CAN SUBJECTIVE RATINGS OF
ABSORPTION, DISSOCIATION, AND TIME
PERCEPTION DURING “NEUTRAL
HYPNOSIS” PREDICT HYPNOTIZABILITY?:
An exploratory study

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Abstract: This study explored absorption, dissociation, and time perception on visual analogue scales (VAS) after a neutral hypnosis session to predict hypnotizability. Sixty-two subjects completed the Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C) and, during a neutral hypnosis session, VAS ratings of absorption, dissociation, and time perception. The findings indicated that 44% of subjects scored high, 35% medium, and 21% low on hypnotizability, as determined by scores on the SHSS:C. Dissociation VAS ratings significantly differed when comparing low to high and medium to high hypnotizable subjects. However, ratings were not significantly different between medium and low subjects. Significant positive correlation was found between dissociation VAS ratings and SHSS:C total scores. Future research is needed to validate this proof-of-concept study.

Hypnosis is defined as a state of focused attention, involving concentration and inner absorption with a relative suspension of peripheral awareness. It has three main components: absorption, dissociation, and suggestibility (Spiegel, 1991). Absorption is the tendency to become fully involved in a perceptual, imaginative, or ideational experience. Dissociation is a mental separation from the environment. Suggestibility is responsiveness to social cues, leading to an enhanced tendency to comply with instructions and a relative suspension of critical judgment. In addition, it seems that subjects in a hypnotic state underestimate the duration of the “hypnotic interval” by 41% (Bowers & Brenneman, 1979).
Hypnosis research is facilitated by the development of behavioral scales used for the measurement of hypnotizability (also called suggestibility). Hypnotizability is defined as an individual’s ability to experience suggested alterations in physiology, sensations, emotions, thoughts, or behavior during hypnosis (Elkins, Barabasz, Council, & Spiegel, 2015). The usual way to assess hypnotizability is to apply a protocol encompassing induction and suggestion, and to sum up the number of suggestions an individual successfully experiences and reports after the hypnotic induction procedure (Braffman & Kirsch, 1999). The experimenter observes the reactions of the subjects along defined criteria and scores the level of hypnotizability as low, medium, or high. Other scales, such as the Phenomenology of Consciousness Inventory: Hypnotic Assessment Procedure (PCI–HAP; Pekala, 1995), include several dimensions of consciousness to generate scores related to phenomenological consciousness (including positive and negative affect, volitional control, rationality, and altered state of awareness; Pekala & Maurer, 2013). Even if most hypnotizability tests offer a continuous score of hypnotizability and some consider the subjective experiences of participants by scoring, for example, taste hallucination, the dream suggestion, or dimensions of phenomenological consciousness, these protocols are time consuming, often limited to behavioral responses, and do not consider the whole phenomenal subjective experience of the participants. A notable exception is the Elkins Hypnotizability Scale (EHS), which includes subjective experience and behavioral observation in scoring (Elkins, 2014; Elkins, Johnson, Johnson, & Sliwinski, 2015; Kekecs, Bowers, Johnson, Kendrick, & Elkins, 2016). Studies have shown positive effects of hypnotic experience in different clinical settings such as in chronic pain, oncology, and surgery (Charland-Verville et al., 2017; Vanhaudenhuyse, Laureys, & Faymonville, 2014).

The aim of this preliminary study was to assess the interest of a new scoring system of hypnotizability experience as self-assessed by subjects. In this study, we tested healthy volunteers with a standardized hypnotizability scale. We also performed a neutral hypnosis session in which these volunteers scored their level of absorption, dissociation, and time perception on visual analogic scales (VAS) immediately after the session. Our clinical and research experience led us to hypothesize that during a hypnotic session a subject’s self-scoring of absorption, dissociation, and time perception correlates with the level of hypnotizability as evaluated with a standardized scale.

**Method**

This study included healthy volunteers recruited via an announcement on our website. They were informed that we needed to know how they would experience hypnosis and to record them in a database for future neuroimaging studies in hypnosis. We tested each
volunteer’s level of hypnotizability with the Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C; Weitzenhoffer & Hilgard, 1962), and, at a separate time, we asked subjects to self-assess absorption, dissociation, and time perception after a neutral hypnosis session. The two hypnotizability assessments took place at two separate times, in a randomized order. Mean time elapsed between the two assessments was 22 days (ranging between 0 and 239 days). Two of the researchers (AV and OG) assessed hypnotizability with the SHSS:C. MEF used neutral hypnosis and asked subjects to self-evaluate dissociation, absorption, and time perception.

We individually assessed hypnotizability in 62 healthy subjects with the SHSS:C and with three self-assessment scales evaluating absorption, dissociation, and time perception. Subjects were paid for their participation in the study.

**SHSS: C Scale**

According to this scale, scores superior or equal to 8 are defined as high hypnotizable; scores between 7 and 5 are defined as medium hypnotizable; and below or equal to 4 are defined as low hypnotizable subjects. We used a French version of this scale, usually applied in our department.

**Three Items Scale**

The procedure started with a hypnotic instruction, encompassing a 5-minute induction procedure of eye fixation and muscle relaxation. Subjects were invited to experience a neutral hypnosis without any specific suggestion. The hypnotic state was maintained for 20 minutes, accompanied by white noise. A 5-minute delay was used to end the hypnosis experience. Immediately after the neutral hypnosis session, subjects self-assessed.

**Absorption.** We asked subjects to answer this question: “Could you estimate on a 0- (not at all) to 10- (fully) scale how deeply you felt absorbed and felt your attention as focalized and focused by the experience you have just lived?”

**Dissociation.** We asked subjects to answer this question: “Could you estimate on a 0-to-10 scale if you felt a dissociation between your bodily sensation and the actual environment? Zero means you were in the reality, in this room; 10 means that you completely escaped in your subjective experience, totally disconnected from the here-and-now reality.”

**Time Perception.** We asked subjects to estimate the time elapsed, in minutes, since they started the hypnotic exercise. Time perception was calculated as the absolute value of the real duration of the hypnotic experience minus the subjects’ estimated time. Beginning
and ending times of the hypnosis session were recorded by the experimenter.

The study was approved by the Ethics Committee of the Faculty of Medicine of the University of Liège, Belgium, and we have written consent forms from subjects.

**Statistical Analyses**

Normality of variable distribution was assessed using the Shapiro-Wilks test. Results for quantitative variables were expressed as median and 25th to 75th percentiles. Qualitative variables were reported as numbers and percentages. The relationship between variables of interest and the level of hypnotizability was assessed using a one-way ANOVA for variables that followed normal distribution or nonparametric Kruskal-Wallis and Wilcoxon tests when variables did not follow normal distribution. Proportions were compared by a Chi-square test. Correlation between SHSS:C scores and subjective ratings of absorption, dissociation, and time distortion were assessed by Spearman correlation tests. All results were considered to be significant at the critical level ($p < .05$). Bonferroni corrections were applied for post hoc multiple comparisons. Statistical analyses were carried out using Stata software (StataCorp., 2015). The raw data used in the analysis together with the statistical analysis script are provided in the supplementary material.

**RESULTS**

Out of 62 subjects, 27 (44%, 18 women, age range 18–71 years) were scored as high hypnotizability (range: 8–11); 22 (35%, 13 women, age range 20–61 years) scored medium hypnotizability (range: 5–7); and 13 (21%, 7 women, age range 19–48 years) scored low hypnotizability (range: 1–4) according to the SHSS:C (Table 1). No significant difference was found between age and gender across the three groups. Dissociation was significantly different across the three categories (high, medium, low) of the SHSS:C ($p = .02$; see Table 1). More specifically, dissociation scores were different when comparing low and high hypnotizability subjects ($p = .014$), and medium and high hypnotizability subjects ($p = .002$), but not when comparing medium and low subjects ($p = .39$). No difference was found when absorption and temporal perception scores were used to compare SHSS:C categories ($p > .05$; see Table 2). Table 3 shows existing correlations between SHSS:C total score and three subjective-rating scores, as measured with VAS. Significant positive correlation was found between dissociation and SHSS:C total score ($p = .004$).
Table 1
*Age and Gender Distribution among High, Medium, and Low Hypnotizability Subjects (N = 62).*

<table>
<thead>
<tr>
<th></th>
<th>High (n = 27)</th>
<th>Medium (n = 22)</th>
<th>Low (n = 13)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>24.4 (21.2–27.1)</td>
<td>23.5 (21.6–27.2)</td>
<td>22.2 (21–24.7)</td>
<td>.43</td>
</tr>
<tr>
<td>Gender, female (%)</td>
<td>18 (67)</td>
<td>13 (59)</td>
<td>7 (54)</td>
<td>.71</td>
</tr>
<tr>
<td>SHSS scores</td>
<td>9 (8–9)</td>
<td>6 (5–6)</td>
<td>4 (3–4)</td>
<td>&lt; .001*</td>
</tr>
<tr>
<td>Actual hypnosis</td>
<td>30 (30–30)</td>
<td>30 (30–30)</td>
<td>30 (30–30)</td>
<td>.81</td>
</tr>
<tr>
<td>duration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived hypnosis</td>
<td>17.5 (10–30)</td>
<td>18.8 (10–20)</td>
<td>15 (13.5–25)</td>
<td>.86</td>
</tr>
<tr>
<td>duration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Age, SHSS score, and actual and perceived hypnosis duration are expressed as median and interquartile range, and comparison was performed using Kruskal-Wallis Test. Gender is reported as female count, and percentage and distribution among groups was assessed by chi-square test (two degrees of freedom, n = 62, Pearson chi-square = .68, p = .71). *Significant p value.

Table 2
*Median and Range Scores of 62 Subjects for Absorption, Dissociation, and Time Perception Scores as Self-Evaluated on a VAS Scale (0–10) by High, Medium, and Low Hypnotizability Subjects (SHSS:C Categorization).*

<table>
<thead>
<tr>
<th></th>
<th>High (n = 27)</th>
<th>Medium (n = 22)</th>
<th>Low (n = 13)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absorption</td>
<td>8 (7–8)</td>
<td>7.5 (6.5–8)</td>
<td>8 (7–8)</td>
<td>.70</td>
</tr>
<tr>
<td>Dissociation</td>
<td>8 (6.5–8.5)</td>
<td>7.3 (6–8)</td>
<td>6.2 (5–7)</td>
<td>.02*</td>
</tr>
<tr>
<td>Time perception</td>
<td>15 (10–20)</td>
<td>10 (7.5–20)</td>
<td>15 (10–15)</td>
<td>.84</td>
</tr>
</tbody>
</table>

Notes: Time perception is calculated as the absolute value of the difference between actual and perceived hypnosis duration (in minutes). Results were considered different at p < .05.

Table 3
*Correlation Between the Three Subjective VAS Ratings and the SHSS-C Total Score.*

<table>
<thead>
<tr>
<th></th>
<th>SHSS-C</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absorption</td>
<td>.12</td>
<td>.361</td>
</tr>
<tr>
<td>Dissociation</td>
<td>.37</td>
<td>.004*</td>
</tr>
<tr>
<td>Time perception</td>
<td>.05</td>
<td>.694</td>
</tr>
</tbody>
</table>

* Results were considered different at p < 0.05.
**Discussion**

Hypnosis research has been developing for decades, and there is currently a real necessity to find tools that reflect the level of subjects’ hypnotizability. Hypnotizability is the responsiveness to suggestion following a hypnotic induction and is measured with standardized tests. Testing hypnotizability requires a hypnotic experience during which an experimenter administers suggestions for altered experience and behaviors. However, although objective measures of hypnotizability can be useful, we think the phenomenology of hypnosis better represents the inner experiences of individuals in a hypnotic state. During this particular modified state of consciousness, subjects can experience an altered sense of space, time, and agency; modifications of the sense of self and sensory–environment perception; and alterations in body representation. These modifications of perception can be missed by an external observer, who may only judge external manifestations, which are not then systematically fitted with internal subjective experience. Some scales, such as the PCI-HAP (Pekala, 1995), allow for better characterization of the inner experience and thus the phenomenology of this particular state of consciousness. However, all of these scales take a long time to administer, and in clinical practice we are confronted with time limitations when we have to assess the hypnotizability of subjects and patients we would include in our clinical studies. The development of a fast tool measuring hypnotizability would thus allow not only a better description of hypnotizability in studies but also a proper assessment of patients’ responses to their treatment. We seek a new way to distinguish subjects according their level of hypnotizability.

During hypnosis, people may experience a range of phenomena, including increased absorption and dissociation, as well as decreased self-agency and self-monitoring, reduced spontaneous thoughts, and a suspension of space and time orientation. In previous studies (Demertzi et al., 2011; Demertzi, Vanhaudenhuyse, Noirhomme, Faymonville, & Laureys, 2015), we observed that participants reported greater dissociation and absorption and reduced spontaneous thoughts during hypnosis (when compared to during normal wakefulness and mental imagery). We hypothesized that these subjective modifications of sensations during hypnosis could be used as quick measures to assess the level of hypnotizability in all subjects.

Our results show that the dissociation score, as self-rated by subjects after a neutral hypnotic session, allows the identification of high and low hypnotizable subjects as categorized by the SHSS:C, whereas absorption and time-perception scores did not. In addition, we found a positive correlation between SHSS:C total score and
dissociation self-rating score. In previous studies, we have shown that self- and environment-awareness processing (Vanhaudenhuyse et al., 2011) was disrupted during hypnosis, with an increased sense of internal awareness and a decreased sense of external awareness (Demertzi et al., 2011, 2015). Subjective reports for increased intensity of self-awareness were related to a disruption of the internal (self-related) brain networks (i.e., reduced functional connectivity in posterior midline and parahippocampal structures but increased connectivity in the lateral parietal and middle frontal areas), whereas decreased environment awareness was associated with reduced functional connectivity in the external brain network (encompassing lateral fronto-parietal areas; see Demertzi et al., 2011; Vanhaudenhuyse et al., 2014). Our results suggest a significant potential for the subjective assessment of feelings of dissociation to differentiate high and low hypnotizable subjects, which fits well with previous neuroimaging studies that have shown that hypnosis is closely related to a disconnection from the environment.

One limitation can be the number of subjects included in our study. We did not perform an a priori power analysis to determine the number of subjects needed. Indeed, this preliminary study aims to test the interest of the new three items scale to assess hypnotizability of healthy volunteers. In this first step study, we propose to compare this new scale with a standardized worldwide-used scale (the SHSS:C) to know if we can observe a clear link between the well-known scores of the SHSS:C and the new scores obtained with the three-item scale. The next step is to reproduce our preliminary results on a larger population to validate this new short and quick hypnotizability scale. In addition, a future study could better clarify differences existing between objective behavioral observations of hypnotizability, as measured by a standardized validated scale (e.g., SHSS:C), and subjective inner experience feeling of subjects during hypnosis.

This study provides proof of concept for the use of a subjective rating by participants to decide if subjects are more or less hypnotizable. In our opinion, hypnotizability is more than simply the ability to follow behavioral suggestions. Hypnotic states involve the most useful built-in capabilities of the human brain, which are focus shifting and dissociation. The natural capacity to perceive an inner-oriented mental imagery, as well as to be disengaged from environmental perception, is often described by people during hypnosis. In addition, behavioral responses to suggestion are not sufficient to characterize the phenomenology of hypnosis (e.g., first-person reports of the qualia of consciousness; see Pekala, 2015). Behavioral responses are thus not sensitive enough to testify to these very subjective sensations, and the feelings of individuals during hypnosis are essential to correctly estimate the intensity of the hypnotic experience. Clinicians need a quick
and efficient measure of hypnotizability to be used in clinical and research protocols. It is difficult or unrealistic to ask patients to follow hours of assessment regarding their level of hypnotizability.

Future studies are needed on a larger sample to validate the efficacy of self-assessed dissociation scores to characterize the hypnotizability of subjects. In addition, we also need to expand the comparison of subjective scores used in this study with other standardized scales assessing the phenomenology of hypnosis (such as the Phenomenology of Consciousness Inventory–Hypnotic Assessment Procedure; Pekala, Maurer, Kumar, Elliott-Carter, & Mullen, 2010), rather than employing the behavioral responses to suggestion.

**DISCLOSURE STATEMENT**

No potential conflict of interest was reported by the authors.

**FUNDING**

The study was supported by the University and University Hospital of Liège, the French Speaking Community Concerted Research Action (ARC - 06/11 - 340), the Belgian National Funds for Scientific Research (FRS-FNRS), Human Brain Project (EU-H2020-fetflagship-hbp-sga1-ga720270), the Luminous project (EU-H2020-fetopen-ga686764), the Wallonie-Bruxelles International, the James McDonnell Foundation, Mind Science Foundation, IAP research network P7/06 of the Belgian Government (Belgian Science Policy), the European Commission, the Public Utility Foundation “Université Européenne du Travail,” “Fondazione Europea di Ricerca Biomedica,” the Bial Foundation, “Plan National Cancer” of Belgium (Grant number 138), Benoit Fundation. Olivia Gosseries is a postdoctoral researcher, and Steven Laureys is research director at FRS-FNRS.

**REFERENCES**


StataCorp. (2015). Stata statistical software: release 14, College Station, TX: StataCorp LP.


AUDREY VANHAUDENHUYSE, DIDIER LEDOUX, OLIVIA GOSERIES, ATHENA DEMERTZI, STEVEN LAUREYS, UND MARIE-ELISABETH FAYMONVILLE

Abstract: Diese Studie untersuchte Absorption, Dissoziation und Zeitempfinden mittels einer visuellen Analogskala (VAS) nach einer neutralen Hypnosesitzung, um Hypnotisierbarkeit vorherzusagen. 62 Teilnehmer füllten die Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C) aus

STEPHANIE RIEGEL, M.D.

Les évaluations subjectives de l’absorption, de la dissociation et de la perception du temps pendant « l’hypnose neutre » peuvent-elles prédire le degré de susceptibilité hypnotique? Une étude exploratoire

AUDREY VANHAUDENHUYSE, DIDIER LEDOUX, OLIVIA GOSSERIES, ATHENA DEMERTZI, STEVEN LAUREYS ET MARIE-ELISABETH FAYMONVILLE

Résumé: Cette étude a permis d’explorer l’absorption, la dissociation et la perception du temps sur une échelle analogique visuelle (EAV) à la suite d’une séance d’hypnose neutre visant à prédire le degré de susceptibilité hypnotique. Soixante-deux participants ont répondu au questionnaire de susceptibilité hypnotique de Stanford, formulaire C (SHSS:C) et, au cours d’une séance d’hypnose neutre, à l’EAV relative à l’absorption, à la dissociation et à la perception du temps. Les résultats indiquent que 44% des sujets ont obtenu un score d’hypnotisabilité élevé; 35% ont obtenu un score moyen; et 21% ont obtenu un score faible; ces résultats étant déterminés par les scores obtenus sur l’échelle SHSS:C. Les cotes de dissociation sur l’EAV diffèrent de façon significative lorsque l’on compare les sujets peu ou moyennement susceptibles à l’hypnose avec des sujets qui y sont très susceptibles. Cependant, les cotes n’étaient pas significativement différentes entre les sujets moyennement susceptibles à l’hypnose et ceux qui y sont peu susceptibles. On a trouvé une corrélation positive significative entre les cotes EAV de dissociation et les scores totaux SHSS:C. D’autres recherches sont nécessaires pour valider le bien-fondé de ce concept.

JOHANNE RAYNAULT
C. Tr. (STIBC)

¿Pueden las evaluaciones subjetivas de absorción, disociación y percepción de tiempo durante “hipnosis neutral” predecir hipnotizabilidad?: Un estudio exploratorio

AUDREY VANHAUDENHUYSE, DIDIER LEDOUX, OLIVIA GOSSERIES, ATHENA DEMERTZI, STEVEN LAUREYS Y MARIE-ELISABETH FAYMONVILLE

Resumen: Este estudio exploró la absorción, disociación y percepción temporal en escalas visuales análogas (EVS) después de una sesión de hipnosis neutral para predecir hipnotizabilidad. Sesenta y dos sujetos completaron la
Escala Stanford de Susceptibilidad Hipnótica, Forma C (ESSH:C) y, durante una sesión de hipnosis neutral, evaluaron mediante EVS absorción, disociación y percepción temporal. Los hallazgos muestran que 44% de los sujetos puntuaron alto; 35% medio y 21% baja hipnotizabilidad conforme las puntuaciones de la ESSH:C. Las puntuaciones EVS de disociación difirieron significativamente entre sujetos bajos y altos y medios y altos. Sin embargo, las puntuaciones no difirieron significativamente entre sujetos medios y bajos. Se encontró una correlación positiva significativa entre las puntuaciones EVS de disociación y las puntuaciones totales de la ESSH:C. Se requiere más investigación para validar este estudio de evidencia de concepto.

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