

Smartphones Hijack Cognitive Capacity

Batya Swift Yasgur, MA, LSW

Medscape, July 14, 2017

Having a smartphone nearby reduces cognitive capacity, even when the phone is turned off, new research shows. A team of investigators led by Adrian Ward, PhD, assistant professor, McCombs School of Business, University of Texas, Austin, conducted two studies in which close to 800 undergraduate students engaged in a cognitive task with their smartphones placed either nearby and in sight, nearby and out of sight, or in a separate room.

The researchers found that the mere presence of a smartphone adversely affected available cognitive capacity, even when participants were successful at sustaining attention, were not using their phone, and did not report thinking about the phone. These cognitive effects were strongest in those who reported greater smartphone dependence.

"It's not that participants were distracted because they were getting notifications on their phones," said Dr Ward in a press release. "The mere presence of their smartphone was enough to reduce their cognitive capacity."

The study was published online, April 3 in the *Journal of the Association for Consumer Research*, as "Brain Drain: The Mere Presence of One's Own Smartphone Reduces Available Cognitive Capacity," Adrian F. Ward, Kristen Duke, Ayelet Gneezy, and Maarten W. Bos

[Full text](#)

Brain Drain

"The proliferation of smartphones has ushered in an era of unprecedented connectivity," the authors write. "As individuals increasingly turn to smartphone screens for managing and enhancing their daily lives, we must ask how dependence on these devices affects the ability to think and function in the world off-screen," they add. They also point out that previous research has focused on how consumers' interactions with their smartphones can both facilitate and interrupt off-screen performance.

The present study differs because it focuses on "a previously unexplored (but common) situation" – when smartphones are not in use but are merely present.

To investigate this question, the researchers conducted two related experiments. In experiment 1, they tested the "proposition that the mere presence of one's own smartphone reduces available cognitive capacity as reflected in performance on tests of working memory capacity (WMC) and fluid intelligence," both of which are domain-general constructs that are "constrained by the availability of attentional resources and the moment-to-moment availability of these resources."

Participants (n = 520; mean age, 21.1 years; SD, 2.4) were randomly assigned to one of three groups, as distinguished by phone location.

The "other room" group left all of their belongings, including their phones, in the lobby before entering the testing room. Participants in the "desk" group left most of their belongings in the lobby but took their phones into the testing room, where they were instructed to place their phones face down in a designated location on their desks. Participants in the "pocket/bag" group carried all of their belongings in the testing room and kept the phones in their pockets or in their bags.

Participants completed two tasks designed to measure available cognitive capacity: the Automatic Operation Span Task (OSpan), and a 10-item subset of Raven's Standard Progressive Matrices (RSPM). Participants also completed a test requiring a mathematical calculation and a questionnaire about their experiences in the laboratory and their beliefs about the connection between smartphones and performance.

Paired comparisons revealed that the "other room" participants performed better than those in the "desk" group ($P = .002$). Participants in the "pocket/bag" group did not perform significantly differently from those in either the "desk" ($P = 0.09$) or "other room" ($P = .11$) groups.

A planned contrasts analysis revealed a significant desk→pocket/bag→other room linear trend and no quadratic trend, "suggesting that as smartphone salience increases, available cognitive capacity decreases," the authors write.

The researchers conducted a one-way ANOVA analysis of participants' responses to the question, "While completing today's tasks, how often were you thinking about your cell phones?" They found no impact of phone location on phone-related thoughts ($P = 0.43$). In fact, the modal self-reported frequency of thinking about the phone in each group was "not at all."

Cognitive Capacity Decreases

In experiment 2, the researchers investigated the effects of smartphone salience on both WMC and a behavioral measure of sustained attention in 275 undergraduates (mean age, 21.3 years; SD 2.6).

The researchers replicated the basic design of experiment 1, with several exceptions. The same three phone locations were used, and the experiment employed a between-subject phone power on/off design. Participants in the "desk" group were instructed to place their phones face up. Participants in all groups were instructed to leave their phones either in either the "power on" or "power off" condition.

Participants then completed two key dependent measures: the OSpan task and the Cue-Dependent Go/No-Go task, which serves as a measure of sustained attention. Participants then reported the subjective difficulty of each task.

Participants also answered exploratory questions regarding their individual differences in use and connection to their smartphones. As in experiment 1, paired comparisons revealed that participants in the "other room" condition performed significantly better on

the OSpan task than did those in the "desk" group. Participants in the "pocket/bag" group did not perform significantly differently from those in the other two groups. The planned contrasts analysis was likewise similar.

"The null effects of Power and the Power \times Location interaction suggest that decreases in performance are not related to incoming notifications (or the possibility of receiving notifications), ruling out this alternative explanation of the effects found in Experiment 1," the authors comment.

The researchers found that the individual differences in dependence on smartphones moderated the cognitive decreases. Participants who were most dependent on their smartphones performed worse than those less dependent, but only when they kept the phones in their pocketbooks or bags or on their desks. "Ironically, the more consumers depend on their smartphones, the more they seem to suffer from their presence — or, more optimistically, the more they may stand to benefit from their absence," the researchers note.

"We see a linear trend that suggests that as the smartphone becomes more noticeable, participants' available cognitive capacity decreases," Dr Ward said. "Your conscious mind isn't thinking about your smartphone, but that process — the process of requiring yourself not to think about something — uses up some of your limited cognitive resources. It's a brain drain."

"Scary" Implications

Commenting on the study for *Medscape Medical News*, Larry Rosen, PhD, professor emeritus of psychology, California State University at Dominguez Hills, called the study "really well done and well executed, but also a little scary.

"Our group has monitored students studying. When they do, they keep their phone next to them. And the norm — even if their work is really important and they know we are observing them — is that they study only 10 out of 15 minutes, which is their maximum ability to pay attention and not feel compelled to check their phones," he reported.

"People check their phones even if the phone does not vibrate or they do not get notifications, which is a product of our immersion in this smartphone world," said Dr Rosen, who is the author of *The Distracted Mind* (MIT Press, 2016).

"We know that this behavior increases anxiety and also decreases brain power by creating difficulties processing information," he said, "which makes total sense if the information you are supposed to be covering is being distracted by the device. How can you remember or process anything deeply if you only process it for a few minutes?"

He said that the study has important implications for clinicians. "You have to be aware that any message you are giving your clients is probably not being heard clearly because you are probably not letting them use their phone while in session, so their brain is partially gone. You may be asking them to reflect, but what they are really reflecting on

is, 'I haven't checked my Snapchat for a while.' " Additionally, "clinicians have to respect their own behavior in this and not check texts in the middle of a session. If necessary, you and the patient can both take a short break to check the phone."

The researchers suggest several tactics to mitigate "brain drain," noting that, in light of their findings, placing the phone face down or face up and turned off are "likely futile." Rather, "our data suggest at least one simple solution: separation" — particularly "defined and protected periods of separation."

The researchers conclude that their study "contributes to the growing discussion among consumers and marketers alike about the influences of technology on consumers — and consumers on technology — in an increasingly connected world."

Research assistance was provided by the Atkinson Behavioral Lab. The authors have disclosed no relevant financial relationships.

Journal of the Association for Consumer Research. Published online April 3, 2016, as "Brain Drain: The Mere Presence of One's Own Smartphone Reduces Available Cognitive Capacity," authors, Adrian F. Ward, Kristen Duke, Ayelet Gneezy, and Maarten W. Bos.

ONLINE: Apr 03, 2017 \ [Full text](#)