you must stop and wait before you begin the next line. Let us do these lines. Are you ready to begin the first one?

(HAND SUBJECT PART B SHEET)

On this new sheet, there is a new target shown in the example. Your task is to locate the target and cancel it out, just as you did before. Let us do these lines. Are you ready to begin the first one?

(HAND THE SUBJECT PART C SHEET)

This time, the new target has three symbols. Your task is to perform the same as before but to cancel out any of these three targets. You may use this strategy: Remember that the targets are all characters with two marks (show subject). These two trials are practice trials this time. Are you ready to begin the first line?

Now, we will repeat this task for the next six lines. Are you ready to begin the first line?

WISCONSON CARD SORTING TASK (WCST):

(IBM COMPUTER ACCESS FILE c:>/west-ev2 *FILL SUBJECT INFO)*

This test is a little unusual because I am not allowed to tell you very much about how to do it. You will be asked to match each of the cards that appear here (point to bottom center of the screen) to one of these four key cards (point to cards at the top). This is a pointer that can move from key card (press the left arrow key to activate the arrow pointer). You can move the pointer by pressing the left or right arrow key (point to keys). You try it now.

You are to match the cards that appear here (point to card at the bottom) to the key card that you think this card matches by moving the pointer beneath the key card and then pressing "ENTER". The computer will place your card under the key card you select, and a new card will appear at the bottom of the screen. I cannot tell you how to match the cards, but the computer screen will

display a word that will tell you each time whether you are right or wrong. If you are wrong, simply try to match the next card correctly, and then continue matching the cards correctly until the test is over. There is no time limit on this test. Are you ready? Let's begin.

Appendix K

Descriptive Statistics for Response Expectancy and Suggestibility and ANOVA Analysis on Order Effects

Table 1K

Means and Standard Deviations of Response to Suggestions, Response Expectancy, and Motivation, as a function of Hypnotic Induction.

	Behavior		Subjective		Motivation		Expectancy B		Expectancy S	
Order	N	H	N	H	N	H	N	H	N	H
NH										
M	19.16	21.38	22.93	21.66	28.66	31.02	20.79	20.25	23.45	22.50
SD	9.39	9.21	8.90	9.21	10.55	12.96	9.94	9.29	9.50	9.20
HN										
M	20.00	21.55	20.97	21.55	32.27	33.70	18.00	21.72	19.47	23.15
SD	11.34	1.29	9.50	9.71	11.20	10.33	11.31	10.27	10.27	9.28

Note: Behavior scores are ratings of behavioral response to suggestions. Subjective scores are ratings of the degree to which participants had the subjective experience called for in each suggestion. ExpectancyB = Behavioral Response Expectancy. ExpectancyS = Subjective Response Expectancy. N = Nonhypnotic suggestibility. H = Hypnotic suggestibility.

Table 2K

Source Table for 2 orders x 2 trials Within-Subjects Repeated Measures ANOVA on Suggestibility in the Imagination and Hypnosis Conditions

Source	*SS*	*DF*	*MS*	*F*	*p*
Trial	5.47	1	5.47	2.889	.093
Trial*Order	.33	1	.33	.174	.678
Error	155.31	82	1.89		

*$p < .05$, **$p < .01$, ***$p < .001$

Source Table for 2 orders x 2 trials Between-Subjects Repeated Measures ANOVA on Suggestibility in the Imagination and Hypnosis Conditions

Source	*SS*	*DF*	*MS*	*F*	*p*
Order	1.45	1	1.45	.125	.725
Error	957.16	82	11.67		

*$p < .05$, **$p < .01$, ***$p < .001$

Appendix L

Correlations of Suggestibility and Response Expectancy with IDQ, DPQ, and Motivation

Table 1L

Intercorrelations between Hypnotic and Nonhypnotic Suggestibility (pass/fail), and RE measures (Behavioral, Subjective, and Confidence).

Variable	HS	NHS	HBRE	HSRE	NHBRE	NHSRE
HS	1.000	.72**	.42**	.45**	.46**	.45**
NHS			.53**	.48**	.59**	.43**
HBRE				.79**	.58**	.51**
HSRE					.49**	.67**
NHBRE						.68**
NHSRE						

*r = *p< .05. **p< .01, *** p< .001 (N = 84)*

Note: HS = hypnotic suggestibility. NHS = Nonhypnotic Suggestibility (pass/fail scores). HBRE = Hypnotic behavioral response expectancy. HSRE = Hypnotic subjective response expectancy. NHBRE = Nonhypnotic behavioral response expectancy. NHSRE = Nonhypnotic subjective response expectancy.

Table 2L

Intercorrelations between RE Measures with Motivations, Suggestibility scores (pass/fail), and the Behavioral and Subjective Suggestibility ratings (Likert-scale) in the Hypnosis Condition.

Variable	Motiv	HBRE	HSRE	HS	HBS	HSS	Effort1	CONF1
Motivation	1.000	.26*	.36*	.19	.20	.21	-.18	.20
HBRE			.79**	.42*	.47**	.46**	-.31**	-.14
HSRE				.45**	.41**	.51**	-.34**	-.10
HS					.84**	.71**	-.17	-.06
HBS						.71**	-.24*	-.05
HSS							-.10	-.11
Effort1								.09

*r = *p< .05. **p< .01, *** p< .001 (N = 84)*

Note: HBRE = Hypnotic behavioral response expectancy. HSRE = Hypnotic subjective response expectancy. HS hypnotic suggestibility (pass/fail), HBS = Hypnotic behavioral suggestibility. HSS = Hypnotic subjective scores. Effort1 = Expected effort. CONF1 = Confidence in RE

Table 3L

Intercorrelations between RE Measures and Motivations, Suggestibility scores (Pass/Fail), and Behavioral and Subjective Suggestibility Scores in the Imagination Condition.

Variable	Motiv	NHBRE	NHSRE	NHS	NHBS	NHSS	Effort2	CONI
Motivation	1.000	.19	.38**	.34**	.34**	.39**	-.28*	.17
NHBRE			.68**	.59**	.69**	.50**	-.18	-.27*
NHSRE				.53**	.49**	.73**	-.28*	-.17
NHS					.86**	.72**	-.33*	-.27*
NHBS						.70**	-.27*	-.24*
NHSS							-.26*	-.20
Effort 2								-.01

*r = *p< .05. **p< .01, *** p< .001 (N = 84)*

Note: NHS = Nonhypnotic suggestibility, NHBRE = Nonhypnotic behavioral Expectancy. NHSRE = Nonhypnotic subjective expectancy. NHBS = Nonhypnotic behavioral suggestibility. NHSS = Nonhypnotic subjective ratings.

Table 4L

Intercorrelations between RE measures and IDQ, DPQ, and Suggestibility, in the Hypnosis Condition.

Variable	HS	HBRE	HSRE	HBS	HSS	IDQ	DPQ
HS	1.000	.42**	.45**	.84**	.71**	.12	.25*
HBRE			.79**	.47**	.46**	.13	.32**
HSRE				.41**	.51**	.32*	.51**
HBS					.71**	.05	.21
HSS						.17	.23*
IDQ							.45**
DPQ							

*r = *p< .05. **p< .01, *** p< .001 (N = 84)*

Note: HS = Hypnotic suggestibility, HBRE = hypnotic behavioral response expectancy. HSRE = hypnotic subjective response expectancy. HBS = Hypnotic behavioral suggestibility. HSS = Hypnotic subjective suggestibility ratings.

Table 5L

Intercorrelations between RE measures with the IDQ, DPQ, Suggestibility scores (Pass/Fail), and the Behavioral and Subjective Suggestibility ratings in the Imagination Condition.

Variable	NHS	NHBRE	NHSRE	NHBS	NHSS	IDQ	DPQ
NHS	1.000	.59**	.53**	.86**	.72**	.15	.40**
NHBRE			.68**	.66**	.50**	.05	.25*
NHSRE				.49**	.73**	.22**	.34**
NHBS					.70**	.11	.35**
NHSS						.20	.45**
IDQ							.45**

*r = *p< .05. **p< .01, *** p< .001 (N = 84)*

Note: NHS = Nonhypnotic suggestibility, NHBRE = Nonhypnotic behavioral response expectancy. NHSRE = Nonhypnotic subjective response expectancy. NHBS = Nonhypnotic behavioral suggestibility. NHSS = Nonhypnotic subjective ratings. Effort2 = Expected effort in imagination. Conf2 = Confidence in Nonhypnotic RE.

Appendix M

Summery Tables of Regression Analysis on Predictors of Behavioral and Subjective Response Expectancy

Table 1M

Summary for Regression analysis on the IDQ, DPQ, Motivation, Confidence and Effort Scores as Predictors of Behavioral RE in the Hypnosis Condition.

Variables	*B*	β	sr^2	ΔR^2
IDQ	.11	.13	.13	.017
DPQ	.48	.33	.29*	.085
Motivation	.16	.20	.21	.043
Confidence	-.16	-.14	-.10	.008
Expected Effort	-.22	-.22	-.21	.045
Constant	17.32			
		$R^2 = .198$		
		Adjusted $R^2 = .139$		
		$R = .445$		

** *p* .01; * *p*< .05 (*n* = 84)

Table 2M

Summary for Regression analysis on the IDQ, DPQ, Motivation, Confidence and Effort Scores as Predictors of Subjective RE in the Hypnosis Condition.

Variables	*B*	β	sr^2	ΔR^2
IDQ	.22	.29	.29*	.082
DPQ	.69	.49	.44***	.191
Motivation	.22	.27	.26**	.070
Confidence	-.02	-.02	-.02	.000
Expected Effort	-.20	-.22	-.21*	.044
Constant	9.39			
		$R^2 = .387$		
		Adjusted $R^2 = .342$		
		$R = .622$		

*** *p* .00; ** *p* .01; * *p*< .05 (*n* = 84)

Table 3M

Summary for Regression analysis on the IDQ, DPQ, Motivation, Confidence and Effort Scores as Predictors of Behavioral RE in the Imagination Condition.

Variables	*B*	*β*	sr^2	ΔR^2
IDQ	.04	.05	.05	.002
DPQ	.46	.29	.26*	.067
Motivation	.15	.15	.15	.021
Confidence	-.37	-.29	-.29**	.080
Effort	-.05	-.06	-.05	.003
Constant	22.29			
		R^2 =.173		
		Adjusted R^2 =.120		
		R =.416		

** *p* .01; * *p*< .05 (*n* = 84)

Table 4M

Summary for Regression Analysis on the IDQ, DPQ, Motivation, Confidence and Effort Scores as Predictors of Subjective RE in the Imagination Condition.

Variables	*B*	*β*	sr^2	ΔR^2
IDQ	.19	.22	.22*	.049
DPQ	.45	.30	.26*	.070
Motivation	.28	.31	.30**	.090
Confidence	-.28	-.23	-.23*	.052
Effort	-.08	-.09	-.08	.006
Constant	17.08			
		R^2 =.267		
		Adjusted R^2 =.220		
		R =.516		

** *p* .01; * *p*< .05 (*n* = 84)

Table 5M

Intercorrelations, Means, and Standard Deviations for Predictors of Behavioral and Subjective Response Expectancy Measures in the Hypnosis Condition.

Variable	IDQ	DPQ	HBRE	HSRE	Motiv	CONF	Effort
IDQ	1.000	.45**	.13	.32**	.12	-.10	-.05
DPQ			.32**	.51**	.25*	-.21	-.21
HBRE				.79**	.26*	-.14	-.31*
HSRE					.36**	-.10	-.34*
Motivation						.20	-.18
Confidence							.09
Means	19.24	21.27	20.95	22.81	32.30	31.38	25.27
SD	11.63	6.59	9.74	9.19	11.79	8.88	9.87

*r = *p< .05. **p< .01 (N = 84)*

Note: NHBRE = Nonhypnotic behavioral response expectancy. NHSRE = Nonhypnotic subjective response expectancy.

Table 6M

Intercorrelations, Means, and Standard Deviations for Predictors of Behavioral and Subjective Response Expectancy in the Imagination Condition.

Variable	IDQ	DPQ	NHBRE	NHSRE	Motiv	CONF	Effort
IDQ	1.000	.45**	.05	.22	.18	.20	-.29*
DPQ			.25*	.34**	.23*	-.05	-.48*
NHBRE				.68**	.19	-.27*	-.18
NHSRE					.37*	-.17	-.28*
Motivation						.17	-.28*
Confidence							-.01
Means	19.24	21.27	19.46	21.56	30.38	33.63	25.77
SD	11.63	6.59	10.65	10.02	10.95	8.27	10.98

r = *$p < .05$. **$p < .01$ *(N = 84)*

Note: NHBRE = Nonhypnotic behavioral response expectancy. NHSRE = Nonhypnotic subjective response expectancy.

Appendix N

Intercorrelations between Hypnotic Suggestibility And Frontal Lobe Tests

Table 1N

Intercorrelations between WCST Measures and Hypnotic Suggestibility Scores

Variable	HS	WCSTerr	WCSTper	WCSTnper	WCSTcon
HS	1.000	.08	-.01	-.08	.09
WCST Error Standard			.84**	.93**	.97**
WCST Perseverative Error				.67**	.82**
WCST Error Nonperseverative					.93**
WCST Conceptual					1.000

*r = *p< .05. **p< .01, *** p< .001 (N = 84)*

Table 2N

Intercorrelations between Hypnotic Suggestibility, Target Detection, and Self Ordered Pointing Task Scores.

Variable	HS	(D2) Com.	(D2) Om.	(D2) total	(D2) RT	SOPT Errors	SOPT Pers.
HS	1.000	-.09	.09	.07	.12	.10	-.05
(D2)Commission Error			.30**	.42**	.01	.34**	.06
(D2) Omission Error				.99*	.01	.32**	.00
(D2) Total Error					.01	.35**	.01
(D2) RT						.08	.10
SOPT Error							.26*
SOPT Errors perseverative							1.000

*r = *p< .05. **p< .01, *** p< .001 (N = 84)*

Table 3N

Intercorrelations between Hypnotic Suggestibility (Pass/Fail), and Memory Measures.

Variable	HS	DSF	DSB	DST
HS	1.000	-.08	-.09	.10
Digit Span Forward			.54**	.87**
Digit Span Backward				.88**
Digit Span Total				1.000

*r = *p< .05. **p< .01, *** p< .001 (N = 84)*

Table 4N

Intercorrelations between Hypnotic Suggestibility (Pass/Fail) and Stroop Measures.

Variable	HS	STcon	STinc	STn	STcon Errors	STEInc Errors	STN Errors
HS	1.000	.06	.14	.12	.05	.16	.20
Stroop (Congruent)			.84**	.91**	.16	.03	.34**
Stroop (Incongruent)				.82**	.26	.01	.33**
Stroop Neutral					.12	.03	.33*
Stroop Errors (Congruent)						.41**	.60
Stroop Errors (Incongruent)							.52**
Stroop Error (Neutral)							1.000

*r = *p< .05. **p< .01, *** p< .001 (N = 84)*

Table 5N

Intercorrelations between Reaction time Measures.

Variable	STconRT	STinc.RT	STn.RT	D2 RT
Stroop Congruent RT	1.000	.84**	.91**	.37**
Stroop Incongruent RT			.82**	.28**
Stroop Neutral RT				.40**
Target Detection RT				1.000

*r = *p< .05. **p< .01, *** p< .001 (N = 84)*

Appendix O

Correlations of Facilitation and Interference with Behavioral and Subjective Suggestibility Scores

Table 1O

Intercorrelations between Hypnotic and Imaginative Suggestibility scores (behavioral and subjective with facilitation and Interference Effects.

Variable	HBS	HSS	NHBS	NHSS	Facili	InterN	InterC
HBS	1.000	.71**	.57**	.50**	.18	.08	.20
HSS			.46**	.58**	.23*	.05	.21
NHBS				.70**	.00	.19	.20
NHSS					.10	.25*	.33*
Facilitation						-.41**	.23*
Interference N							.80**
Interference C							1.000

*r = *p< .05. **p< .01, *** p< .001 (N = 84)*

Note: HBS = Hypnotic behavioral Suggestibility. HSS = Hypnotic subjective ratings. NHBS = Nonhypnotic behavioral Suggestibility. NHSS = Nonhypnotic Subjective Suggestibility.

Appendix P

Correlations of Cognitive Measures with Ideomotor, Challenge, and Cognitive Suggestions

Table 1P

Intercorrelations between Hypnotizability, Ideomotor, Challenge, Cognitive scores, and Memory function (n = 84)

Variable	HS	Ideomotor	Challenge	Cognitive	DPQ	IDQ	DSF	DSB	DST
HS	1.000	.65**	.87**	.61**	.25*	.12	.08	-.09	-.09
Ideomotor			.36**	.35**	.34*	.25*	-.05	-.06	.01
Challenge				.32**	.13	-.05	-.03	-.14	-.10
Cognitive					.13	.14	-.19	-.25*	-.25*
DPQ						.46**	.09	.06	.09
IDQ							-.00	.12	.07
DSF								.54**	.87**
DSB									.88**
DST									1.000

*r = p< .05. **p< .01, *** p< .001 (N = 84)*

Table 2P

Intercorrelations for Ideomotor, Challenge, and Cognitive Scores with Memory Measures, DPQ, IDQ, and SOPT for the LH Group.

Variable	HS	Ideo	Chal	Cog	IDQ	DPQ	DSF	DSB	DST	SOPT error	SOPT pers
HS	1.000	.84**	.28	.29	.03	.36	.06	.25	.19	.18	-.29
Ideomotor			.00	.37	.16	.33	-.10	.11	.02	.24	-.21
Challenge				-.19	-.21	.01	.17	-.19	-.04	.24	-.09
Cognitive					-.03	-.20	-.20	.09	-.05	.35	.03
IDQ						.46*	-.20	.11	-.03	-.03	-.12
DPQ							.14	.14	.17	.01	-.10
DSF								.42	.80**	-.38	.12
DSB									.88**	-.44*	-.06
DST										-.49*	.03
SOPTerror											.31

*r = p< .05. **p< .01, *** p< .001 (N = 21)*

Table 3P

Intercorrelations for Ideomotor, Challenge, Cognitive scores, with Memory, DPQ, IDQ, and SOPT for MH Group

Variable	HS	Ideo	Chal	Cog	IDQ	DPQ	DSF	DSB	DST	SOPT error	SOPT pers
HS	1.000	.36*	.66*	.36*	.08	.25	-.17	-.37*	-.31	-.21	-.32*
Ideomotor			-.18	.09	.30*	.36*	-.14	.04	-.06	.04	-.24
Challenge				-.23	-.24	-.04	-.09	-.33*	-.24	-.08	-.08
Cognitive					.25	.27	-.09	-.26	-.20	-.22	-.17
IDQ						.42**	-.20	.21	.13	-.35*	-.07
DPQ							-.04	-.04	-.05	-.17	-.30*
DSF								.55**	.87**	.05	-.04
DSB									.89**	-.11	-.11
DST										-.04	-.09
SOPTerror											.06

*r = p< .05. **p< .01, *** p< .001 (N = 45)*

Table 4P

Intercorrelations between Ideomotor, Challenge, and Cognitive scores and Memory measures, DPQ, IDQ, and SOPT for HH Group

Variable	HS	Ideo	Chal	Cog	IDQ	DPQ	DSF	DSB	DST	SOPT error	SOPT pers
HS	1.000	.02	.45	.45	.01	.07	-.56*	-.42	-.55*	-.06	-.23
Ideomotor			-.24	-.28	.29	.19	.49*	.22	.40	.18	.06
Challenge				-.16	-.13	.14	-.22	-.06	-.16	-.45	-.42
Cognitive					-.24	-.34	-.62**	-.64**	-.71**	.07	.09
DPQ						.54*	.23	-.14	.05	.31	.34
IDQ							.30	.20	.28	-.21	-.08
DSF								.58*	.89**	-.07	.05
DSB									.88**	-.45	-.07
DST										-.29	-.01
SOPTerror											.57

*r = p< .05. **p< .01, *** p< .001 (N =18)*

Appendix Q

Summary of Regression Tables on Predictors of Ideomotor, Challenge, and Cognitive scores

Table 1Q

Summary of Hierarchical Regression Analysis for CognitiveVariables as predictors of Ideomotor Scores (N = 84)

Variables	sr^2	B	β	ΔR^2
IDQ	.25	.02	.25*	.065
DPQ	.26	.02	.29*	.066
Facilitation	.16	.03	.16	.026
Interference	-.03	-.04	-.03	.000
DSF	-.06	-.02	-.07	.005
DSB	.02	.05	.08	.004
Constant	1.55			
		$R^2 = .166$		
	Adjusted	$R^2 = .101$		
		$R = .407$		

** *p* .01; * *p*< .05

Table 2Q

Summary of Hierarchical Regression Analysis for Cognitive Variables as Predictors of Cognitive Scores (N = 84)

Variables	B	β	sr^2	ΔR^2
IDQ	.02	.145	.14	.021
DPQ	.02	.08	.07	.005
Facilitation	.03	.25	.30*	.062
Interference	.03	.27	.24*	.060
DSF	-.02	-.15	-.15	.021
DSB	-.12	-.27	-.22*	.050
Constant	.95			
			$R^2 = .219$	
		Adjusted	$R^2 = .158$	
			$R = .468$	

** *p .01; * p< .05*

Table 3Q

Intercorrelations, Means and Standard Deviations for Predictor Variables of Ideomotor, Challenge, and Cognitive Scores (n = 84)

Variable	Ideo	Chal	Cog	IDQ	DPQ	Facili	Intern	DSF	DSB
Ideomotor	1.000	.36**	.35**	.25*	.34**	.09	-.03	-.05	.06
Challenge			.32**	-.05	.13	.12	.06	-.03	-.14
Cognitive				.14	.13	.21	.14	-.19	-.25*
IDQ					.45**	-.18	.07	-.00	.12
DPQ						-.16	.15	-.10	.06
Facilitation							-.41**	-.13	.02
Interference								-.04	-.05
DSF									.54**
Means	2.32	2.13	.98	19.24	21.27	8.46	57.25	10.64	7.17
SD	.84	1.54	.96	11.63	6.59	37.41	60.29	2.05	2.18

*r = p< .05. **p< .01, *** p< .001 (N = 84)*