Ecological Momentary Assessment as a Potential Outcome Variable in Insomnia Research

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What is the Methodological Question Being Addressed? How might ecological momentary assessment complement traditional measures of daytime symptoms among older adults with insomnia?

Introduction Assessment of daytime symptoms of insomnia has historically relied on retrospective questionnaires with varying recall periods. The purpose of the present study was to employ ecological momentary assessment (EMA) to evaluate the impact of insomnia on daytime function among older adults. EMA is a data-rich approach to assessing participant experience in real-time. In EMA studies, participants respond to queries multiple times per day (e.g., via mobile device), in their own natural environments. We hypothesized that 1) EMA would differentiate daytime symptoms between older adults with and without insomnia, and 2) relative to traditional neurocognitive testing, EMA would be more sensitive to between-groups differences in cognition.

Methods Participants included 29 older adults who met DSM-5 diagnostic criteria for insomnia disorder and 34 older adults without sleep disorders. Daytime symptoms of insomnia were assessed using the psychometrically derived, 17-item Daytime Insomnia Symptoms Scale (DISS). The DISS measures daytime symptoms in four domains: positive mood, negative mood, fatigue/sleepiness, and alert cognition. Neurocognitive testing was administered using the Brief Test of Adult Cognition by Telephone (BTACT), which assesses episodic memory, working memory, reasoning, verbal fluency, and executive function. Participants were trained on how to use a commercially available EMA software app with versions for iOS and Android. Following a baseline assessment, participants completed surveys 4x/daily for two weeks, for a total of 56 administrations during the study period. The timing of survey administration was personalized based on participant preferred wake/rise times. Surveys were completed at fixed times upon arising and before bed, and variable times around noon and late afternoon. Sleep diaries were completed upon arising as part of the morning EMA survey.

Results Relative to controls, participants with insomnia were younger (70.4 [sd 5.6] years vs 67.5 [sd 6.6] years, p=.03). Based on self-report questionnaires and relative to controls, participants with insomnia demonstrated more severe symptoms of insomnia and common insomnia symptoms,

including depression, anxiety, sleepiness, and fatigue (all Wilcoxon ps <.001, except sleepiness p=.02). In terms of Hypothesis 1, for all four outcome domains, data visualization of EMA results revealed striking between-groups differences at all four times of day. Across two weeks and relative to controls, participants with insomnia reported higher levels of negative mood and fatigue/sleepiness, and lower levels of positive mood and alert cognition. In terms of Hypothesis 2, no between-groups differences were detected when comparing results on any domains of the BTACT. By contrast, significant between-groups differences were detected based on alert cognition as assessed via EMA.

Conclusion These data highlight the potential utility of EMA methods for measurement of common daytime symptoms, including cognitive symptoms, of insomnia, a highly prevalent sleep and psychiatric disorder. EMA appears a promising approach to supplement traditional outcomes assessments to detect treatment-related change. Future insomnia clinical trials should incorporate EMA as a key outcome measure.

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