Mind-wandering and cognitive load effects on working memory performance across experimental contexts

KELLY COTTON[1], JOSHUA SANDRY[2] & TIMOTHY J. RICKER[3]

[1] THE GRADUATE CENTER, CITY UNIVERSITY OF NEW YORK [2] MONTCLAIR STATE UNIVERSITY, [3] UNIVERSITY OF SOUTH DAKOTA

Contact: kcotton@gradcenter.cuny.edu

Mind-wandering, cognitive load, and experimental context have been independently shown to impact working memory performance.

Both mind-wandering and cognitive load affect working memory performance, but there may be performance differences in basic cognitive tasks depending on context.

- Self-reported mind-wandering impairs visual working memory performance (Krimsky et al., 2017)
- Higher cognitive load impairs performance (Barrouillet, et al. 2004)
- Basic attention paradigms show similar patterns of performance both in-person and online (Crump et al., 2013)
- Sparse research directly comparing working memory performance in-person and remotely

Predictions

- Higher cognitive load leads to task disengagement and increased mind-wandering
- Participants who report more mind-wandering will have worse working memory performance
- Online participants will have even higher rates of mind-wandering and worse task performance

Cognitive load affects working memory accuracy, but not mind-wandering and experimental context affects mind-wandering but not working memory accuracy.

Cognitive load and accuracy

- Main effect of cognitive load (BF_{10} = 1.2e[10])
- No main effect of context or interaction effect (BF_{10} = .29, .15)

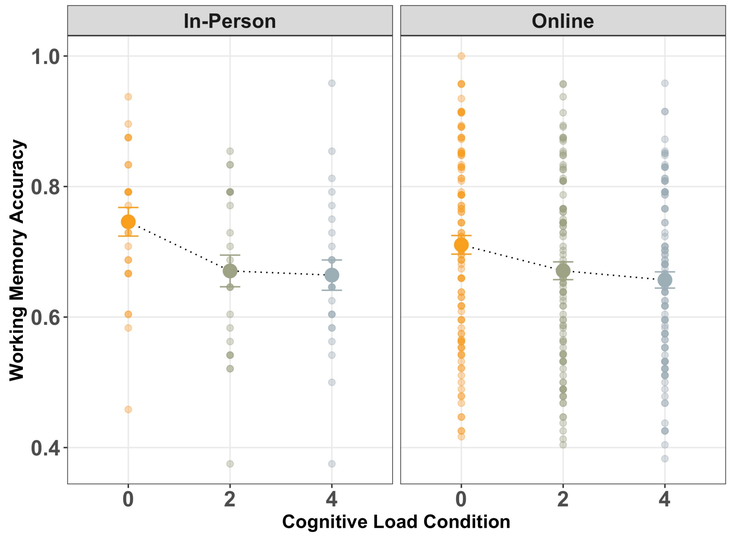

Figure 2. *Cognitive load effect on working memory accuracy. Error bars represent standard error.*

Cognitive load and mind-wandering

- Main effect of context (BF_{10} = 2.8)
- No main effect of cognitive load or interaction effect (BF_{10} = .15, .12)

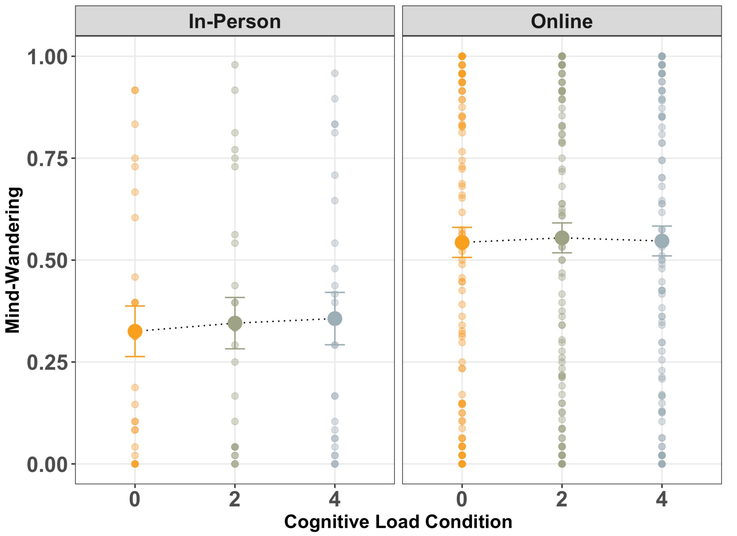

Figure 3. *Cognitive load effect on mind-wandering. Error bars represent standard error.*

Current Study Methods

Participants Online *N* = 108, In-Person *N* = 26

Procedure

- 144 trials
- Single-item probe change detection task
- Parity judgement (0, 2, or 4 items)
- Mind-wandering probe every trial
- At end, Mindful Attention Awareness Scale

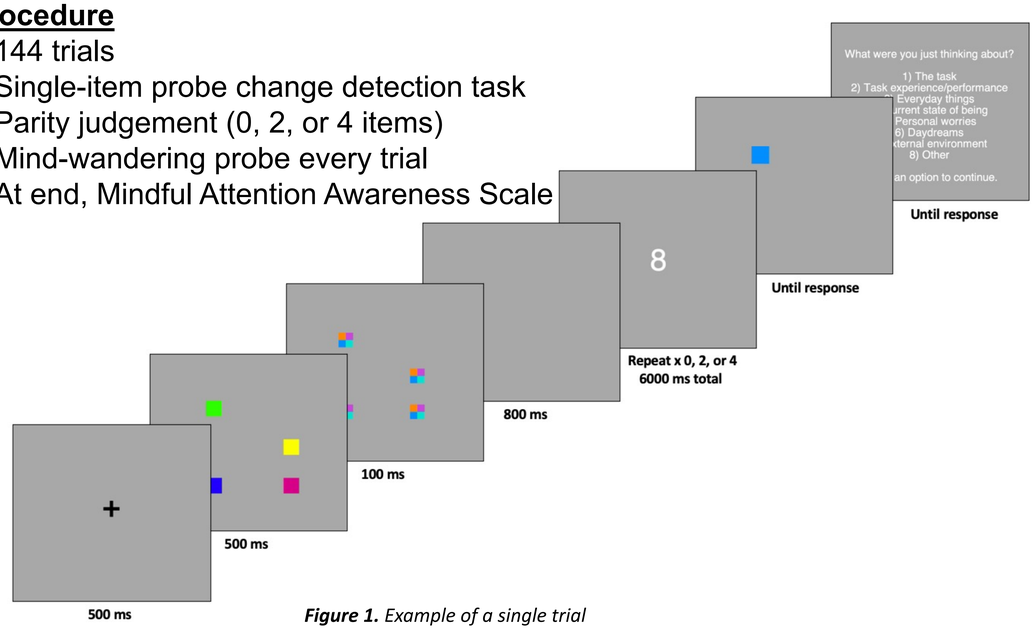

Figure 1. *Example of a single trial*

Mind-wandering rates may correlate with working memory accuracy in online context.

Overall mind-wandering across contexts

- Online reported off-task thought in 55% of all trials
- In-Person reported off-task thought in 34% of all trials

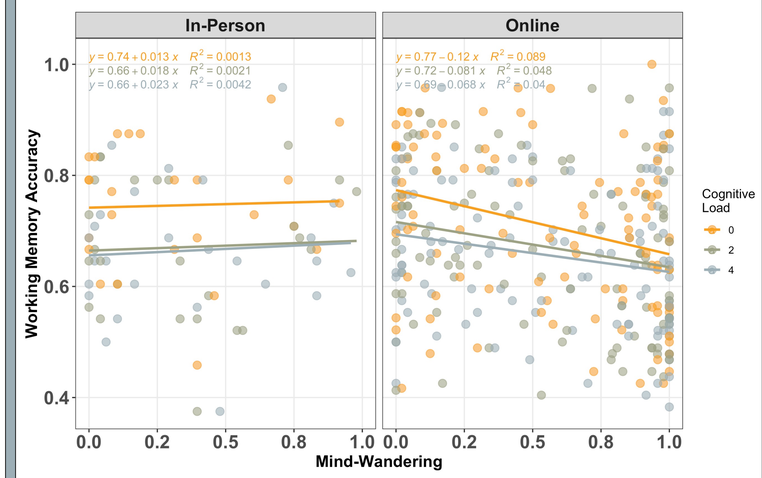

Figure 4. *Mind-wandering rate vs. working memory accuracy.*

Inconclusive results as to effects of cognitive load and experimental context on mind-wandering and working memory.

Mixed effects of cognitive load on working memory accuracy and mind-wandering.

- Main effect of cognitive load on accuracy replicated prior research.
- No main effect of cognitive load on mind-wandering suggests that increasing cognitive load did not lead to participants engaging in more mind-wandering.

Online participants reported more mind-wandering compared to in-person participants.

- The online environment may be more distracting or online participants are more willing to self-report off-task thought.

For participants in the online context, level of mind-wandering was correlated with working memory accuracy.

- More mind-wandering corresponded with worse accuracy, across all cognitive load conditions.