cognitions or mind-wandering with studies providing support for mind-wandering to be linked with adaptive and maladaptive functional outcomes. However, despite this being a ubiquitous phenomenon, there is considerable debate in the literature on the definition of mind-wandering, associated neural correlates, and implications for cognitive and brain health. In this symposium, we bring together four presenters, who employ variegated experimental methods and definitions to understand the neural correlates of this elusive construct of mind-wandering. Through carefully designed methods, the four presenters also investigate the implications of engaging in task-unrelated thoughts for creativity, rumination, psychological health, and cognitive functioning in healthy and pathological aging.

Orwig et al. examine neural correlates of intentional vs. unintentional mind wandering. Their results support a differential involvement of posterior cortices in intentional mind wandering whereas unintentional mind wandering involved the top-down regulatory nodes of the prefrontal cortices. Interestingly, both intentional and unintentional mind wandering was associated with creative thinking thus providing support for mind wandering as an adaptive process.

Andrews-Hanna et al. have developed a novel think aloud technique where participants are asked to voice aloud their thoughts in real time across rest periods in the lab, the MRI scanner, and in participants own homes. Across several contexts, they found participants to show a high degree of similarity in resting thought. They also report significant individual differences content and dynamic characteristics of resting thought. Importantly, trait levels of rumination were associated with resting state thought patterns characteristic of brooding—negative, self-focused, and past-oriented thoughts. Individual differences in creativity, in contrast, were associated with loosely associative thoughts that exhibited a pattern of exploration.

Prakash & Teng demonstrate the first empirical test of a direct relationship between mind-wandering and fluid-based biomarkers of amyloid and tau pathology in 289 older adults from the Alzheimer's Disease Neuroimaging Initiative. The neuromarker of mind-wandering—representing edges associated with a high degree of off-task thinking—was positively associated with a high CSF p-tau/Aβ42 ratio (indicative of higher levels of pathology). Moreover, network strength in the high mind-wandering model was also associated with lower global cognition, lower executive functioning, and episodic memory.

O'Callaghan et al. examine dysfunctional mind-wandering in neuropsychiatric diseases of aging: frontotemporal dementia, Alzheimer's disease, and Parkinson's disease. Employing a thought-sample task to probe mind-wandering, they show evidence of reduced mind-wandering in individuals with fronto-temporal dementia and Parkinson's disease. They also provide evidence that the hippocampal sharp wave-ripple is a compelling candidate for a brain state that can trigger mind-wandering episodes.

Keyword 1: awareness
Keyword 2: neuroimaging: functional connectivity
Keyword 3: cognitive functioning

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1 Neuromarker of Mind Wandering Predicts CSF-based Biomarkers of Amyloid and Tau Pathology

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Objective: Mind-wandering—the spontaneous shift in attention away from the external task to internal thoughts (including daydreaming, fantasizing, rumination, and worrying)—is negatively associated with performance across a variety of tasks including the sustained attention to response task, the Stroop task, tasks of working memory, choice reaction time, visual search, as well as more ecologically related tasks like reading comprehension and mathematics. There has also been promising evidence suggesting a potential link between mind-wandering, functional connectivity of the canonical networks of the brain, and Alzheimer's disease (AD). However, no study has directly examined the relationship between neural correlates of mind-wandering and AD pathogenesis. In prior work, our lab has identified a whole-brain, functional connectivity-based marker of mind-wandering—the mwCPM—which predicted response time variability in older adults. In this study, we

sought to evaluate the ability of this mind wandering CPM, derived from response time variability, to predict CSF p-tau/Aβ42 ratio in 289 older adults from the Alzheimer's Disease NeuroImaging Initiative. We hypothesized that the combined mind-wandering model including functional connections that predict high mind-wandering and functional edges that predict stability in attention, would predict AD pathology.

Participants and Methods: Resting-state functional MRI data from 289 older adults (147 healthy older adults, 111 individuals with mild cognitive impairment, and 31 older adults with AD) from the Alzheimer's Disease NeuroImaging Initiative was analyzed for the current study. Participants were only included in the analyses if they had resting-state fMRI data, CSF measures of amyloid beta and tau pathology, and performance on cognitive composites of global cognition, episodic memory, and executive functioning. Using the well-established methodology of connectome-based predictive modeling, the mind-wandering model was applied to the resting-state fMRI data to predict CSF-based biomarker levels of p-tau and Aβ42. Moreover, we also examined if this mind-wandering model predicted individual differences in composite measures of global cognition, episodic memory, and executive functioning

Results: The high mwCPM model successfully predicted measured CSF p-tau/Aβ ratios (high model: ρ = .137, p = .0196), controlling for mean framewise displacement. However, the combined network and the low MW network were not significant (combined model: ρ = .0731, p = .216; low model: ρ = -.0027, p = .960). We next examined the association between connectivity strengths of the high mwCPM and cognitive functioning in the domains of general cognition, episodic memory, and executive functioning. Connectivity strength in the high mwCPM—functional edges that were associated with high behavioral variability—were negatively associated with all three cognitive composites (global cognition: r = -.239, p < .0001; episodic memory: r = -.208, p = < .0001; executive functioning: r = -.178, p < .0001).

Conclusions: This study provides the first empirical support for a link between a neuromarker of mind-wandering and AD pathophysiology. Moreover, mind-wandering also has downstream consequential effects for key domains of cognitive functioning in older adults. Interventions targeted at reducing mind-wandering, particularly before the onset of AD

pathogenesis, may make a significant contribution to the prevention of AD-related cognitive decline.

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Keyword 1: aging disorders
Keyword 2: awareness
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2 Intentionality of Self-Generated Thought: Contributions of Mind Wandering to Creativity

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Objective: Studies suggest that internally oriented cognitive processes are central to creativity. Here, we distinguish between intentional and unintentional forms of mind wandering and explore their component contributions to creativity. Furthermore, we describe resting-state connectivity profiles associated with these trait-level measures of mind wandering. Bearing in mind the role of the DMN in internally directed cognitive processes, we hypothesize that, in general, mind wandering will be associated with increased connectivity of voxels in the medial prefrontal and posterior cingulate cortices, key nodes in the DMN. We further hypothesize that intentional and unintentional mind wandering will be associated with distinct patterns of connectivity across DMN core regions.

Participants and Methods: We used a sample of 155 healthy adults from the mind-brain-body dataset, all of whom completed resting-state fMRI scans and trait-level measures of mind wandering. We analyzed intentional and unintentional mind wandering tendencies using self-report measures. Next, we explored the relationship between mind wandering tendencies and creativity, as measured by a divergent thinking task. Additionally, we describe patterns of resting-state network connectivity associated with mind wandering, using graph theory (weighted degree) functional connectivity analysis.

Results: At the behavioral level, results showed a significant positive association between creativity and both intentional and unintentional