HYPNOTIZABILITY, SLEEPINESS, AND SUBJECTIVE EXPERIENCE[1]

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Abstract: The relationships between hypnotizability, sleepiness, and the subjective experience of hypnotic suggestions were investigated in 90 participants. Scores from the Harvard Group Scale of Hypnotic Susceptibility Form A (HGSHS:A), the Karolinska Sleepiness Scale (KSS), the Epworth Sleepiness Scale (ESS), the Pittsburgh Sleep Quality Index (PSQI), and our self-developed Questionnaire on Subjective Hypnotic Experiences (QSHE) were analyzed. Findings show that hypnotizability correlates with both habitual daytime sleepiness and instantaneous sleepiness after the hypnotic procedure. Results also indicate that subjective self-evaluation of responses to hypnotic suggestions may be a useful tool in some cases when comparing with other subjectively rated scales, such as those concerning sleepiness.

Hypnosis and sleep may greatly resemble each other from the perspective of an outside viewer. Hypnotized participants may sit still or lay down with eyes closed and may not respond to environmental stimuli. This resemblance has greatly influenced the early view of the phenomenon: The formerly used term "somnambulism" referred to sleep walking, and currently hypnosis is named after Hypnos, the Greek god of sleep. In fact, there are many overlapping processes between the sleeping and the hypnotized mind that have not received much attention in recent research. Despite the apparent unresponsiveness, external stimuli can be incorporated into dream content, whereas suggestions can be transformed into hallucinatory content in hypnosis (Arkin & Antrobus, 1991; Szechtman, Woody, Bowers, & Nahmias, 1998). Both hypnosis and REM sleep dreaming are also characterized by diminished self-reflection and decreased ability to plan and execute tasks (see e.g., Hilgard, 1965; Windt & Metzinger, 2007). There is an acceptance of paradoxical states of affairs that had been termed as bizarreness in dreams, and as trance logic in hypnosis (Revonsuo &

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Salmivalli, 1995; Orne, 1959). Memory is generally impoverished in both cases: Dream recall is generally poor, while hypnotic amnesia can disrupt even autobiographical memory (Goodenough, 1991; Barnier, 2002). Underestimation of elapsed time is also typical for both late night sleep and hypnosis (Aritake et al., 2004; Naish, 2007).

Gradual transition between sleep and hypnosis has also been reported: Hypnotized individuals have drifted into natural sleep when left undisturbed or given suggestions to fall asleep. Or, the sleeping participant may awaken directly into a hypnotic state rather than an ordinary waking state, if suggested so (Kratochvil, 1970). After waking from Stage 3 or 4 of non-rapid eye movement (NREM) sleep, sleep inertia, a drowsy transitional stage, can be observed (Tassi & Muzet, 2000). Respectively, it had been observed in our previous study (Fingelkurts, Fingelkurts, Kallio, & Revonsuo, 2007) that a highly susceptible individual, "hypnotic virtuoso", may remain in transition to wakefulness for at least several minutes after the induction procedure in neutral hypnosis, i.e., without suggestions. In addition to hypnotic inertia, our virtuoso (T.S.-H.) has also reported a very brief time needed for falling asleep in the evening. This is in line with the polysomnography observation that highly hypnotizable participants fall asleep in a sleep laboratory significantly more quickly than low hypnotizable participants (Evans, 1972). These observations, along with the transient hypofrontality hypothesis (Dietrich, 2003), the proposal of Kahn and Hobson (2003) that hypnosis could be better understood by studying the neural basis of REM sleep dreaming, and other theoretical and experimental work (Gruzelier, 2000; Crawford & Gruzelier, 1992; Kallio, Revonsuo, Hämäläinen, Markela, & Gruzelier, 2001) suggest a relationship between hypnotizability and certain aspects of sleep.

There exist several cognitive abilities that correlate with - and can be used as indicators or predictors of - hypnotizability, such as absorption (Tellegen & Atkinson, 1974), fantasy proneness (Lynn & Rhue, 1988), and empathy (Wickramasekera II & Szlyk, 2003). Although self-scoring of own behavior during hypnosis has been proved to strongly correlate with observer-scored behavior (Bentler & Hilgard, 1963), it seems to be more difficult to estimate behavioral indicators of hypnotizability. Previous research shows quite clearly (see e.g. Hilgard, 1965; Sheehan and McConkey, 1982) that behind an identical behavioral hypnotic response can lie very different subjective experiences. This article presents results from a study investigating the relationships between hypnotizability, self-reported sleepiness, sleep quality and the subjective experience of hypnotic suggestions. Our initial hypotheses held that: (1) Hypnotizability correlates positively with self-reported habitual daytime sleepiness; (2) Higher hypnotizability is associated with higher hypnotic inertia that manifests itself as increased instantaneous drowsiness after the hypnosis session, and (3) Self-scored subjective experiences may provide additional data on hypnotizability which would not be detected by standard self-scored behavior.

METHODS

Participants

The study was carried out with 90 unpaid volunteers (71 females, 78.9%, and 19 males, 21.1%) with an age range from 18 to 57 and a mean age of 23.3 (*SD* = 5.9). Majority of the participants were psychology students at the University of Turku, Finland, and were recruited through public bulletin boards and e-mailing list announcements. They signed up to participate in a group hypnosis session and were informed that the study was being conducted to collect data about hypnotizability. Only 6.7% of the participants reported previous experience of hypnosis, although 83.3% reported seeing it on TV, 37.8% reported reading about it in books, and 27.8% reported personally knowing someone who was hypnotized before.

Hypnosis-Related Scales

The Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A) (Shor & Orne, 1962) is a widely used instrument for initial screening of hypnotic susceptibility (e.g., Benham, Smith, & Nash, 2002; DuHamel, Difede, Foley, & Greenleaf, 2002; Nordenstrom, Council, & Meier, 2002). The scoring of the HGSHS:A responses followed the procedure described by Shor and Orne (1962). Amnesia was scored in two different ways: (1) In accordance with the original HGSHS:A, which was scored as 1 if the participant recalled three or less out of 12 items before the amnesia lifted; and (2) In accordance with a procedure described by Kihlstrom and Register (1984) that was scored as 1 if the participant recalled three or less items before the amnesia lifted and, in addition, recalled two or more items after being asked to recall everything.

In order to analyze the phenomenal level during hypnotic responding, we developed a new scale particularly aimed at elucidating the subjective experiences associated with responding to each item in HGSHS:A. This scale (Questionnaire on Subjective Hypnotic Experiences, QSHE) consists of twelve multiple choice items and is meant to be given together with the answering sheet in HGSHS:A. Table 1 shows an example of HGSHS:A item #1 and its corresponding QSHE item. Scoring of QSHE was straightforward: Answer options A, B, C, and D were scored as 0, 1, 2, and 3 points, respectively.

[Table 1]

Sleep-Related Scales

The Karolinska Sleepiness Scale (KSS) (Åkerstedt & Gillberg, 1990) is a widely used clinical tool for measuring instantaneous sleepiness. It has a single question with a nine-point scale, ranging from 1 ("very alert") to 9 ("very sleepy, great effort to stay awake, or fighting sleep") points. The KSS is closely related to electroencephalographic, behavioral performance and

other subjective variables, indicating a high validity in measuring sleepiness (Kaida et al., 2006).

The Epworth Sleepiness Scale (ESS) (Johns, 1991) is used in diagnosing excessive habitual sleepiness. It asks a person to rate the likelihood of falling asleep during typical daily situations. The ESS consists of eight questions, scored from 0 ("would never fall asleep") to 3 ("very high chance to doze") points, thus the possible score range is from 0 to 24 points. The average ESS score for healthy persons is about 6 points; scores above 12 points may indicate a sleep disorder, such as sleep apnea or narcolepsy.

The Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989) is a self-rated questionnaire which assesses sleep quality and disturbances. It consists of 19 self-rated items that generate 7 component scores: Subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The calculation of PSQI global score with a range from 0 to 21 points was automatized by using Microsoft Office Excel spreadsheet formulas.

Procedure

The data was collected in four sessions during two consecutive days, with two sessions per day. Sessions were held in a seminar room at the University of Turku; group sizes were 27, 17, 26, and 20 participants. Each session began with obtaining a signed informed consent, after which the participants were asked to fill in the first page of the HGSHS:A response booklet. Before the hypnotic induction procedure, participants were asked to mark their current state of sleepiness on the KSS form. The induction procedure and suggestions were then played out loud from a 45-minute pre-recorded Compact Disc. This recording was made by the same person who read the induction and suggestions when the Finnish norms for HGSHS:A were gathered (Kallio & Ihamuotila, 1999). After listening to the audio recording, participants were asked again to mark their current state of sleepiness on the second KSS form, and to fill in the rest of the HGSHS:A response booklet as well as the QSHE.

In addition, participants were asked to fill in the ESS and PSQI forms at home, shortly after the hypnotic session (PSQI requires that a part of the questionnaire would be answered by the participant’s bedroom partner, which was not possible during the hypnosis sessions). On-line forms of these two questionnaires had been created with Webropol software at www.webropol.fi. Personal web links to the forms pages were sent out by email to all participants. Within two weeks from the sessions, 89 on-line responses (98.9%) were received. Total length of a session and the estimated time for filling in the on-line questionnaires was about 1.5 hours.

RESULTS

HGSHS:A Total Score

As shown in Table 2, HGSHS:A total score mean (M = 6.54) and standard deviation (SD = 2.35) fit in the mid-range (from 5.38 to 7.64, M = 6.56, SD = 2.69) of the 12 international HGSHS:A reference sample scores published so far (Lichtenberg, 2008; Pyun & Kim, 2009). Although the scores obtained by this study are notably lower than the Finnish norms (M = 7.26, SD = 2.61, n = 285) (Kallio & Ihamuotila, 1999) and are closest to the German norms (M = 6.50, SD = 2.43, n = 374), they nevertheless correlate significantly with the Finnish norms (Spearman's Rho rank correlation coefficient r = .98, p < .01). On the HGSHS:A, 12 participants (13.3%) scored as High (ranging 10–12 points), 21 participants (23.3%) scored as Low (ranging 0–4 points), and the rest 57 participants (63.4%) scored as Medium (ranging 5–9 points). No significant difference (Mann-Whitney test U = 672.5, Z = -.02, p = .984) was found between females (M = 6.58, SD = 2.28, n = 71) and males (M = 6.42, SD = 2.65, n = 19). Comparisons between the four session groups found no significant differences in their HGSHS:A scores (Kruskal-Wallis test $\chi^2(3, N = 90) = .14$, $p < .986$).

[Table 2]

HGSHS:A Item Difficulty

Average item pass rate of the HGSHS:A was 54.6%. Individual item pass rates are shown in Table 3 along with the Finnish norms. An alternative way of scoring amnesia was also conducted, as suggested by Kihlstrom and Register (1984). When amnesia was scored according to the original method (Shor & Orne, 1963), the pass percentage was 39, whereas the alternative method resulted in a pass percentage of 17. Participants who passed the original amnesia scoring method but not the alternative method (n = 20) had a mean total score of 7.35 points, while participants who passed the alternative method of scoring amnesia (n = 15) had a mean total score of 7.53 points.

[Table 3]

Questionnaire on Subjective Hypnotic Experiences (QSHE)

As expected, QSHE results (M = 16.4, SD = 5.7, n = 90) had a strong positive correlation with the HGSHS:A total score. Spearman's Rho rank correlation coefficient between HGSHS:A and QSHE total scores was r = .70 at a significance level of p < .000001, and the coefficient of determination indicated 48% of shared variance.

Karolinska Sleepiness Scale (KSS)

Sleepiness increased from before-test (M = 4.4, SD = 1.3, n = 88) to after-test (M = 5.9, SD = 1.3, n = 88) by an average of 1.5 points on the KSS

scale, and a significant negative correlation (r = -.22, p < .05) was found between before-test and after-test KSS scores. As the four hypnosis sessions had been conducted at different times of the day, a Kruskal-Wallis test had expectedly found significant differences between the before-test KSS scores (χ^2(3, N = 88) = 7.906, p < .048) and the after-test KSS scores (χ^2(3, N = 88) = 13.486, p < .004) of the four sessions.

There were no significant correlations between the HGSHS:A total score and the three KSS scores (before-test, after-test, and their difference). A Mann-Whitney U test did not result in significant relations between the 12 Highs and the 21 Lows, nor between the upper half (ranging 0–6 points, n = 41) and lower half (ranging 7–12 points, n = 47) groups by the HGSHS:A. However, the notably large difference between Highs (KSS_{diff} = 1.45) and Lows (KSS_{diff} = 1.14) were taken to further analysis. A Wilcoxon signed-rank test of the before-test and after-test KSS scores yielded only a nearly significant difference for Highs (Z = -1.742, p < .081, n = 12), but a significant difference for Mediums (Z = -3.953, p < .0005, n = 56), for Lows (Z = -2.581, p < .01, n = 21), and for all participants (Z = -4.950, p < .0005, n = 88). Contrary to HGSHS:A total scores, QSHE total scores correlated significantly (r = .36, p < .001) with after-test KSS scores. QSHE total scores had also a significant positive correlation with KSS scores difference (r = .23, p < .05).

Epworth Sleepiness Scale (ESS)

ESS total scores (M = 7.24, SD = 3.4, n = 89) showed no significant difference between males (M = 7.53, SD = 4.15, n = 19) and females (M = 7.16, SD = 3.2, n = 70) with a Mann-Whitney U test. ESS total score means for HGSHS:A total score groups were M = 8.08 for Highs (n = 12), M = 7.33 for Mediums (n = 56), and M = 6.45 for Lows (n = 21).

When ESS total scores were compared to HGSHS:A total scores by using Spearman's Rho rank correlation coefficients, only borderline significance (r = .20, p < .057) was found. Nevertheless, a Mann-Whitney test showed significant difference (U = 719, W = 1800, W = -2.227, p < .026) in ESS total scores between lower half (n = 46) and upper half (n = 43) groups by HGSHS:A total scores. There was no significant correlation between ESS total scores and QSHE total scores.

Item-by-item comparison of these two scales found no statistically significant correlations when using a Bonferroni adjustment of the alpha level of significance. However, it is to be noted here that out of all ESS items, the napping-related item #5 ("Lying down to rest in the afternoon when circumstances permit") had the highest correlation with all three other scales: HGSHS:A total scores, QSHE total scores, and the after-test KSS score.

Pittsburgh Sleep Quality Index (PSQI)

PSQI total score (M = 4.39, SD = 2.23, n = 89) showed no significant difference between males (M = 4.63, SD = 3.32, n = 19) and females (M = 4.33, SD = 1.9, n = 70) with a Mann-Whitney U test. PSQI total score means

for HGSHS:A total score groups were $M = 4.42$ for Highs ($n = 12$), $M = 4.49$ for Mediums ($n = 56$), and $M = 4.10$ for Lows ($n = 21$). PSQI scores were compared to HGSHS:A scores by using Spearman's Rho rank correlation coefficients, but no correlation was found between PSQI total score and HGSHS:A total score. A Mann-Whitney U test showed no significant difference in PSQI total scores, when samples were grouped into a lower half ($n = 47$, ranging 0–6 points) and an upper half ($n = 43$, ranging 7–12 points) by HGSHS:A total score.

There were no statistically significant correlations between the individual items of PSQI and HGSHS:A when using a Bonferroni adjustment of the alpha level of significance. Thus, contrary to previous experiments (Evans, 1972), we did not find a significant correlation between sleep latency (as asked by PSQI question #2) and hypnotizability in neither HGSHS:A nor subjective experience questionnaire QSHE total scores.

DISCUSSION

Association between sleep and hypnosis could have been supported earlier mainly by indirect evidence, such as hypnosis-reminding incorporation of external stimuli into dream content (Arkin & Antrobus, 1991) or distortion of time perception during late night sleep (Aritake et al., 2004). Findings of our study, such as the significant correlations found between hypnotizability, instantaneous and habitual daytime sleepiness, demonstrate direct evidence of an association between hypnosis and sleepiness that are assessable also by clinically validated instruments. Even though we did not find a correlation between hypnotizability and sleep onset time, methodological differences (i.e., self-evaluation versus laboratory measurements) may adequately explain our non-significant results as compared to the significant correlation reported by Evans (1972).

The positive correlation found between HGSHS:A and ESS scores lends support to our first initial hypotheses about the relationship between hypnotizability and habitual daytime sleepiness. The findings seem to support the idea that both types of altered consciousness (i.e., sleep and hypnosis) may share some common mechanisms (Evans, 1999). Such mechanisms may be related to the ability to quickly change the psychophysiological set into a more relaxed one, or to dedicate a sufficient amount of attention for immersing into less externally driven mental content. However, it seems to be difficult to establish a non-speculative theoretical basis for explaining the effects of the particular component scores of the two scales that contributed to the significant results.

The positive correlation found between post-hypnotic instantaneous sleepiness and hypnotizability lends support to our second initial hypothesis about hypnotic inertia: The more susceptible participants were, the more relaxed they remained after the session. Without this hypothesis clearly defined in advance, a negative correlation could have been alternatively interpreted as Highs obeying better the post-hypnotic suggestion to feel alert

and energetic after coming out of hypnosis. However, as post-hypnotic sleepiness correlated only with QSHE scores and did not correlate with HGSHS:A scores, findings can be considered only as a partial support to our second initial hypothesis concerning hypnotizability and instantaneous sleepiness. Still, these findings lend full support to our third initial hypotheses that subjective scales may be more useful compared to behavioral scales.

The Wilcoxon signed-rank test result for the differences of all participants' KSS scores showed that the session indeed had an effect on the participants. Although this difference of the KSS scores showed a general drowsiness in the participants, no control situation was arranged to test sleepiness in similar session circumstances without hypnosis. Thus, it seems intuitively probable that merely sitting still and silently in a dim room with eyes closed while listening to instructions for relaxation may increase sleepiness in participants even without hypnotic induction and suggestions. Significant results for only Mediums and Lows suggest that the likelihood of Type 2 error could not be excluded for Highs, especially as group sample sizes seemed to have a strong effect on the significance level.

As neither the HGSHS:A total score nor the QSHE total score correlated significantly with the PSQI, we conclude that hypnotizability seems to be associated with daytime residues of sleep - such as instantaneous or habitual daytime sleepiness - rather than with night sleep quality. This view is also supported by results from napping studies with high- and low-hypnotizable participants (Evans, 1999). Regarding the proposal of Kahn and Hobson (2003) about hypnosis and REM sleep dreaming, our findings indicate that studying the fluctuating levels of daytime sleepiness and arousal might be another promising avenue of research that could further the understanding of hypnosis.

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Table 1

HGSHS:A Item #1 and Corresponding QSHE Item #1

Form HGSHS:A (hypnotic susceptibility), item #1 *(Head falling)*:

You were first told to sit up straight in your chair for 30 seconds and then to think of your head falling forward. Would you estimate that an onlooker would have observed that your head fell forward at least 2 inches during the time you were thinking about it happening?

A. My head fell forward at least 2 inches.
B. My head fell forward less than 2 inches.

Subjective experience questionnaire QSHE, item #1:

A. The thought of head falling had no influence on me.
B. The thought of head falling caused a minor feeling about heaviness of the head.
C. The thought of head falling caused a strong feeling about heaviness of the head.
D. The thought of head falling caused a very strong feeling about heaviness of the head.

Table 2

HGSHS:A Total Score Means and SDs Compared With 12 International Norms

Country	CAN	AUS	ISR	ROM	ITA	GER	**Study**	SWE	KOR	SPA	FIN	USA	DAN
N	535	1994	253	340	376	374	**90**	291	271	220	285	132	376
M	5.38	5.45	5.61	6.24	6.41	6.51	**6.54**	6.77	6.95	7.13	7.26	7.39	7.64
SD	3.28	2.95	2.59	2.68	2.80	2.43	**2.35**	2.50	2.25	2.61	2.61	3.04	2.50

Note. Results from our study shown in boldface.

Table 3

Item Pass Rates (in Percent), Means and SDs Compared With the Finnish Norms

HGSHS:A Item	Study Pass Rate	Study Rank	Finnish Norms Pass Rate	Finnish Norms Rank
1. Head Falling	77	(4)	84	(3)
2. Eye Closure	90	(2)	86	(2)
3. Left Hand Lowering	99	(1)	89	(1)
4. Right Arm Immobilization	28	(10)	43	(10)
5. Finger Lock	54	(5)	66	(5)
6. Left Arm Rigidity	52	(6)	53	(7.5)
7. Moving Hands Together	78	(3)	78	(4)
8. Communication Inhibition	49	(7)	56	(6)
9. Experiencing of Fly	24	(12)	28	(12)
10. Eye Catalepsy	39	(8.5)	52	(9)
11. Posthypnotic Suggestion	26	(11)	37	(11)
12. Amnesia	39	(8.5)	53	(7.5)
Mean Percentage Per Item	54.6		60.4	
Sample Mean	6.54		7.26	
Sample SD	2.35		2.61	