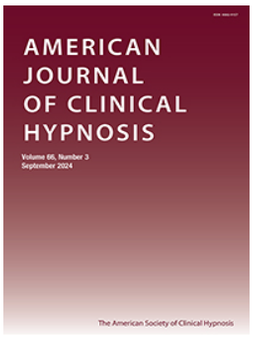

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Sleepiness may predict hypnotizability, while personality traits do not

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ABSTRACT

Sleepiness and personality traits have been controversially reported as associated to individual hypnotizability level i.e. receptiveness to hypnotic suggestions and behave accordingly. In this study, we further investigate the relationship between the level of general daytime sleepiness and personality traits with the level of hypnotizability. Seventy-eight healthy young volunteers (34 women) completed the fast assessment of general daytime sleepiness and personality with the Epworth Sleepiness Scale and the 10-item Big Five Inventory respectively, and underwent hypnotic evaluation through the Harvard Group Scale of Hypnotic Susceptibility Form A (HGSHS:A). Main findings revealed a correlation between sleepiness and hypnotizability levels, and no influence of personality traits. Interestingly, women exhibited higher levels of hypnotizability compared to men. Taken together, these results suggest that sleepiness assessment might be considered as a predictive tool to hypnotic suggestions, which would offer practical insight for enhancing hypnosis intervention efficacy.

KEYWORDS

Gender; hypnotic susceptibility; personality; sleepiness

Hypnosis may be defined as a state of consciousness involving focused attention through an intensified absorption in inner experiences, accompanied by a reduction in peripheral awareness and elevated responsiveness to suggestions (Elkins et al., 2015). Over the past two decades, numerous studies have contributed to significant progress in our understanding of the effectiveness of hypnotically mediated treatments across various clinical conditions. Specifically, hypnosis has been reported as a valuable therapeutic tool for pain management (Hammond, 2007; Jensen & Patterson, 2014; Tome-Pires & Miro, 2012), such as musculoskeletal and neuropathic pain (Langlois et al., 2022), for post-traumatic stress disorder (PTSD) symptoms (Rotaru & Rusu, 2016) and for other problems and conditions such as depression (Alladin & Alibhai, 2007; Yapko, 2024), anxiety (Hammond, 2010), and addiction (Lynn et al., 2010). However, the efficacy of hypnosis may be influenced by the degree of receptiveness to hypnotic suggestions, a capacity commonly referred to as hypnotizability (Piccione et al., 1989). This psychophysiological trait predicts the individual's susceptibility to enter hypnosis and to accept suggestions aimed at modifying perception, memory and behavior (Meyer & Lynn, 2011). It can be measured by standardized questionnaires, which usually consist of a hypnotic induction procedure, followed by behavioral suggestions, such as in the Harvard Group Scale of Hypnotic Susceptibility,

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Form A HGSHS:A (Shor & Orne, 1963) allowing to classify individuals based on their receptiveness to hypnotic suggestions, ranging from low to high hypnotizability. Accumulated findings have demonstrated that individuals with a high level of hypnotizability tend to exhibit enhanced cognitive and physiological processes, including for instance greater proficiency in mental skills e.g. motor imagery quality (Ruggirello et al., 2019), pain control (Santarcangelo & Carli, 2021), higher attentional focusing efficiency (Cojan et al., 2015), deeper absorption (Council & Green, 2004) and even a greater proneness to modulate the activity of the immune system (Gruzelier, 2002). Given the physio-cognitive advantages linked to a high hypnotizability trait, examining the factors that make some individuals more responsive to hypnotic suggestions than others remain a central issue of both fundamental and clinical research in hypnosis (De Pascalis, 2024; Jensen et al., 2017; Oakley & Halligan, 2013). From a practical standpoint, optimizing the swift identification of individual hypnotizability traits through predictive factors should offer an effective means for determining personalized health interventions, which in turn may contribute to enhanced therapeutic outcomes. To date, only a few studies have reported a link between individual hypnotizability and diurnal sleepiness levels, or personality traits, but findings remain controversial and may not directly translate to clinical practice e.g (Evans, 1977; Zhang et al., 2017). However, they still offer valuable theoretical support for further examine whether hypnotizability level is associated to the level of sleepiness and personality traits.

In the seminal study into the interplay of sleep and hypnosis, Evans (1977) observed that high hypnotizable participants fall asleep significantly more quickly compared to low hypnotizable participants. These findings provided a support that sleep and hypnosis might share some common mechanisms likely attributable to the capacity to change psychological sets, attentional states, and states of awareness (Evans, 1977). Interestingly, recent studies have hypothesized that interoceptive sensibility, which encompasses the perception of visceral and proprioceptive signals, could be the key mechanism influencing the relationship between hypnotizability and sleep (Cordi & Rasch, 2022; Diolaiuti et al., 2020). Therefore, high hypnotizable individuals are more able to fall asleep easily, by an overall detachment from the external environment with an attentional focus on the current internal experience (i.e. absorption), which is externally induced by the hypnotist (Sodre et al., 2023). Yet, only the study by Móró et al. (2011) tested whether general daytime sleepiness, with the Epworth Sleepiness Scale ESS (Johns, 1991), correlated with the hypnotizability level (Móró et al., 2011). They reported a difference in daytime sleepiness between the lower half hypnotizable participants and the higher one, which somewhat support the relationship between sleep and hypnosis. However, they did not find any correlations between the self-reported daytime sleepiness and the hypnotizability levels ($r = 0.20$). Yet, these findings need to be replicated to clarify and establish whether daytime sleepiness can indeed be associated to hypnotizability level. This would enhance the validity, consistency, and credibility of this relationship, enabling the use of these data as a quick and easily implementable assessment tool.

To date, despite numerous attempts in hypnosis research to examine the relationships between hypnotizability and personality traits, most of the reported findings have failed to conclusively identify a discernible and robust link. Correlations between hypnotizability and personality traits considered similar to those induced by the hypnotic state have been observed. This includes among others imaginative involvement (Hilgard, 1970), vividness

of imagery (Farthing et al., 1983) and absorption (Piesbergen & Peter, 2006). Regarding more general personality traits without an apparent connection to hypnosis, the results are more ambiguous. Recent research in personality psychology has widely accepted and settled upon the "Big Five" : a set of five major dimensions – Neuroticism, extraversion, agreeableness, conscientiousness, and openness to experience – forming a comprehensive summary of individual differences in personality (Costa & McCrae, 1985; Plaisant et al., 2010) that may be assessed by the Big Five Inventory (BFI). Considering absorption as a crucial mechanism in hypnotizability, it has been showed to be linked to the openness trait (Glisky & Kihlstrom, 1993; Tellegen & Atkinson, 1974). Accordingly, some studies have only reported a weak correlation between hypnotizability and openness to experience (Glisky et al., 1991; Malinoski & Lynn, 1999; Nordenstrom & Meier, 2002). More recently, Zhang et al. (2017) reported weak correlation between openness, extraversion, and agreeableness traits only in individuals with high levels of hypnotizability (Zhang et al., 2017), while Green (2004) did not find any significant association between personality and hypnotizability (Green, 2004). Therefore, the relationship between hypnosis and personality remains unclear and merits further investigation.

The aim of the present study was to determine whether the level of hypnotizability might be associated to the general daytime sleepiness, and to personality traits. We aimed to address this issue by devising an easy-to-implement assessments applicable to both clinical practitioners and researchers in hypnosis, thereby using brief, reliable and standardized questionnaires.

Method

Participants

Seventy-eight healthy volunteers (24.21 ± 2.98 years, 34 women) took part in the experiment. Participants were students at the University Claude Bernard Lyon 1 (France) and were recruited through public bulletin boards and e-mailing list announcements. All participants were informed that the study was conducted to collect data about hypnotizability and that they would be able to learn about their own level of hypnotizability without further details regarding the aim of the study. They were also informed that they would be videotaped during the hypnotizability test to ensure the validity of the obtained scores by checking their behavioral responses a posteriori. All participants signed an informed consent form before the study began in accordance with Helsinki and this study was approved by the Institutional Review Board of the University of Lyon (N° : 2023-10-19-002).

General design

First, the day before the experiment, participants were asked to fill in individual on-line forms of the Epworth Sleepiness Scale (ESS) to assess general daytime sleepiness propensity (Johns, 1991), and the 10-item Big Five Inventory BFI-10 (Courtois et al., 2020). Then, participants were invited to the laboratory for the assessment of their hypnotizability in a group session using the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A), conducted by a certified hypnotist (UD). During this hypnosis session, as

is conventionally done, 12 suggestions were given to quantify the hypnotizability of participants according to their responses to these suggestions. The data were collected in eight sessions held in a quiet experimental room in groups of 10 participants maximum who were seated on a chair, about 1 m apart. Before the hypnotic induction phase, they were asked to answer questions about their past experiences and beliefs concerning hypnosis, as well as their level of alertness. Then, the hypnotist initiated the HGSHS:A with standardized demystification of hypnosis to address misconceptions and negative beliefs, facilitating optimal response. This was followed with induction and suggestions according to the HGSHS:A conventional procedures. After the hypnosis session, participants scored their behavioral response and subjective experience in the HGSHS:A booklet and were asked again to evaluate their belief and alertness level (post-alertness). The session was videotaped so that it could be noted a posteriori whether participants passed or failed each of the 12-item objectively. Total length of the session was about 55 minutes.

Psychometric tests and questionnaires

Harvard group scale of hypnosis susceptibility: form A

At the beginning of the session, using the HGSHS:A, participants were asked about their past experience with hypnosis, i.e. whether or not they had ever been hypnotized. We further asked them their level of belief in the practice of hypnosis before and after HGSHS:A procedure using a linear 100 mm visual analogue scales (VAS) anchored at either end with "I strongly don't believe in hypnosis" to "I strongly believe in hypnosis," corresponding to 0 and 10 respectively. Participants indicated their responses by marking the line, and the distance in millimeters from zero was used in subsequent analyses.

The HGSHS:A french version (see Anlló et al., 2017) is a widely used standardized hypnosis scales composed of 12 items to screen the hypnotic responsiveness. Objective behavioral responses to the 12 suggestions were scored, and the number of passed items corresponded to the participant's level of hypnotizability. Participants with scores ranging from 0 to 4 points, 5 to 8 points, and 9 to 12 points are considered having a low, medium and high level of hypnotizability respectively.

Sleepiness-related scales

The Epworth Sleepiness Scale (ESS) is the most used scales in the field of sleep to assess the sleepiness propensity and demonstrated good reliability and validity (Gonçalves et al., 2023; Johns, 1991). Individual has to rate the likelihood of falling asleep during daily situations such as sitting and reading, or in a car, while stopped for a few minutes in the traffic. The ESS includes eight situations, scored from 0 ("would never fall asleep") to 3 ("very high chance to doze") points, resulting in a total score ranging from 0 to 24 points. Scores ranging from 0 to 10 points correspond to the normal range of sleepiness in healthy adults. Scores from 11 to 14 indicate mild sleepiness, scores from 15 to 17 indicate moderate sleepiness, and scores from 18 to 24 indicate severe sleepiness. Cronbach's alpha value was 0.81 in our study.

For control purposes, participant's instantaneous alertness was assessed pre- and post-hypnosis on a linear 100 mm visual analogue scales (VAS). The VAS was anchored at either end with "very sleepy, great effort to stay awake, or fighting sleep" to "very alert," corresponding to 0 and 10 respectively.

Personality traits assessment

Participants' personality traits were determined using the French 10-item version of the Big Five Inventory BFI-Fr (Courtois et al., 2020). This shorter version consists of 10 items, rated on a five-point Likert scale from 1 = "disagree strongly" to 5 = "agree strongly," measuring normal adult personality across the following five basic domains: neuroticism (N), extraversion (E), openness to experience (O), agreeableness (A), and conscientiousness (C). Cronbach's alpha for the five factors ranged from a minimum of 0.74 (agreeableness) to a maximum of 0.86 (neuroticism).

Statistical analyses

Quantile-to-quantile plots were used to explore the normality of data. Sleepiness scores were submitted to a one-way Analysis of Variance (ANOVA) with the level of hypnotizability according to three groups (High, Medium and Low) as between factor. A two-way ANOVA was applied to BFI-10 scores across the five BFI-10 personality domains (E, O, A, C and N) in the High, Medium, and Low groups. Posthoc analyses with Bonferroni correction for multiple comparisons were performed when significant effects or interaction were found following ANOVAs.

Multivariable linear regression analysis was used to explore the factors associated with hypnotizability (factors explored: gender, age, past hypnosis experience, belief in hypnosis, sleepiness, and personality traits). The β coefficient (i.e., estimate the effect on the outcome of each 1-unit increase in the independent variable), standard error (SE) and the adjusted coefficients R^2 (i.e., percentage of variance explained) were computed. For explanatory variables that were statistically significant, additional statistical analyses were performed: one-sided Mann-Whitney test and Pearson correlation.

Finally, one-sided Wilcoxon signed-rank tests were performed to compare participants' belief in the practice of hypnosis pre- and post-session, as well as their level of alertness. Statistical analyses were performed with JASP® software (version 0.18.3.0). All hypotheses were tested using a statistical significance level of 0.05.

Results

Harvard group scale of hypnosis susceptibility: form a score

The mean total score of hypnotizability using the HGSHS:A was 6.64 ± 2.96 which corresponds to the data observed in 12 international HGSHS:A reference sample scores from 5.36 to 7.64 (Lichtenberg, 2008). Here, 26 participants (32.33%) scored as high, 21 participants (26.92%) as low, and the remaining 31 participants (39.74%) were medium. A significative difference (Mann-Whitney U Test = 1060.5; $p = .002$) was found between females (7.88 ± 2.66) and males (5.77 ± 2.82).

General daytime sleepiness and personality traits

The average score obtained by participants for the ESS questionnaire and the 10- BFI results are indicated in Table 1. The ESS mean score of participants was 8.24 (±3.88) which corresponds to the normative values of sleepiness in healthy adults. The results on the five 10-BFI personality domains followed the range of a normative study carried out

Table 1. Sleepiness and personality traits scores extracted from the ESS and 10-BIF questionnaires ranging from 0 to 24 points and 0 to 5 points respectively. Data are presented as mean (± standard deviation).

Sleepiness (ESS)		8.24 (±3.88)
Personality traits (10-BFI)	Openness	2.89 (±0.93)
	Consciousness	3.54 (±0.82)
	Extraversion	2.74 (±1.06)
	Agreeableness	2.99 (±0.97)
	Neuroticism	2.69 (±1.24)

internationally Openness : 2.9 ± 1.3, Consciousness : 4.0 ± 1.0, Extraversion : 3.0 ± 1.5, Agreeableness 3.9 ± 1.1, and Neuroticism : 2.4 ± 1.4 (Mastracusa et al., 20232023).

Predictive factors of hypnotizability

ANOVA performed on the general daytime sleepiness scores across the three groups – High, Medium, and Low levels of hypnotizability – revealed a main effect of the level of hypnotizability ($F_{(2,71)} = 5.57$; $p = .006$), with higher sleepiness scores in participants having a high level of hypnotizability compared to those with a low level (posthoc t-test $t_{(71)} = 3.26$; $p = .005$). No significant difference was observed between the Medium group and the two others (Figure 1).

In contrast, the two-way ANOVA performed on BFI-10 scores did not show a main effect of group of level of hypnotizability ($F_{(2,335)} = 1.006$; $p = .37$), and no interaction ($F_{(8,335)} = 1.07$; $p = .38$). It showed a main effect of personality domains (E, O, C, A and N; $F_{(4,335)} = 7.7$, $p < .001$).

In addition, the main result from the multivariable regression model showed that the level of hypnotizability was strongly associated with general daytime sleepiness score (ESS; $p = .006$) and the gender ($p = .03$). Personality traits were not associated to the level of hypnotizability (Table 2).

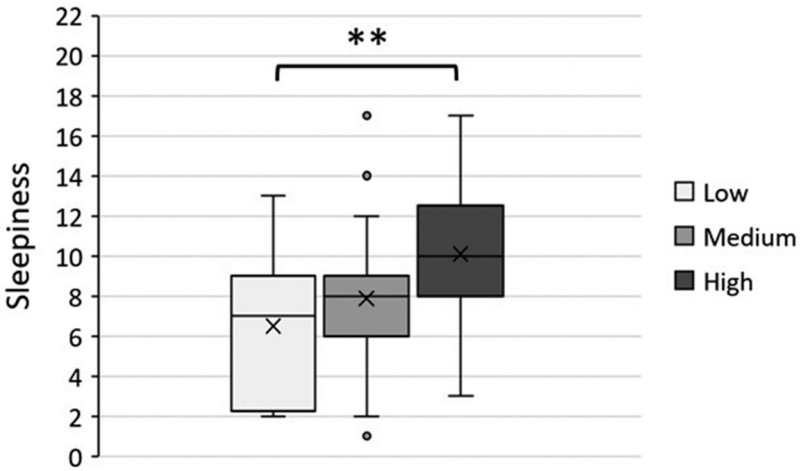

Figure 1. Sleepiness scores from ESS questionnaire according to low ($n = 21$), medium ($n = 31$) and high ($n = 26$) level of hypnotizability in participants. **$p < .01$.

Table 2. Multivariable regression model to identify the association between hypnotizability and six factors: gender, age, past hypnosis experience, belief in hypnosis, sleepiness, and personality traits. Significant relationships of the model analyses are in bold. *$p <$ .05; **$p <$ .01; SE is the standard error. *P*-value of the model: <.001. Adjusted R^2 was 0.56.

	β	SE	Standardized β	Standardized SE	*p*-value
Gender (Male)	−2.48	1.07	−2.48	1.07	**.03***
Age	0.22	0.16	0.72	0.54	.20
Previously hypnotized (Yes)	1.36	0.94	1.36	0.94	.14
Pre-hypnosis belief (VAS)	−0.03	0.17	−0.07	0.42	.87
Sleepiness (ESS)	0.33	0.11	1.36	0.45	**.006****
Openness	−0.39	0.43	−0.35	0.38	.36
Consciousness	−0.52	0.45	−0.44	0.38	.26
Extraversion	−0.42	0.39	−0.44	0.41	.30
Agreeableness	0.23	0.46	0.21	0.42	.62
Neuroticism	0.12	0.35	0.14	0.42	.74

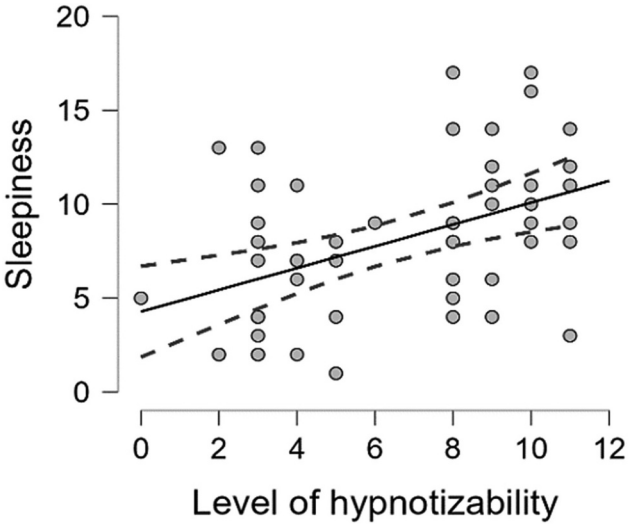

Figure 2. Pearson correlation between participants' level of hypnotizability and sleepiness scores from ESS questionnaire. The dashed lines indicate the 95% confidence interval. $r = 0.44$.

As previously shown by the one-sided Mann-Whitney test on the gender factor in the first paragraph of the results, females had a significantly higher level of hypnotizability than males (7.88 ± 2.66 versus 5.77 ± 2.82, $W = 1060.5$, $p = .002$). Pearson correlation analysis between the level of hypnotizability and sleepiness score further revealed a positive correlation ($r = 0.44$, $p < .001$). Figure 2 depicts the relationship between hypnotizability and sleepiness.

Complementary assessments: belief and alertness

Out of the 78 participants, 60.26% ($n = 47$) have never been hypnotized. In addition, participants' belief in the practice of hypnosis increased from 6.90 (±2.47) pre-session to 7.36 (±1.74) post-session on the VAS (one-sided Wilcoxon signed-rank test = 245,

z = −2.02, $p = .02$). The repeated measures ANOVA taking into account the "previously hypnotized" factor, and the pre- and post- belief in hypnosis factor, revealed an interaction effect ($F_{(1,71)} = 4.48$, $p = .04$). Thereby, the difference in pre- and post-belief levels was only observed for participants who have never been hypnotized before (*Posthoc* t-test $t_{(71)} = -2.89$, $p = .04$).

The level of alertness, assessed on a VAS as a control measure, revealed a significant decrease from pre- (6.19 ± 1.82) to post-session (5.35 ± 2.29) (One-sided Wilcoxon signed-rank test = 1351.5, z = 2.629, $p = .004$), consistent with typical findings in similar conditions documented in the literature [18].

Discussion

We conducted the present study to examine whether general daytime sleepiness and personality traits were associated to receptiveness to hypnotic suggestions. The main finding revealed an association between the level of sleepiness and hypnotizability, but no influence of the personality traits. Interestingly, our data further showed that women exhibit higher levels of hypnotizability compared to men. Finally, preexisting beliefs in hypnosis increased after the session using HGSHS:A in inexperienced individuals, without influence on their level of hypnotizability.

The main important finding is that our results not only replicate the previously reported difference in self-reported daytime sleepiness (ESS) between high and low hypnotizable individuals by Móró et al. (2011), but further reinforce these observations by demonstrating a correlation between daytime sleepiness and the level of hypnotizability (HGSHS: A). This is consistent with the existing literature suggesting that high hypnotizable individuals, relative to the low, more easily transition from wakefulness to daytime sleep (Evans, 1977; Móró et al., 2011). Importantly, our data showed a correlation between general daytime sleepiness scores and the level of hypnotizability ($r = 0.44$). In contrast, Móró et al. (2011) reported a weaker correlation between daytime sleepiness scores and hypnotizability (20%), which was nearly significant ($p = .06$). One possible explanation for this discrepancy may relate to the difference in the nature of the HGSHS:A administration between the two studies (i.e., audiotape vs. live-hypnotist here). Költő and Polito (2017) did not find differences in hypnotizability scores between different types of HGSHS:A administration, the absence of reproducibility tests in both their study and that of Móró et al. (2011) raises concerns regarding the reliability of audiotape HGSHS:A compared to live human administration. The HGSHS:A screening procedure administered live by a hypnotist may be time-consuming compared to the audiotape method, but it provides the advantage of adapting to the pace of behavioral responses to hypnotic suggestions, especially in group settings, such as slowing down the script rhythm, incorporating longer periods of silence, or adding ratification/positive feedback. Moreover, our finding from a live hypnotist administering the HGSHS:A better aligns with the personalized and tailored approach characteristic of actual hypnosis practice (Geagea et al., 2023). Thus, our data highlights the potential to use of indirect and brief inquiries about sleepiness (e.g. derived from the ESS) in hypnosis context of application for both patients and participants, serving as a robust predictor of their responsiveness to hypnotic suggestions.

The second result of the study did not reveal any association between the personality traits and the hypnotizability level. This finding is corroborated by a prior study conducted by Nordenstrom and Meier (2002) where the 45-item BFI and the HGSHS:A were used, revealing no significant relationships between personality traits and hypnotic suggestibility. Therefore, our data further support that assessing personality traits by means of the brief 10-item BFI may not be associated with the degree of hypnotizability. Yet, several studies using various measurements of personality traits and methods for assessing hypnotizability have also failed to establish reliable relationships between both (Malinoski & Lynn, 1999; Radtke & Stam, 1991). At best, weak associations between hypnotizability and openness to experience have been emphasized by Glisky et al. (1991) albeit limited to high hypnotizable subjects. Given that other authors have reported associations between hypnotic susceptibility and extraversion-agreeableness traits, but not with openness (Malinoski & Lynn, 1999; Green, 2004), one may conclude that the assessment of personality traits does not appear to be a stable or a reliable predictor of hypnotizability levels. However, historical studies focusing on personality as a whole have reported that three distinct personality styles correlated with low, medium and high hypnotizability, which have been described as Apollonian, Odyssean and Dionysian, respectively (Greenleaf, 2006; Spiegel & Spiegel, 1978). These personality styles were defined according to various criteria reflecting the complexity of the human personality, such as propensity to be rational, intuitive, or antisocial, for example. Therefore, rather than focusing on just one of the five personality domains, future studies could investigate the correlation of the combination of several domains with hypnotizability levels.

Analysis of gender factor revealed that women (7.77 ± 3.09) had a higher level of hypnotizability relative to men (5.23 ± 3.00). This finding is similar to those obtained in several recent standardized studies in the domain of hypnosis using the HGSHS:A (Cardeña et al., 2007; Költő & Polito, 2017; Page & Green, 2007), and others using different tools for hypnotic suggestibility measurements (Asensio et al., 2018). Our data particularly replicated those by Költő and Polito (2017) with HGSHS:A group setting where women also demonstrated higher hypnotizability than men, particularly at a young age (mean 24.55 years vs 25 here). They further reported that women were more hypnotizable than men in a group setting but not in an individual context and suggested that this may be due to cooperation-type which is influenced by gender and setting. According to Charness and Rustichini (2011) when being observed by their peers, men cooperated substantially less often, whereas women cooperated substantially more often.

Finally, our data showed that the level of belief in hypnosis practice did not influence the level of hypnotizability. This result is partially in line with the findings of Groth-Marnat and Mitchell (1998) and Shimizu (2014), suggesting that the measurement of acceptance or resistance to hypnotic suggestions using the Therapeutic Reactance Scale (Dowd et al., 1991) in conjunction with the use of HGSHS:A may not consistently predict differential hypnotic responsiveness. However, it is noteworthy that Robin et al. (2005) reported contrasting results despite using similar materials. Here, it is important to acknowledge that our question regarding belief in hypnosis practice could have been interpreted (at least) in two ways: either as belief in the effectiveness of therapeutic hypnosis involving beliefs about hypnotic states, or as expectations about what would happen to the subject during the subsequent hypnosis session using HGSHS:A. Moreover, pre-hypnotic information and instructions from the HGSHS:A to counteract misconceptions about hypnosis and negative

beliefs and attitudes that may impede optimal responding were communicated to subjects after asking their belief about hypnosis practice. Therefore, even if it is possible that the level of hypnotizability may not depend on the belief in its effectiveness as a peculiar state of consciousness, this result should be taken with caution as it may have been influenced by the pre-hypnotic HGSHS:A information. From a practical perspective, this also emphasizes the importance for therapists to address clients 'misconceptions, particularly fears related to the belief that hypnosis abilities are unnatural, such as those associated with arousing extraordinary ability.

Summary and conclusions

To conclude, the present findings strongly support that general daytime sleepiness is strongly associated with hypnotizability levels, while personality traits may not. Given the study's dedication to identify predictive factors of hypnotizability allowing a quick and easy-to-implement assessment tools for practitioners in both clinical and research contexts, we can recommend the use of indirect questions regarding general daytime sleepiness. Additionally, it was shown that women exhibit higher levels of hypnotizability compared to men. Thus, if patients or potential participants in hypnotic experiments report a tendency to easily fall asleep in daytime situations and are women, it may enhance the likelihood of hypnotic responsiveness.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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References

Alladin, A., & Alibhai, A. (2007). Cognitive hypnotherapy for depression: An empirical investigation. *The International Journal of Clinical and Experimental Hypnosis*, *55*(2), 147–166. https://doi.org/10.1080/00207140601177897

Anlló, H., Becchio, J., & Sackur, J. (2017). French norms for the Harvard group scale of hypnotic susceptibility, form A. *HAL (Le Centre Pour La Communication Scientifique Directe)*, *65*(2), 241–255. https://doi.org/10.1080/00207144.2017.1276369

Asensio, X. P., Escolano, A. F., & Rodríguez, J. R. (2018). Psychometric analysis of the barber suggestibility scale in a clinical population. *The American Journal of Clinical Hypnosis*, *60*(4), 386–402. https://doi.org/10.1080/00029157.2017.1421138

Cardeña, E., Kallio, S., Terhune, D. B., Buratti, S., & Lööf, A. (2007). The effects of translation and sex on hypnotizability testing. *Contemporary Hypnosis*, *24*(4), 154–160. https://doi.org/10.1002/ch.340

Charness, G., & Rustichini, A. (2011). Gender differences in cooperation with group membership. *Games and Economic Behavior*, *72*(1), 77–85. https://doi.org/10.1016/j.geb.2010.07.006

Cojan, Y., Piguet, C., & Vuilleumier, P. (2015). What makes your brain suggestible? Hypnotizability is associated with differential brain activity during attention outside hypnosis. *Neuroimage: Reports*, *117*, 367–374. https://doi.org/10.1016/j.neuroimage.2015.05.076

Cordi, M. J., & Rasch, B. (2022). Hypnotizability may relate to interoceptive ability to accurately perceive sleep depth: An exploratory study. *The International Journal of Clinical and Experimental Hypnosis*, *70*(4), 385–402. https://doi.org/10.1080/00207144.2022.2130068

Costa, P. T., Jr., & McCrae, R. R. (1985). Concurrent validation after 20 years: Implications of personality stability for its assessment. In J. N. Butcher & C. D. Spielberger (Eds.), *Advances in personality assessment* (Vol. 4, pp. 31–54). Erlbaum.

Council, J. R., & Green, J. P. (2004). Examining the absorption-hypnotizability link: The roles of acquiescence and consistency motivation. *The International Journal of Clinical and Experimental Hypnosis*, *52*(4), 364–377. https://doi.org/10.1080/00207140490883950

Courtois, R., Petot, J., Plaisant, O., Allibe, B., Lignier, B., Réveillère, C., Lecocq, G., & John, O. P. (2020). Validation française du Big Five Inventory à 10 items (BFI-10). *L'Encéphale*, *46*(6), 455–462. https://doi.org/10.1016/j.encep.2020.02.006

De Pascalis, V. (2024). Brain functional correlates of resting hypnosis and hypnotizability: A review. *Brain Sciences*, *14*(2), 115. https://doi.org/10.3390/brainsci14020115

Diolaiuti, F., Fantozzi, M. P. T., DiGalante, M., D'Ascanio, P., Faraguna, U., Sebastiani, L., & Santarcangelo, E. L. (2020). Association of hypnotizability and deep sleep: Any role for interoceptive sensibility? *Experimental Brain Research*, *238*(9), 1937–1943. https://doi.org/10.1007/s00221-020-05853-4

Dowd, E. T., Milne, C. R., & Wise, S. L. (1991). The therapeutic reactance scale: A measure of psychological reactance. *Journal of Counseling & Development*, *69*(6), 541–545. https://doi.org/10.1002/j.1556-6676.1991.tb02638.x

Elkins, G., Barabasz, A., Council, J. R., & Spiegel, D. (2015). Advancing research and practice: The revised APA division 30 definition of hypnosis. *The American Journal of Clinical Hypnosis*, *57*(4), 378–385. https://doi.org/10.1080/00029157.2015.1011465

Evans, F. J. (1977). Hypnosis and sleep: The control of altered states of awareness*. *Annals of the New York Academy of Sciences*, *296*(1), 162–174. https://doi.org/10.1111/j.1749-6632.1977.tb38170.x

Farthing, C. W., Venturino, M., & Brown, S. W. (1983). Relationship between two different types of imagery vividness questionnaire items and three hypnotic susceptibility scale factors: A brief communication. *The International Journal of Clinical and Experimental Hypnosis*, *31*(1), 8–13. https://doi.org/10.1080/00207148308407176

Geagea, D., Ogez, D., Kimble, R., & Tyack, Z. (2023). Redefining hypnosis: A narrative review of theories to move towards an integrative model. *Complementary Therapies in Clinical Practice*, *54*, 101826. https://doi.org/10.1016/j.ctcp.2023.101826

Glisky, M. L., & Kihlstrom, J. F. (1993). Hypnotizability and facets of openness. *The International Journal of Clinical and Experimental Hypnosis*, *41*(2), 112–123. https://doi.org/10.1080/00207149308414542

Glisky, M. L., Tataryn, D. J., Tobias, B. A., Kihlstrom, J. F., & McConkey, K. M. (1991). Absorption, openness to experience, and hypnotizability. *Journal of Personality & Social Psychology*, *60*(2), 263–272. https://doi.org/10.1037/0022-3514.60.2.263

Gonçalves, M. T., Malafaia, S., Santos, J. M. D., Roth, T., & Marques, D. R. (2023). Epworth sleepiness scale: A meta-analytic study on the internal consistency. *Sleep Medicine*, *109*, 261–269. https://doi.org/10.1016/j.sleep.2023.07.008

Green, J. P. (2004). The five factor model of personality and hypnotizability: Little variance in common. *Contemporary Hypnosis*, *21*(4), 161–168. https://doi.org/10.1002/ch.303

Greenleaf, M. (2006). Mind styles and the hypnotic induction profile: Measure and match to enhance medical treatment. *The American Journal of Clinical Hypnosis*, *49*(1), 41–58. https://doi.org/10.1080/00029157.2006.10401551

Groth-Marnat, G., & Mitchell, K. (1998). Responsiveness to direct versus indirect hypnotic procedures: The role of resistance as a predictor variable. *The International Journal of Clinical and Experimental Hypnosis*, *46*(4), 324–333. https://doi.org/10.1080/00207149808410012

Gruzelier, J. H. (2002). A review of the impact of hypnosis, relaxation, guided imagery and individual differences on aspects of immunity and health. *Stress*, *5*(2), 147–163. https://doi.org/10.1080/10253890290027877

Hammond, D. C. (2007). Review of the efficacy of clinical hypnosis with headaches and migraines. *The International Journal of Clinical and Experimental Hypnosis*, *55*(2), 207–219. https://doi.org/10.1080/00207140601177921

Hammond, D. C. (2010). Hypnosis in the treatment of anxiety- and stress-related disorders. *Expert Review of Neurotherapeutics*, *10*(2), 263–273. https://doi.org/10.1586/ern.09.140

Hilgard, J. R. (1970). *Personality and hypnosis. A study of imaginative involvement*. University of Chicago Press.

Jensen, M. P., Jamieson, G. A., Lutz, A., Mazzoni, G., McGeown, W. J., Santarcangelo, E. L., Demertzi, A., De Pascalis, V., Bányai, É. I., Rominger, C., Vuilleumier, P., Faymonville, M. E., & Terhune, D. B. (2017). New directions in hypnosis research: Strategies for advancing the cognitive and clinical neuroscience of hypnosis. *Neuroscience of Consciousness*, *3*(1), nix004. https://doi.org/10.1093/nc/nix004

Jensen, M. P., & Patterson, D. R. (2014). Hypnotic approaches for chronic pain management: Clinical implications of recent research findings. *The American Psychologist*, *69*(2), 167–177. https://doi.org/10.1037/a0035644

Johns, M. W. (1991). A new method for measuring daytime sleepiness: The Epworth sleepiness scale. *SLEEP*, *14*(6), 540–545. https://doi.org/10.1093/sleep/14.6.540

Költő, A., & Polito, V. (2017). Changes in the sense of agency during hypnosis: The Hungarian version of the sense of agency rating scale (SOARS-HU) and its relationship with phenomenological aspects of consciousness. *Consciousness and Cognition*, *49*, 245–254. https://doi.org/10.1016/j.concog.2017.02.009

Langlois, P., Perrochon, A., Ragazzoni, D., Rainville, P., Wood, C., Vanhaudenhuyse, A., Pageaux, B., Ounajim, A., Lavallière, M., Debarnot, U., Luque-Moreno, C., Roulaud, M., Simoneau, M., Goudman, L., Moens, M., Rigoard, P., & Billot, M. (2022). Hypnosis to manage musculoskeletal and neuropathic chronic pain: A systematic review and meta-analysis. *Neuroscience & Biobehavioral Reviews*, *135*, 104591. https://doi.org/10.1016/j.neubiorev.2022.104591

Lichtenberg, P. (2008). Israeli norms for the Harvard group scale of hypnotic susceptibility, form A. *The International Journal of Clinical and Experimental Hypnosis*, *56*(4), 384–393. https://doi.org/10.1080/00207140802255385

Lynn, S. J., Green, J. P., Accardi, M., & Cleere, C. (2010). Hypnosis and smoking cessation: The state of the science. *The American Journal of Clinical Hypnosis*, *52*(3), 177–181. https://doi.org/10.1080/00029157.2010.10401717

Malinoski, P., & Lynn, S. J. (1999). The plasticity of early memory reports: Social pressure, hypnotizability, compliance and interrogative suggestibility. *The International Journal of Clinical and Experimental Hypnosis*, *47*(4), 320–345. https://doi.org/10.1080/00207149908410040

Mastrascusa, R. C., De Oliveira Fenili Antunes, M. L., De Albuquerque, N. S., Virissimo, S. L., Moura, M. F., Motta, B. V. M., De Lara Machado, W., Moret-Tatay, C., & Irigaray, T. Q. (2023). Evaluating the complete (44-item), short (20-item) and ultra-short (10-item) versions of the Big Five Inventory (BFI) in the Brazilian population. *Scientific Reports*, *13*(1). https://doi.org/10.1038/s41598-023-34504-1

Meyer, E. C., & Lynn, S. J. (2011). Responding to hypnotic and nonhypnotic suggestions: Performance standards, imaginative suggestibility, and response expectancies. *The International Journal of Clinical and Experimental Hypnosis*, *59*(3), 327–349. https://doi.org/10.1080/00207144.2011.570660

Móró, L., Noreika, V., Revonsuo, A., & Kallio, S. (2011). Hypnotizability, sleepiness, and subjective experience. *The International Journal of Clinical and Experimental Hypnosis*, *59*(2), 211–224. https://doi.org/10.1080/00207144.2011.546220

Nordenstrom, B. K., & Meier, B. P. (2002). The "Big Five" and hypnotic suggestibility. *The International Journal of Clinical and Experimental Hypnosis*, *50*(3), 276–281. https://doi.org/10.1080/00207140208410103

Oakley, D. A., & Halligan, P. W. (2013). Hypnotic suggestion: Opportunities for cognitive neuroscience. *Nature Reviews. Neuroscience*, *14*(8), 565–576. https://doi.org/10.1038/nrn3538

Page, R. A., & Green, J. P. (2007). An update on age, hypnotic suggestibility, and gender: A brief report. *The American Journal of Clinical Hypnosis*, *49*(4), 283–287. https://doi.org/10.1080/00029157.2007.10524505

Piccione, C., Hilgard, E. R., & Zimbardo, P. G. (1989). On the degree of stability of measured hypnotizability over a 25-year period. *Journal of Personality & Social Psychology*, *56*(2), 289–295. https://doi.org/10.1037/0022-3514.56.2.289

Piesbergen, C., & Peter, B. (2006). An investigation of the factor structure of the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS: A). *Contemporary Hypnosis*, *23*(2), 59–71. https://doi.org/10.1002/ch.311

Plaisant, O., Courtois, R., Réveillère, C., Mendelsohn, G. A., & John, O. P. (2010). Validation par analyse factorielle du Big Five Inventory français (BFI-Fr). Analyse convergente avec le NEO-PI-R. *Annales Médico-psychologiques, revue psychiatrique*, *168*(2), 97–106. https://doi.org/10.1016/j.amp.2009.09.003

Radtke, H. L., & Stam, H. J. (1991). The relationship between absorption, openness to experience, anhedonia, and susceptibility. *The International Journal of Clinical and Experimental Hypnosis*, *39*(1), 39–56. https://doi.org/10.1080/00207149108409617

Robin, B. R., Kumar, V. K., & Pekala, R. J. (2005). Direct and indirect scales of hypnotic susceptibility: Resistance to therapy and psychometric comparability abstract. *The International Journal of Clinical and Experimental Hypnosis*, *53*(2), 135–147. https://doi.org/10.1080/00207140590927617

Rotaru, T. S., & Rusu, A. (2016). A meta-analysis for the efficacy of hypnotherapy in alleviating PTSD symptoms. *The International Journal of Clinical and Experimental Hypnosis*, *64*(1), 116–136. https://doi.org/10.1080/00207144.2015.1099406

Ruggirello, S., Campioni, L., Piermanni, S., Sebastiani, L., & Santarcangelo, E. L. (2019). Does hypnotic assessment predict the functional equivalence between motor imagery and action? *Brain & Cognition*, *136*, 103598. https://doi.org/10.1016/j.bandc.2019.103598

Santarcangelo, E. L., & Carli, G. (2021). Individual traits and pain treatment: The case of hypnotizability. *Frontiers in Neuroscience*, *15*, 15. https://doi.org/10.3389/fnins.2021.683045

Shimizu, T. (2014). A causal model explaining the relationships governing beliefs, attitudes, and hypnotic responsiveness. *The International Journal of Clinical and Experimental Hypnosis*, *62*(2), 231–250. https://doi.org/10.1080/00207144.2014.869142

Shor, R. E., & Orne, E. C. (1963). Norms on the Harvard group scale of hypnotic susceptibility, form A. *The International Journal of Clinical and Experimental Hypnosis*, *11*(1), 39–47. https://doi.org/10.1080/00207146308409226

Sodre, M. E. J., Wießner, I., Irfan, M., Schenck, C. H., & Mota-Rolim, S. A. (2023). Awake or sleeping? Maybe both … A review of sleep-related dissociative states. *Journal of Clinical Medicine*, *12*(12), 3876. https://doi.org/10.3390/jcm12123876

Spiegel, H., & Spiegel, D. (1978). *Trance and treatment: Clinical uses of hypnosis*. Basic Books (Reprinted, Washington, DC, American Psychiatric Press, 1987).

Tellegen, A., & Atkinson, G. (1974). Openness to absorbing and self-altering experiences ("absorption"), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology*, *83*(3), 268–277. https://doi.org/10.1037/h0036681

Tome-Pires, C., & Miro, J. (2012). Hypnosis for the management of chronic and cancer procedure-related pain in children. *The International Journal of Clinical and Experimental Hypnosis*, *60*(4), 432–457. https://doi.org/10.1080/00207144.2012.701092

Yapko, M. D. (2024). Guest editorial: Hypnosis in treating depression: The despair of young people. *The American Journal of Clinical Hypnosis*, *66*(2), 93–96. https://doi.org/10.1080/00029157.2024.2343622

Zhang, Y., Wang, Y., Shen, C., Ye, Y., Shen, S., Zhang, B., Wang, J., Chen, W., & Wang, W. (2017). Relationship between hypnosis and personality trait in participants with high or low hypnotic susceptibility. *Neuropsychiatric Disease and Treatment*, *13*, 1007–1012. https://doi.org/10.2147/ndt.s134930