

APA citation of journal article: Seli, P., Carriere, J. S. A., Wammes, J. D., Risko, E. F., Schacter, D. L., & Smilek, D. (2018). On the Clock: Evidence for the Rapid and Strategic Modulation of Mind Wandering. *Psychological Science*, 29(8), 1247–1256. <https://doi.org/10.1177/0956797618761039>

The Basics:

1. What was the broad question being asked by this research project? What was the specific question being asked by this research project?
 - a. Summarize the background information on the research topic in three sentences.
 - b. What is the gap in the literature identified by the researchers? What question(s) are they trying to answer? What is their hypothesis and what should happen if the author's hypothesis is true?
 - c. What are alternative hypotheses?

General: How does mind-wandering vary across situations? Specific: Can people modulate their mind-wandering from moment to moment in anticipation of upcoming changes in task demands?

Background: mind-wandering is pervasive, varies across different contexts; so far, only manipulations can be changes in difficulty across different tasks or blocks within a task. So instead, authors will look for strategic shifts.

Hypothesis: If participants are motivated to do well on the task, they will modulate their mind-wandering so that it decreases closer to when they actually need to respond to the clock hitting 12. Mind-wandering should also increase once they finished the event, because there were 20-seconds until the next event.

Alternative Hypothesis: If participants are not motivated to do well, they won't modulate their mind-wandering and would maintain a consistent level of disengagement.

2. What experiments were done to test the hypothesis or investigate the research question?
 - a. Explain the task design – what are participants instructed to do and what is being measured? Think about the independent and dependent variables.

Participants were given a bonus for good performance. Amazon Mechanical Turk workers – i.e., online participants – pressed the space bar to indicate when a fake analog clock crossed back to 12:00 within 500 ms of the event. The authors ran their first sample, then preregistered their sample size, analyses, etc. for the second replication sample. 20 thought probes asking about whether or not the participants' thoughts were on or off task appeared intermittently (could answer: on task, intentional mind-wandering, unintentional mind-wandering), with 5 occurring in each of the 4 quadrants of the clock face. They also probed participant motivation after the practice and experiment tasks about how motivated they were to press the space bar ASAP. They were also asked to self-report their media multitasking. Participants had a practice phase and then 60 trials of an experimental phase with the clock. They analyzed error rates (errors of omission, not responding within 500 ms of the 12:00) for the clock task and rates of mind-wandering (by type), and they broke down the time elapsed since the last trial into quartiles.

3. What evidence supports each of the conclusions?
 - a. Before you read the discussion, summarize the main findings and link each one back to the research question(s). How does each result inform the hypothesis?

Participants engaged in more intentional than unintentional mind-wandering (Table 1, Figure 2). They also engaged in less mind-wandering towards the last quadrant. This is qualified by a

quadratic function for mind-wandering by quadrant (i.e., time elapsed since the last trial). Specifically, mind-wandering increased right after they responded to the clock and decreased right before they would have to respond to the clock. Almost all of this, except for the differences in rates of mind-wandering by type, replicated in Sample 2.

In terms of exploratory analyses, they didn't find a correlation between intentional or unintentional mind-wandering and errors of omission. Even though participants mind-wandered, it wasn't associated with decreases in performance.

4. What are the major conclusions?
 - a. What do the results add to the field? How do the researchers interpret their findings? Summarize any limitations identified by the researchers.

Interpret them to mean that mind-wandering can be strategically adapted on a moment-to-moment basis for changing task-demands, a kind of 'control' over mind-wandering that doesn't result in a performance cost. They also point out how in this study, intentional mind-wandering was either higher or the same as unintentional mind-wandering, and that it could be a function of predictability.

The researchers mention the latter to say that participants could have strategically focused their attention on the clock task instead of strategically modulating their mind-wandering. This experiment doesn't have the ability to dissociate between the two.

The Critique:

1. Is the paper well written? How do you know? For week 2 & later, use this space to practice headlines & summaries of the articles via tweets.

This paper was pretty accessible to read, but perhaps that's because of the topic.

2. Do the conclusions seem logical given the data processed? Why or why not? Another way of thinking about this: do the results adequately support the conclusions that are drawn? Are there alternative explanations for the findings? What inferences about the hypotheses and questions can be made based on these results?

The idea of extending a resource account seems weird, particularly with regard to the controller, because people have explicitly suggested that having a 'switch' region in the brain to say 'oh now it's time to pay attention and stop mind-wandering' is not feasible. So where does learning come into play here? It's not really acknowledged. And their point about strategic modulation of attention vs. mind-wandering also makes it hard to what is being inferred.

3. Are the conclusions important? How do you think this relates to everyday behavior?

I think the conclusions are important in the sense that this is the kind of thing that happens everyday. In classes, if a professor tells you the next section isn't important, the engagement is noticeably going to drop even if people are still in class.

4. What were the best aspects of the research presented, and how could the research be improved? Name at least one way to improve the experiment.

There were five trials per quadrant for their mind-wandering probe. Even though the experiment was replicated, the results might not be that reliable. The correlation isn't well powered enough (typically need $N = 250$ for a correlation to "stabilize"). Would participants have been motivated without a bonus? It might've been interesting to compare with/without a bonus—also how did motivation fare? I did not see those results reported...

The best part is the simplicity of the experiment. It has a simple design, it's easy for participants to do, and it's not overloaded with conditions to compare.

5. How would you follow-up this experiment or study?

I'd like to know how this relates to the classroom. Is my example above an accurate way to think about this research? Is this strategic mind-wandering related to how people learn to adapt their attention in different contexts (i.e., research referenced in the intro – if different proportions of hard/easy tasks, then is how people adapt in those contexts related to these increases/decreases in mind-wandering?).

Additional Resources: What are the basic concepts that you need to know to understand the science presented in your paper? What other information or resources would help you better understand the paper? This is helpful to consider for your science communication pieces.

Paul's research on mind-wandering; mind-wandering vs. attention (perhaps Kiyonaga review on working memory/internal and external attention)

Further Questions:

Write at least five comments or questions about the article to discuss with the class.

1. What other questions would you be interested in answering as they pertain to mind-wandering research?
2. With a clock task like this, it'd be interesting to measure the extent to which participants clicked out of their browser; that'd be a direct measure of multitasking to get at the idea of task-unrelated activity or thoughts. Would that have been helpful? And asking about the intentional mind-wandering more deeply?
3. To what extent do you feel that you can modulate your mind-wandering, and does that depend on the type? I think we all infer we modulate our intentional (daydreaming-like) mind-wandering, but that it can sometimes spiral into unintentional thoughts too.
4. Do you do this in classrooms? Would it be weird if a professor asking you these thought probes in class?
5. Is this a good example of open science? It got most of the badges, but they said nothing else about the motivation measures.