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Is Your Phone Distracting You, Even If You're Not Using It? How Do Notifications and Merely Having a Phone Nearby Affect How Well We Focus and Remember Things?

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Abstract: This review examines whether a cell phone can negatively impact an individual's ability to pay attention and recall information while the person is not actively using the device. Ward et al. (2017) indicated that simply having one's own cell phone present resulted in less available working memory, with the greatest negative effects being among individuals who depend heavily upon their phones. Additionally, Thornton et al. (2014) discovered similar decreases in performance on challenging attention-demanding tasks. However, Ruiz Pardo and Minda (2022), in a pre-registered direct replication, and Hartmann et al. (2020), in a pre-registered conceptual replication, both failed to find a significant overall effect of phone presence. The results of the meta-analyses were also mixed. Some found evidence of effects on memory, while another found no significant overall effect of phone presence. Beyond the mere presence of a cell phone, receiving notifications has been shown to impair sustained attention (Stothart et al., 2015), and frequent media multitaskers showed poorer filtering abilities when dealing with extraneous information in Ophir et al.'s (2009) study. Overall, the evidence supporting a memory cost from phone presence remains limited and disputed.

Keywords: smartphone presence, cognitive performance, working memory, attention, notifications, media multitasking, brain drain effect, replication

INTRODUCTION

Many students have a cell phone close by during class or while studying. The obvious cost of a cell phone is the amount of time spent actively using it. But a more interesting question is: Does having a cell phone present cost us something when it sits idle? This review looks at three related areas of research: does the mere presence of a cell phone reduce our cognitive capacity; do notifications impair attention even when we do not respond to them; and is habitually engaging in media multitasking associated with lower levels of cognitive control? As part of this review, we also examined the replication record of these findings because the widely discussed "brain drain" finding has not replicated consistently, and an accurate review should acknowledge this.

METHODOLOGY

How We Identified Our Sources

To identify research related to the presence of smartphones, smartphone notifications, and media multitasking, we searched through a variety of academic sources. The present narrative review contains selected peer-reviewed empirical studies and meta-analyses

published between 2009 and 2024. In total, we identified six primary sources along with four meta-analytic reviews.

RESULTS AND DISCUSSION

The Findings of Each Study

Ward et al. (2017) examined data collected from 795 college students included in the final analyses of two experiments. Each student placed their own smartphone either on their desk, in their pocket/bag, or in another room prior to completing cognitive tests. Their first experiment tested working memory and fluid intelligence; their second tested working memory and sustained attention. When the smartphone was located in another room, working memory scores were higher than those obtained with the smartphone on the desk. However, there was no significant difference between the pocket/bag group and the other two groups. Phone placement did not significantly affect sustained attention. Many participants reported that they did not think about their phone during testing. An exploratory analysis of the second experiment found that the working-memory cost associated with having a phone nearby was larger among the most phone-dependent participants.

Thornton et al. (2014) identified an effect similar to Ward's, but with one important difference. They used an experimenter-owned phone placed on a desk during the session and a control condition where a notebook was provided. Only when participants completed the harder tasks was performance impaired. On the easy tasks, there was no statistically significant difference. A second classroom study using each participant's personal phone yielded the same pattern as the prior study.

The replication record, however, shows variability. Ruiz Pardo and Minda (2022) conducted a preregistered replication of Ward et al.'s second study. Phone placement had no statistically significant effect on working memory or sustained attention. Furthermore, Hartmann et al. (2020) found that placing a phone on a table had no significant overall effect on prospective or short-term memory performance. However, participants who scored low on one phone dependency measure performed better on a prospective memory task when their phones were absent.

Meta-analyses have produced differing conclusions regarding the cognitive effects of smartphones. Böttger et al. (2023) published a meta-analysis that demonstrated a small but statistically significant overall effect (g = −0.14), with a significant pooled effect on memory (g = −0.23). The pooled effect on attention was not statistically significant. This review included studies concerning the use of cellphones as well as cellphone presence; therefore, this overall estimate does not represent just the impact of an inactive cellphone. Parry (2024) examined data collected from 7,093 participants and identified a significant effect on working memory, but found no statistically significant effects for sustained attention, response inhibition, or fluid intelligence. Hartanto et al. (2024), however, reviewed 33 studies containing data from 4,368 participants and found no statistically significant overall effect of smartphone presence (d = −0.02). Thus, it appears that mere-presence effects are relatively small and inconsistent, with different reviews showing evidence of effects on memory or no statistically significant overall effect.

Why Would This Happen?

One potential explanation for this cognitive drain relates to working memory. Working memory works like a small workbench. It can hold only a few items at any given time, and therefore any space occupied on the workbench cannot be used for other purposes. Ward et al. proposed the "brain drain" hypothesis in 2017. Their argument was that a smartphone does not have to buzz to take up space. One proposed explanation is that checking a phone is a habit, so the brain may spend effort resisting the urge to check it.

This could also explain Ward et al.'s moderation finding. As previously stated, Ward et al. found greater working-memory costs among more phone-dependent participants. As such, it is possible that those who depend heavily on their phones would experience greater difficulty ignoring them, using more cognitive resources to do so.

The same idea may explain Thornton et al.'s finding that only the demanding tasks suffered in the presence of someone else's phone. Less demanding tasks allow for excess space on the workbench; therefore, any drain may be less noticeable until the task requires the entire workbench. It may also explain the variability of replications. Since the attention a cellphone attracts may vary depending upon factors such as environment and mood, it is possible that differences in experimental procedures may affect how distracting the phone appears.

Notifications & Multitasking

Notifications can also disrupt attention. Stothart et al. (2015) studied sustained attention performance among undergraduate students assigned to call/text/control conditions. The final analyses included 166 of the 212 students recruited. Students were unaware of the notification source, and those who looked at or handled their phones were excluded. Commission errors increased more from Block 1 to Block 2 in both notification groups than in the control group. The authors noted that the text-message effect may be partially due to different error rates between groups before the notifications were sent.

Media multitasking habits may also be relevant. In their study, Ophir et al. (2009) screened 262 students and compared smaller groups of those who heavily multitasked using media with those who rarely multitasked using media. Heavy media multitaskers were significantly worse at ignoring unwanted distractions, showed a greater increase in false alarms as working-memory task difficulty increased, and showed a switch cost 167 milliseconds greater than that of the light multitaskers. These groups were determined based on individual habits. Therefore, this study cannot demonstrate that media multitasking causes poor performance. More recently, a meta-analysis demonstrated that the correlation between media multitasking and cognitive control depends upon measurement type, with weaker correlations observed using performance-based measures than using self-report measures (Parry & le Roux, 2021).

DISCUSSION AND LIMITATIONS

This body of research shows how science is supposed to work. Initially, Ward et al. (2017) indicated a phone-presence effect; however, subsequent replication attempts did not consistently produce it (Ruiz Pardo & Minda, 2022; Hartmann et al., 2020), nor do the meta-

analytic findings provide consistent support for such an effect. If a study replicates poorly, then that does not necessarily imply anything inappropriate occurred at the time of the original investigation. Instead, a small or conditional effect may exist, methods or sample characteristics may differ, or the original finding may have been a false positive.

There are several issues to consider in these studies. First, many of the primary studies reviewed here used college students, which may limit how well the findings apply to younger students. Second, the number of participants per group in Ophir et al. (2009) was relatively small (15–22). Third, laboratory-based studies may not fully reflect actual studying. Finally, Parry (2024) concluded that statistical power was relatively low in the mere-presence literature.

CONCLUSIONS

What You Should Do Instead

The literature is inconclusive regarding phone presence and clearer about the distracting effects of notifications. Here is a challenge. Leave your phone in another room and turn off notifications for one week while completing your homework. Record whether you notice any difference in your work. Because this is an informal comparison, it can't tell us if any differences were due to location, notifications, or another variable.

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