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Reply to: Comment on: Using Smartphone Technology to Improve Prospective Memory Functioning

Jared F. Benge, PhD[1], **Michael K. Scullin, PhD**[2]

[1]Department of Neurology, Dell Medical School, The University of Texas at Austin, Austin, TX, USA

[2]Department of Psychology and Neuroscience, Baylor University, Waco, TX USA

To the Editor:

We agree with several of the comments raised by Xu and Yin[1] regarding our randomized controlled trial on smartphone-based reminder systems for daily prospective memory tasks[2]. We wish to clarify a few conceptual issues raised in the commentary and highlight goals for future research on smart technology, prospective memory, and dementia.

One conceptual issue related to how the intervention aided prospective memory. The goal of offloading strategies–including those used in our study–is to reduce the demands on neurocognitive processes that are typically required to support prospective memory performance[3]. For example, by setting task reminders, one reduces or eliminates the burden on encoding, storage/consolidation, spontaneous retrieval, and monitoring/vigilance processes that underpin prospective memory[4]. Therefore, conceptually speaking, offloading allows one to improve prospective memory *functioning* (i.e., increase the probability that a task is completed) without necessarily affecting prospective memory *abilities* (i.e., the neurocognitive processes that contribute to prospective memory functioning in the absence of reminders). Xu and Yin[1] argued that in our study, these underlying neurocognitive abilities were not improved by the smartphone-based intervention. We are inclined to agree that our intervention was compensatory rather than rehabilitative, however, our study was also not designed to directly test that research question. Such a study is warranted though, and would involve completing standardized cognitive assessments of the multiple cognitive processes that underlie prospective memory ability before and after the intervention phase. This is especially true because learning a new technology might confer neurocognitive benefits in and of itself. Such outcomes have been observed in studies that trained healthy older adults to use a tablet[5], and are thematically similar to observations in cognitive training studies[6].

Corresponding author: Jared F. Benge, 1601 Trinity St Bldg B, Austin, TX 78712 (jared.benge@utexas.edu) or Michael K. Scullin (michael_scullin@baylor.edu).

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A second conceptual issue regarded how smartphone-based reminder interventions impacted quality of life (QOL) and instrumental activities of daily living (iADL). Our study assessed four QOL components: cognitive function, participation in social activities, satisfaction with social activities, and positive affect. Given that our intervention focused on prospective memory, one would expect the cognitive QOL domain to improve, which it did. We did not see improvements in social activity or positive affect, though prior reports suggested that some smart technologies can increase social support and reduce loneliness[7]. Similarly, iADL scores did not change with the intervention, but many of the items on the iADL scale were not targeted by our smartphone intervention, such as food preparation, housekeeping, and laundry (for a similar discussion of QOL outcomes following technology interventions in aMCI participants, see Schmitter-Edgecombe et al[8]).

A third conceptual issue regards the selection of a control group for studies involving smart technologies. We caution against using no-contact control groups, which violate the principle of clinical equipoise, introduce experimenter biases, and lead to differential expectations across participants, amongst other drawbacks[9]. In designing our study, we extensively weighed the pros and cons of possible comparison conditions such as education in general memory strategies, paper-based to-do lists, and non-smartphone technologies (e.g., PDAs). None of these conditions struck us as ideal in maintaining clinical equipoise, minimizing bias, or facilitating the primary goal of the project which was to test whether smartphone-based interventions would be feasible and acceptable in persons with mild ADRD. With that primary goal in mind, we decided to compare two smartphone-based approaches to offloading prospective memories. Larger studies that include a smartphone-only comparison group (without a memory strategy app) would be additive to the field.

The literature on smart technology solutions for prospective memory has produced encouraging results, but has been characterized by small sample sizes, short study durations, and minimal attention to experimenter biases.[10] Our recent study was a step in the right direction for addressing some of these methodological shortcomings; however, more work is certainly needed, including studies with larger sample sizes, longer study durations, pre- and post-intervention neuropsychological testing, and a diversity of comparison conditions. The ability for scientists to achieve these methodological goals will require significant commitment from funding agencies. Future work should also incorporate evidence-based methods for sustaining engagement with smart technologies,[8] especially because correlational analyses indicate that sustained engagement benefits prospective memory functioning and iADL functioning[2].

In conclusion, the benefits of offloading strategies are well-documented in healthy adults[3] and even some clinical groups[10]. We encourage continued efforts to develop cross-disciplinary collaborations aimed at identifying the optimal means for translating the benefits of offloading and smart technologies to persons with Alzheimer’s disease and related dementias.

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