

# A decade of data reveals that heavy multitaskers have reduced memory

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The smartphones that are now ubiquitous were just gaining popularity when Anthony Wagner became interested in the research of his Stanford colleague, Clifford Nass, on the effects of media multitasking and

attention. Though Wagner, a professor of psychology at Stanford University and director of the Stanford Memory Laboratory, wasn't convinced by the early data, he recommended some cognitive tests for Nass to use in subsequent experiments. More than 11 years later, Wagner was intrigued enough to write a review on past research findings, published in *Proceedings of the National Academy of Sciences*, and contribute some of his own.

The paper, co-authored with neuroscientist Melina Uncapher of the University of California, San Francisco, summarizes a decade's worth of research on the relationship between [media](#) multitasking and various domains of cognition, including working memory and [attention](#). In doing that analysis, Wagner noticed a trend emerging in the literature: People who frequently use many types of media at once, or heavy media multitaskers, performed significantly worse on simple memory tasks.

Wagner spoke with Stanford Report to explain the findings from his review on media multitasking and cognition, and discuss why it's premature to determine the impact of these results.

## **How did you become interested in researching media multitasking and memory?**

I was brought into a collaboration with Cliff Nass, a Stanford faculty member in communication who passed away a few years ago, and his master's student, Eyal Ophir. They had this question: With the explosion of media technologies that has resulted in there being multiple simultaneous channels available that we can switch between, how might this relate to human cognition? Eyal and Cliff would come chat with me about their early findings and – I have to say – I thought it was complete hooey. I was skeptical. But, after a few experiments, the data were increasingly pointing to a link between media multitasking and attention.

Their findings struck me as potentially important given the way we're living as humans in this attention economy. Years later, as a memory scientist my interests continued to grow. Given that attention and cognitive control are so fundamental for memory, I wanted to see if there was a relationship between media multitasking and memory.

## **How do you define media multitasking, and can you give hypothetical examples of people that would be "heavy" and "light" media multitaskers?**

Well, we don't multitask. We [task](#) switch. The word "multitasking" implies that you can do two or more things at once, but in reality our brains only allow us to do one thing at a time and we have to switch back and forth.

Heavy media multitaskers have many media channels open at once and they switch between them. A heavy media multitasker might be writing an academic paper on their laptop, occasionally checking the Stanford basketball game on TV, responding to texts and Facebook messages, then getting back to writing – but then an email pops up and they check it. A light media multitasker would only be writing the academic paper or may only switch between a couple of media. They may turn off Wi-Fi, put away their phone or change their settings so they only get notified every hour. Those are some extreme examples, but they provide a sense of how people differ in their media use. Moreover, because our media landscape has continued to accelerate and change, those who are considered a heavy or light media multitasker today may not be the same as those a decade ago.

## **How do scientists assess someone's memory?**

There are many forms of memory, and thus many ways of probing

memory in the lab. For working memory – the ability to keep a limited amount of information active in mind – we often use simple short-delay memory tasks. For example, in one test we show a set of oriented blue rectangles, then remove them from the screen and ask the subject to retain that information in mind. Then we'll show them another set of rectangles and ask if any have changed orientation. To measure memory capacity, we do this task with a different number of rectangles and determine how performance changes with increasing memory loads. To measure the ability to filter out distraction, sometimes we add distractors, like red rectangles that the subjects are told to ignore.

## **What overall trends did you notice when you were looking through the literature to write this review?**

In about half of the studies, the heavy media multitaskers are significantly underperforming on tasks of working memory and sustained attention. The other half are null results; there's no significant difference. It strikes me as pretty clear that there is a negative relationship between media multitasking and memory performance – that high media multitasking is associated with poor performance on cognitive memory tasks. There's not a single published paper that shows a significant positive relationship between working memory capacity and multitasking.

In the review we noticed an interesting potential emerging story. One possibility is that reduced working memory occurs in heavy media multitaskers because they have a higher probability of experiencing lapses of attention. When demands are low, they underperform. But, when the task demands are high, such as when the working memory tasks are harder, there's no difference between the heavy and light media multitaskers. This observation, combined with the negative relationship between multitasking and performance on sustained attention tasks,

prompted us to start looking at intrasubject variability and moment-to-moment fluctuations in a person's ability to use task goals to direct attention in a sustained manner.

## How do these findings affect how people should engage with media, or should they at all?

I would never tell anyone that the data unambiguously show that media multitasking causes a change in attention and [memory](#). That would be premature. It's too early to definitively determine cause and effect.

One could choose to be cautious, however. Many of us have felt like our technology and media are controlling us – that email chime or text tone demands our attention. But we can control that by adopting approaches that minimize habitual multitasking; we can decide to be more thoughtful and reflective users of media.

That said, multitasking isn't efficient. We know there are costs of task switching. So that might be an argument to do less media multitasking – at least when working on a project that matters academically or professionally. If you're multitasking while doing something significant, like an academic paper or work project, you'll be slower to complete it and you might be less successful.

**More information:** Melina R. Uncapher et al. Minds and brains of media multitaskers: Current findings and future directions, *Proceedings of the National Academy of Sciences* (2018). [DOI: 10.1073/pnas.1611612115](https://doi.org/10.1073/pnas.1611612115)

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