



Hypnotised by Your Phone? Smartphone Addiction Correlates With Hypnotisability

Jay A. Olson^{1*}, Moriah Stendel² and Samuel Veissière^{1,3,4}

¹ Department of Psychiatry, McGill University, Montreal, QC, Canada, ² Department of Psychology, University of Oregon, Eugene, OR, United States, ³ Culture, Mind, and Brain Program, McGill University, Montreal, QC, Canada, ⁴ Department of Anthropology, McGill University, Montreal, QC, Canada

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*Correspondence:

Jay A. Olson
jay.olson@mail.mcgill.ca

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Hypnosis and heavy smartphone use are both characterised by absorbed states in which one loses track of time and responds automatically to stimuli. In this pre-registered study, we tested whether there was a relationship between smartphone addiction and hypnotisability: one's tendency to follow suggestions under hypnosis. Over 11 public lectures, we hypnotised 641 student-aged participants; after the hypnosis session, participants completed the Smartphone Addiction Scale (Short Version). There was a positive correlation between hypnotisability and smartphone addiction ($r = .17$, 95% CI [.09, .24], $p < .001$) with a magnitude similar to standard predictors of hypnotisability. This correlation was small but unlikely spurious: it was positive in 10 of the 11 samples (including two from psychology courses) and persisted in a follow-up several months later. The addiction scores in this Canadian sample were unexpectedly high ($M = 31.41$) compared to other countries. We hypothesise that targeting the absorbed, time-distorted, and automatic use of smartphones may promote healthier phone habits.

Keywords: problematic smartphone use, smartphone addiction, technology addiction, hypnosis, hypnotisability

INTRODUCTION

Smartphone use has risen dramatically in the past decade. In the United States, 96% of young adults own a smartphone (1) and half of teenagers report feeling addicted to their phones (2); other developed countries show similar rates (3). Researchers and reporters have compared this heavy phone use to a trance or hypnosis (4, 5). Madrigal (6) even likens the “hypnotic” state of endless social media scrolling to the trance-like absorption of slot machines (7), due to their intermittent rewards (8). If heavy smartphone use can resemble hypnosis, people who are more hypnotisable may also be more prone to *problematic smartphone use*, in which phone use interferes with daily life (9). No studies have yet attempted to link these phenomena, so we present the first test of this hypothesis.

The American Psychological Association defines hypnosis as a “state of consciousness involving focused attention and reduced peripheral awareness characterised by an enhanced capacity for response to suggestion” (10), though researchers debate aspects of this definition (11). We propose that hypnosis and heavy smartphone use may share phenomenological features such as absorption, time distortion, and automaticity. Absorption refers to the tendency to become immersed in one's

thoughts or experiences (12), such as forgetting about the movie theatre while watching a film. Absorption predicts addictive behaviours in the context of gambling (7, 13), video games (14), internet use (15), and problematic smartphone use (16). Heavy smartphone users often find themselves in these absorbed states, leading to the term “smartphone zombie” to describe the head-down phone-absorbed user, who occasionally walks into other pedestrians—or into traffic (17). Several cities have already established special walking lanes for smartphone users, and researchers have developed phone functions to warn users about incoming objects in the environment, highlighting the extent of absorbed attention when using a phone. Similarly, many people report being heavily absorbed in their experience when under hypnosis (18, 19), and trait absorption tends to correlate with hypnotisability (12, 20, 21).

Hypnosis and smartphone use can also both distort time perception. People underestimate the amount of time spent on their phone (22), with heavier smartphone users showing greater distortions (23). Accordingly, several measures of problematic smartphone use probe whether people use their phone longer than they intend (24, 25). Similar time distortions are well known in hypnosis; people consistently underestimate how long they were hypnotised for, and the higher their hypnotisability, the larger this distortion (26, 27).

Finally, hypnosis and smartphone use can both elicit automatic behaviours with a reduced feeling of control. People can become side-tracked while simply trying to check the time on their phone (28) and report being “sucked down a rabbit hole of un-productivity” (29) or “into some mindless ... black hole” (30). People commonly report a loss of self-control when using their phones (30), especially if they feel addicted to them (31). Relatedly, people feel less control over their behaviours under hypnosis (32), such as feeling their arm lifting without their apparent control. People can even engage in complex behaviours, such as writing sentences with a pen, without feeling like they are controlling their actions (33).

Given these phenomenological similarities, we hypothesised that people who are more hypnotisable—those more likely to follow suggestions under hypnosis (10)—would be more prone to problematic smartphone use. We anticipated a correlation around $r = .19$, similar to other predictors of hypnotisability (34, 35).

MATERIALS AND METHODS

Procedure

We held 11 public lectures on hypnosis at McGill University in Montreal, Canada. Two of these lectures were for introductory psychology courses. After a 45-min lecture, we invited the audience to participate in a study, during which we administered standard measures of hypnotisability and problematic smartphone use. Each lecture, almost everyone stayed to participate without compensation, so there was no further selection bias. The protocol was approved by the McGill University Research Ethics Board (#338-0117).

Participants

In total, 718 participants completed the study. We excluded those without smartphones ($n = 40$) or with missing values on the hypnosis ($n = 22$) or smartphone questionnaires ($n = 15$). (Imputing these missing values using mean substitution would have changed no decisions about our hypotheses.) After the exclusions, 641 participants remained; the majority were women (71%) and the average age was 21.2 ($SD = 3.6$, range: 18 to 47).

Measures

Hypnotisability

After consenting to the study, participants completed the Harvard Group Scale of Hypnotic Susceptibility Form A (36), the most common scale of hypnotisability. This procedure has two parts. First, the experimenter plays a standard 45-min audio recording of a hypnotic induction (e.g., “Your eyelids are getting heavy...”) followed by a series of 12 verbal suggestions. For example, the recording suggests that the participant’s head will fall forward or that they will be momentarily unable to open their eyes. Second, after the suggestions, the recording leads participants out of hypnosis; they then complete a questionnaire reporting how many of the 12 suggestions they successfully followed. Higher scores indicate greater hypnotisability. The scale has good internal consistency in previous samples from the same city ($KR-20 = .84$) (37), but it was lower in our sample (.64). We considered the reliability sufficient for this preliminary research (38).

Problematic Smartphone Use

Participants then completed the Smartphone Addiction Scale (Short Version) (25), the most common measure of problematic smartphone use. This scale quantifies how much smartphones interfere with daily life; we are agnostic about whether this constitutes an addiction in the general population (39). An example item is: “I feel impatient and fretful when I am not holding my smartphone”. We made minor changes to the wording of some of the questions to fix grammatical issues and improve clarity for our sample (see **Appendix A**). The 10 items use Likert scales ranging from “Strongly disagree” (1) to “Strongly agree” (6), for a total score between 10 and 60. Higher scores indicate a greater risk of addiction as judged by clinicians (25, 40). The scale usually has high internal consistency (Cronbach’s $\alpha = .91$) (25) which was similar in our sample (.83). To assess test-retest reliability, an exploratory subsample of the participants ($n = 54$) retook the Smartphone Addiction Scale approximately 6 months later ($M = 185.5$ days, $SD = 178.3$, range: 3 to 535) in an unrelated study. Beyond demographics, no other measures were collected.

Analysis

All aspects of the study and analysis were pre-registered online (see <https://osf.io/juk4n>). Using linear regression, we tested whether hypnotisability predicted smartphone use (partial model) before adding sex as an additional predictor (full model). We anticipated a small correlation which would require 300 valid data points for 90% statistical power. We continued to hold public lectures until we reached this number.

We then replicated these results using an identical procedure. We describe both samples together and focus on correlations and robust standardised mean differences signified as d_R (41). The regression results (**Appendix B**) are confirmatory and all other tests are exploratory. All assumptions for the tests were reasonable; hypnotisability (42) and problematic smartphone use are often normally distributed (43). Square brackets denote bootstrapped 95% confidence intervals (44).

RESULTS AND DISCUSSION

Hypnotisability Predicted Problematic Smartphone Use

Scores on the Smartphone Addiction Scale positively correlated with the number of hypnotic suggestions that participants followed ($r(639) = .17$ [.09, .24], $p < .001$; **Figure 1A**). The correlation was small, as expected in our pre-registration ($r = .186$), but it was fairly stable (**Figure 1B**) given the large sample size (45). Indeed, the sample correlations were in the positive direction for 10 of the 11 public lectures. The correlation was unlikely due to selection bias; we also saw a positive correlation in the two samples taken from psychology courses ($r = .29$ [.11, .44]). Hypnotisability has few strong predictors, so small correlations are common; traits such as the Big Five show correlations with hypnotisability between .01 and .19 (34, 35). There were roughly linear relationships for men ($r(186) = .21$ [.08, .33], $p = .004$) and women ($r(449) = .15$ [.06, .24], $p = .001$). **Table B1** shows the regression results for each sample.

The average hypnotisability score was 6.12 [5.93, 6.32], with little difference between men (6.10 [5.73, 6.45]) and women (6.13 [5.93, 6.34]; $d_R = 0.02$ [-0.02, 0.20]). These averages resembled previous samples from the same city (37, 46).

In some studies, predictors of hypnotisability are inflated when completing other measures in the same context as the hypnosis (20, 21). This was unlikely here, since our test-retest sample showed a similar correlation six months later in a different context ($r = .21$ [-.08, .46], excluding one participant with a difference score of $z = 4.16$). The test-retest reliability of

the smartphone measure was high ($r = .78$ [.62, .87]) across participants with the full range of hypnotisability scores (i.e., 0 to 12).

Problematic Smartphone Use Was High

The average Smartphone Addiction Scale (Short Version) score was 31.41 [30.68, 32.10]. Women scored 32.62 [31.82, 33.42] and men scored 28.48 [27.13, 29.69] ($d_R = 0.43$ [0.15, 0.75]). Using the scale authors' criteria (40), 51% of the women and 39% of the men would have a high risk of phone addiction.

These scores from Montreal, Canada were unexpectedly high. Our average was higher than in samples from Spain (21.10) (47), Germany (23.09) (48), Switzerland (23.45) (49), Belgium (24.00) (47), Romania (24.2) (50), and the midwestern United States (27.01) (51), but it was similar to adolescent samples in Turkey (31.37) (52), and China (34.0) (53). The reason for our high scores is unclear. It is unlikely that our minor rewording of the questionnaire items had a large effect, given that the scale has been translated into several languages without apparent inflation of the scores. Further, selection bias cannot entirely explain these findings; our scores resemble those obtained in unrelated studies we are conducting in the same city. The field may benefit from a comprehensive review of problematic smartphone use scores across countries to help explain these regional differences (3).

Limitations and Future Studies

Our study had several limitations. First, all measures were self-reported, as is common when measuring hypnosis and problematic smartphone use. Future studies adding objective measures such as screen time tracking could reveal whether hypnotisable participants use their phones more, especially for absorbing activities such as gaming or social media. Second, our sample was young (primary 18 to 22 years old), so we can only generalise to the student population but not to older adults. Since problematic smartphone use primarily affects youth (40), though, the age of our sample was appropriate. Third, given our correlational design we could not assess causality or the direction of the relationship. It seems unlikely that phone use affected hypnotisability, since hypnotisability is generally stable

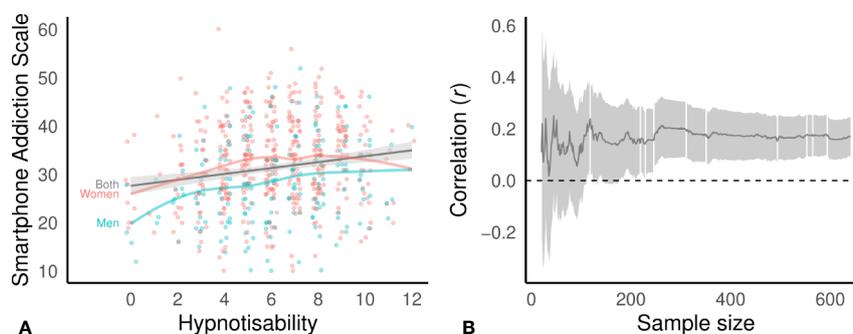


FIGURE 1 | (A) Correlation between problematic smartphone use and hypnotisability **(B)** across the sessions. In **(A)**, curved lines show smoothed averages for each sex, straight line shows linear prediction, band shows 95% confidence interval, and (jittered) dots represent participants. In **(B)**, line shows correlation coefficient across participants, band shows 95% confidence interval, and white lines demarcate sessions.

across adulthood (54). We thus expect that either hypnotisability affects smartphone use, or an underlying construct is acting as a third variable. One candidate may be dissociation, in which one disengages from the sense of self or the environment (55, 56). Similar to absorption, dissociative experiences predict problematic technology use (16, 57). Dissociation is related to hypnotisability in some highly hypnotisable participants (58), but it generally shows inconsistent correlations (59) so cannot account for all of our results. Another possible candidate could be sociality. Some theories posit that hypnosis is primarily a social context involving a set of expectations about what will occur (60), such as the belief that one will automatically follow the hypnotist's suggestions. Hypnotisability may also relate to responsiveness to social cues more generally (61, 62). Relatedly, using phones for social purposes predicts habitual use and addictive behaviour (63, 64). Future studies could test whether dissociation, absorption, or sociality could be the third variable underlying the relationship.

Our findings may also point towards potential interventions. If the positive correlation here reflects the phenomenological similarities between hypnosis and problematic smartphone use (i.e., absorption, time distortion, and automaticity), interventions could target these components. To reduce automatic interactions, behavioural interventions could reduce the salience of the phone or make it more effortful to use (65), for example by keeping the phone further out of reach (66) or limiting sporadic notifications (67). Indeed, combining similar strategies can effectively reduce problematic smartphone use (Olson et al., in preparation).

CONCLUSION

In the current “attention economy”, smartphone use translates into data collection and advertising revenue, giving developers economic incentive to keep users absorbed (68). As digital interfaces continue to become more immersive, so too may

users' absorption, time distortion, and automatic behaviour. The relationship between hypnotisability and problematic smartphone use may thus continue to strengthen, further necessitating interventions to tackle these components.

DATA AVAILABILITY STATEMENT

The full data set is available on the Open Science Framework (<https://osf.io/etyj6/>).

ETHICS STATEMENT

This study was reviewed and approved by the McGill University Research Ethics Board (#338-0117). The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JO led all aspects of the study. MS assisted with data collection. SV provided funding and supervised the study. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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APPENDIX A SMARTPHONE ADDICTION SCALE—SHORT VERSION (SAS-SV)

We made minor changes to the wording of the SAS-SV items to fix grammatical issues, improve clarity, and update the examples of social networking sites. We confirmed with the scale's authors that these changes did not impact the intended meaning of the items (Kwon, personal communication, 2019). As in the original measure, each item used a Likert scale from 1 to 6 (strongly disagree, disagree, weakly disagree, weakly agree, and so on). The differences are highlighted in bold below.

1. **I miss work that I planned**, due to smartphone use.
2. **I have** a hard time concentrating in class, while doing assignments, or while working, due to smartphone use.
3. **I feel** pain in my wrists or at the back of my neck while using a smartphone.
4. **I wouldn't** be able to stand not having a smartphone.
5. **I feel** impatient and fretful when I am not holding my smartphone.
6. **I have** my smartphone on my mind even when I am not using it.
7. **I would** never give up using my smartphone even if my daily life **were** greatly affected by it.
8. **I constantly check** my smartphone so as not to miss conversations between other people on Twitter, Facebook, Snapchat, Instagram, or other social media.

9. **I use** my smartphone longer than I intend.
10. **People** around me tell me that I use my smartphone too much.

Original items (40):

1. Missing planned work due to smartphone use.
2. Having a hard time concentrating in class, while doing assignments, or while working due to smartphone use.
3. Feeling pain in the wrists or at the back of the neck while using a smartphone.
4. Won't be able to stand not having a smartphone.
5. Feeling impatient and fretful when I am not holding my smartphone.
6. Having my smartphone in my mind even when I am not using it.
7. I will never give up using my smartphone even when my daily life is already greatly affected by it.
8. Constantly checking my smartphone so as not to miss conversations between other people on Twitter or Facebook.
9. Using my smartphone longer than I had intended.
10. The people around me tell me that I use my smartphone too much.

APPENDIX B CONFIRMATORY TESTS

TABLE B1 | Confirmatory regression results for the pre-registered sample ($n = 310$) and replication ($n = 331$).

Sample	Model	Sex	Predictor	B	SE	t	p
1	Partial	Both	(Intercept)	26.45	1.36		
			Hypnotisability	0.75	0.21	3.57	<.001
		Men	(Intercept)	22.17	2.54		
	Full	Women	Hypnotisability	1.08	0.41	2.64	.010
			(Intercept)	28.79	1.56		
		Both	Hypnotisability	0.55	0.24	2.33	.021
2	Partial	Both	(Intercept)	24.29	1.49		
			Hypnotisability	0.71	0.21	3.43	<.001
		Sex (F)	3.55	1.09	3.25	.001	
	Full	Men	(Intercept)	28.91	1.30		
			Hypnotisability	0.47	0.19	2.44	.015
		Women	(Intercept)	25.67	2.07		
Full	Both	Hypnotisability	0.45	0.29	1.53	.130	
		(Intercept)	29.74	1.57			
	Both	Hypnotisability	0.53	0.24	2.24	.026	
			(Intercept)	25.31	1.51		
			Hypnotisability	0.51	0.19	2.69	.007
			Sex (F)	4.60	1.04	4.43	<.001