The Impact of MW on Value-Based Cued Prospective Memory

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Event-based prospective memory (PM) relies on detecting associated cues that initiate memory recall. Failing to recognize these cues could result in problematic consequences, including forgetting to behave in morally appropriate ways. *Mind wandering* (MW) is an unintentional and unguided perceptually decoupled state wherein cognitive and neural processing of external stimuli is attenuated. This suggests that PM cue recognition would be impaired during MW. However, highly valued items often capture attention more than low-valued items, suggesting that important PM cues might be recognized despite MW.

This work assessed whether the cognitive and neural impact of MW on PM cue recognition varied according to the value of the PM and associated cue. Participants completed a virtual lunch-serving task, delivering lunches to fictitious students (presented as face stimuli). Most students required a standard lunch, denoted by a frequent button press. Select students (previously learned PM cues) required a dairy-free lunch to avoid a stomachache (moderate PM cues), or they required a peanut-free lunch to avoid life-threatening anaphylactic shock (severe PM cues). Each of these alternative lunches were denoted by a different button press. As such, the lunch-serving task required vigilance to recognize the infrequent PM cues from perceptually similar non-PM cue stimuli and to marshal active control processing to override the frequent behavioral response to students receiving the standard lunch. After half of the PM-cue trials, participants self-reported whether they had just been mind wandering or paying attention to the task.

The findings showed that behavioral accuracy for both the severe and moderate PM cues was worse before self-reported mind wandering than paying attention. Scalp-recorded event-related potential (ERP) measures showed that the PM cue-evoked *parietal positivity*, reflecting PM cue recognition and post-retrieval PM processes, was attenuated before self-reported MW— but only for the moderate PM cues. For severe PM cues, there was no difference in the cue-evoked parietal positivity for self-reported MW and self-reported paying attention. This suggests that PM cue recognition for the severe PM cues occurred despite MW. However, with MW, behavioral responses to the severe PM cues were initiated and executed *before* the onset of the PM-recognition parietal positivity. Thus, during mind wandering, it was likely that PM-specific processes were not fully engaged to marshal active control processing to inhibit the frequent standard behavioral response.

These findings have important implications for theories about whether consciousness and control are necessary for moral responsibility. As with many cases of negligent wrongdoing, key factors that impact perceptions of culpability—such as prior knowledge, intention, or desire—are not often present in cases of MW-related PM failures. Participants knew that delivering a wrong lunch would be harmful, but, during MW, they did not always recognize that the person was one needing an alternative lunch. MW can occur despite people's best intentions and desires to remain focus. Yet, people might still be angry and blame the wrongdoer for the PM failures. Thus, by understanding the cognitive and neural impact of MW on PM, the current work provides suggestive insights into culpable control.