

Application Fields and Innovative Technologies

The Use of Cognitive Prosthetic for Enhancing Medication Adherence in Older Adults with Diabetes. William Bayer, MD and Anthony A. Sterns, PhD. *Gerontechnology* 25(s)

Purpose. In 2025, 24.6% of U.S. adults with diabetes are expected to have an HbA1c level above 8.0%, signifying poor blood sugar control [1]. Medication nonadherence among older adults with diabetes is a major public health problem that leads to preventable complications and substantial healthcare costs [2]. Drawing on a historical review of medication adherence theories, this work develops self-determination theory–based hypotheses and tests the effectiveness of MediTeddi, an interactive cognitive prosthetic that uses companionship and real-time tracking to improve adherence. **Method** Two studies were conducted. The first study was a randomized controlled repeated-measures intervention trial comparing changes in HbA1c and in medication adherence scores (N=16). The second study was a repeated-measures intervention-only trial (N = 50). **Results and Discussion** In the first study, an exploratory t-test indicated the participants' HbA1c decreased by 0.88 in the intervention group compared to the control group ($p < .10$). In the second study, participants who completed the trial ($n = 35$) experienced a 1.71-point decrease in HbA1c ($p < .01$) over the six-month period compared with baseline. Those who completed both the baseline and endpoint measures ($n = 35$) also showed a significant improvement from 1.6 to 3.1 ($p < .001$) on the Morisky Medication Adherence Scale (MMAS-4) and a decrease from 20.9 to 15.6 ($p < .001$) on the Type 2 Diabetes Distress Assessment Scale (T2-DDAS). Patient Health Questionnaire-2 (PHQ-2) scores ($n = 35$) also significantly decreased from 2.5 to 1.5 ($p < .001$). No significant differences were found between the completers and the disengagers at baseline on any of the demographics or biometrics tracked. Feedback from the disengagers was limited, with indications that the daily reminders and device comments were negatively reinforcing. Grounded in Self-Determination Theory, the intervention improved medication adherence by prioritizing self-regulation and connection over the negative reinforcement of repetitive reminders. The theory is extended to create a cognitive prosthetic theory that can guide further improvements in medication adherence. These findings highlight the potential of patient-centered technologies to address both unintentional and intentional nonadherence in aging populations.

References

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Figure 1. *MediTeddi is pre-programmed to deliver medication reminders once or twice per day. The “START” time is set when MediTeddi is switched on for the first reminder. The next reminder will automatically occur 10, 12, or 24 hours after the “START” time, and then every day thereafter on the same schedule. Pressing both paws simultaneously will prompt the bear to give a statistical adherence review.*

