



Applying AI to a mindfulness and caregiver skills course for family dementia caregivers

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Family Caregivers of People with Chronic Illness Show High Rates of Depression and Suicidal Ideation

- Depression ~3x increased risk relative to the general population
- Suicidal ideation - CDC
 - Overall ~30% “serious SI”
 - Sandwiched Caregivers ~60% “serious SI”
- More than 50 smaller studies of SI in family caregivers
 - Rates of SI reported between 2.7% to 71%

Mindfulness therapies for caregivers

- Structured courses with weekly group sessions (generally 4-8 weeks)
- Led by a trained instructor
- Systematic meta-analysis has shown moderate effect sizes for depression
- Not everyone benefits—clear variability in effect



Mentalizing Imagery Therapy

- A “Second Generation” mindfulness therapy
- Aims to
 - Improve trait mindfulness (curiosity / non-judgmentalness)
 - Improve mentalizing
- Format for caregivers
 - 4 weekly 2-hour sessions (in person)
 - When combined with caregiver skills and mobile app support, 8 weekly 1 hour sessions
- Home practice about 20 min per day recommended

Jain et al, 2014; Morgan et al, 2018;
Sikder et al, 2019; Jain and Fonagy,
2020; Van Gordon and Shonin, 2020

Randomized, controlled trial of MIT in person

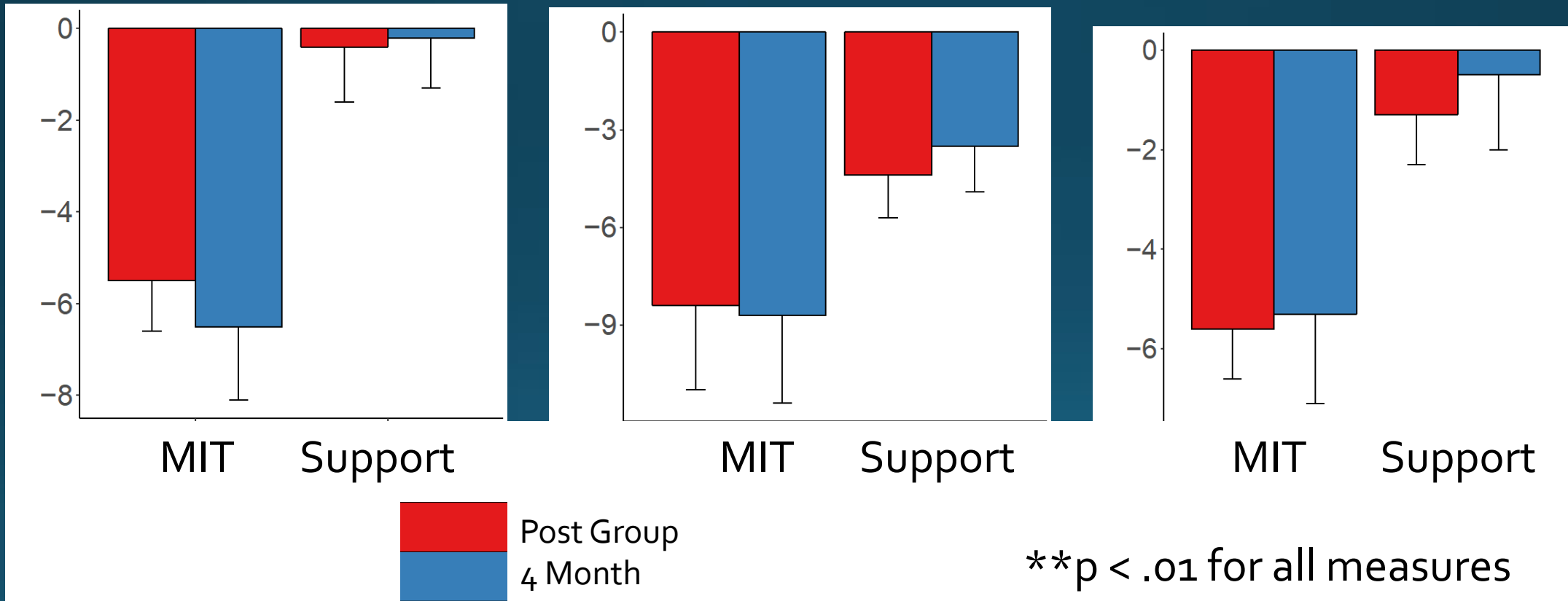
- 46 family caregivers, Age ~ 63, 80% female
- Random assignment to MIT (N=24) and Support Group (N=22)
- Effects on negative symptoms: depression, anxiety, stress
- Effects on positive traits: mindfulness, self compassion, well-being
- Neuroimaging for resting brain connectivity

Symptom Outcomes

Clinician-Rated Depression**

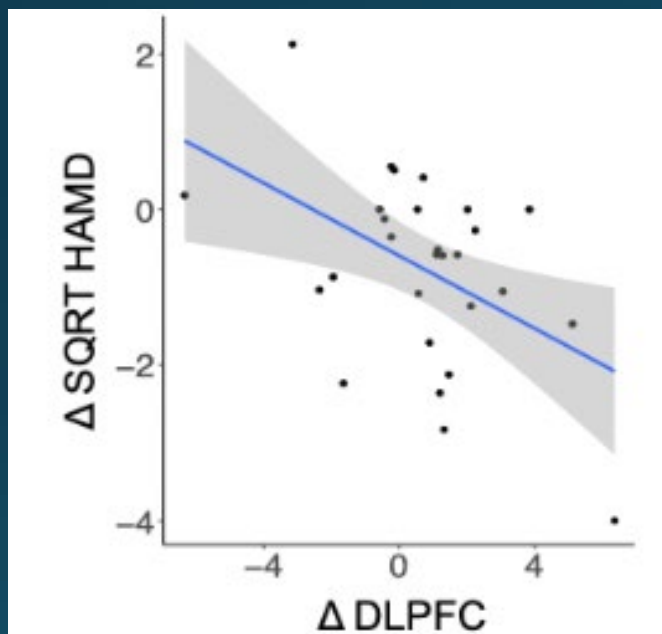
Anxiety – Trait**

Perceived Stress**

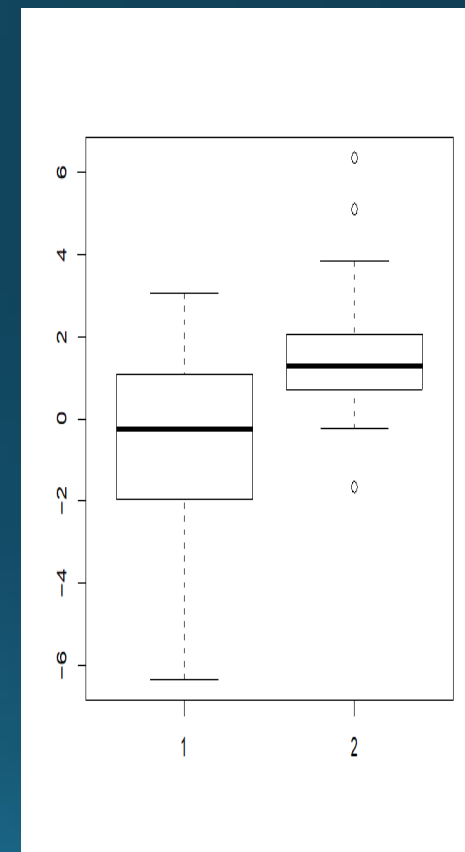
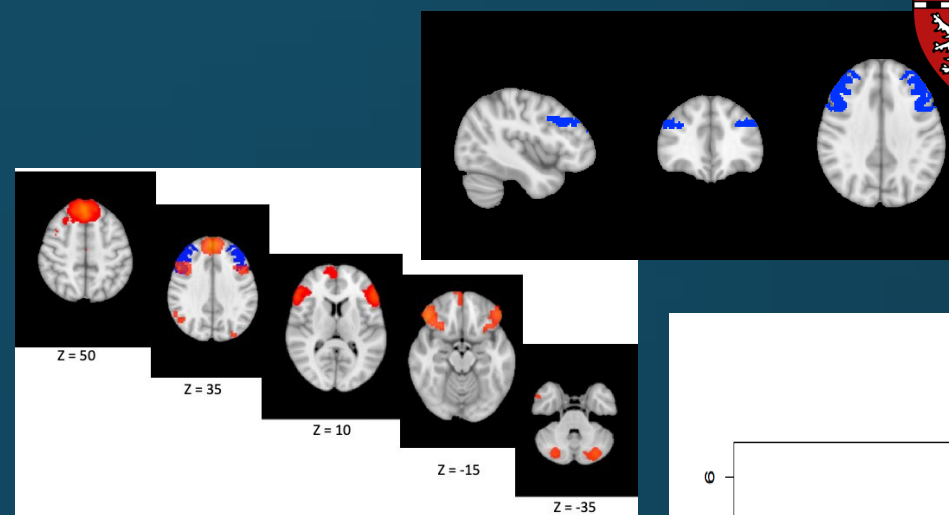
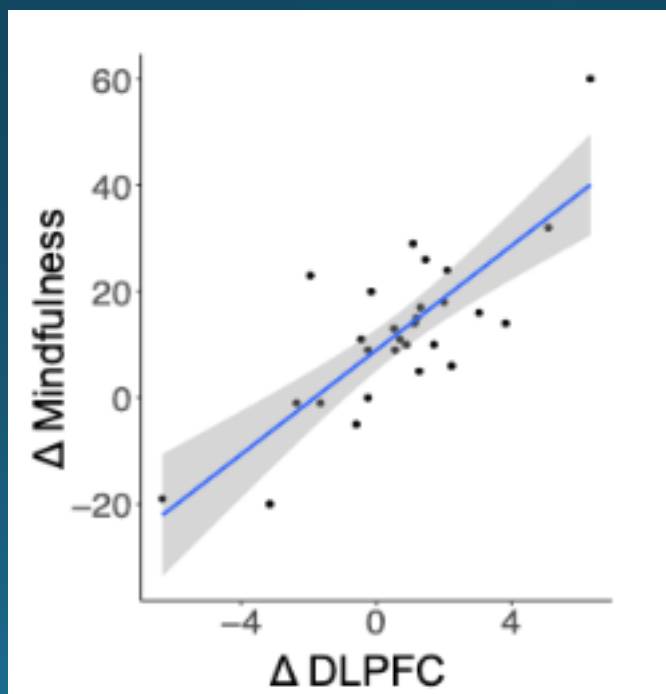


Neuroimaging

Δ Depression



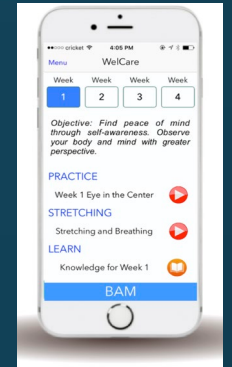
Δ Mindfulness



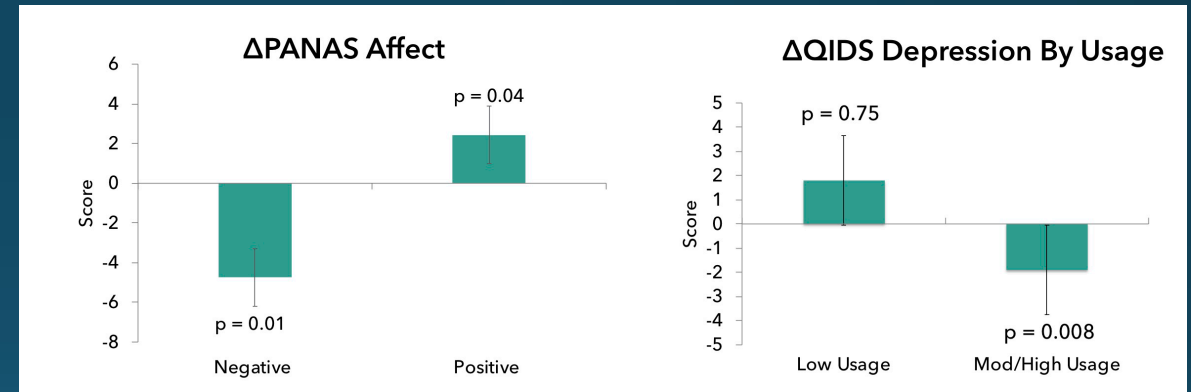
SG (N=13) MIT (N=15)
 $p=0.6$ $p=.002$
 Between group $p=.019$

Jain et al, *Psychotherapy and Psychosomatics*, 2022

Smartphone Delivery of MIT (prototype)

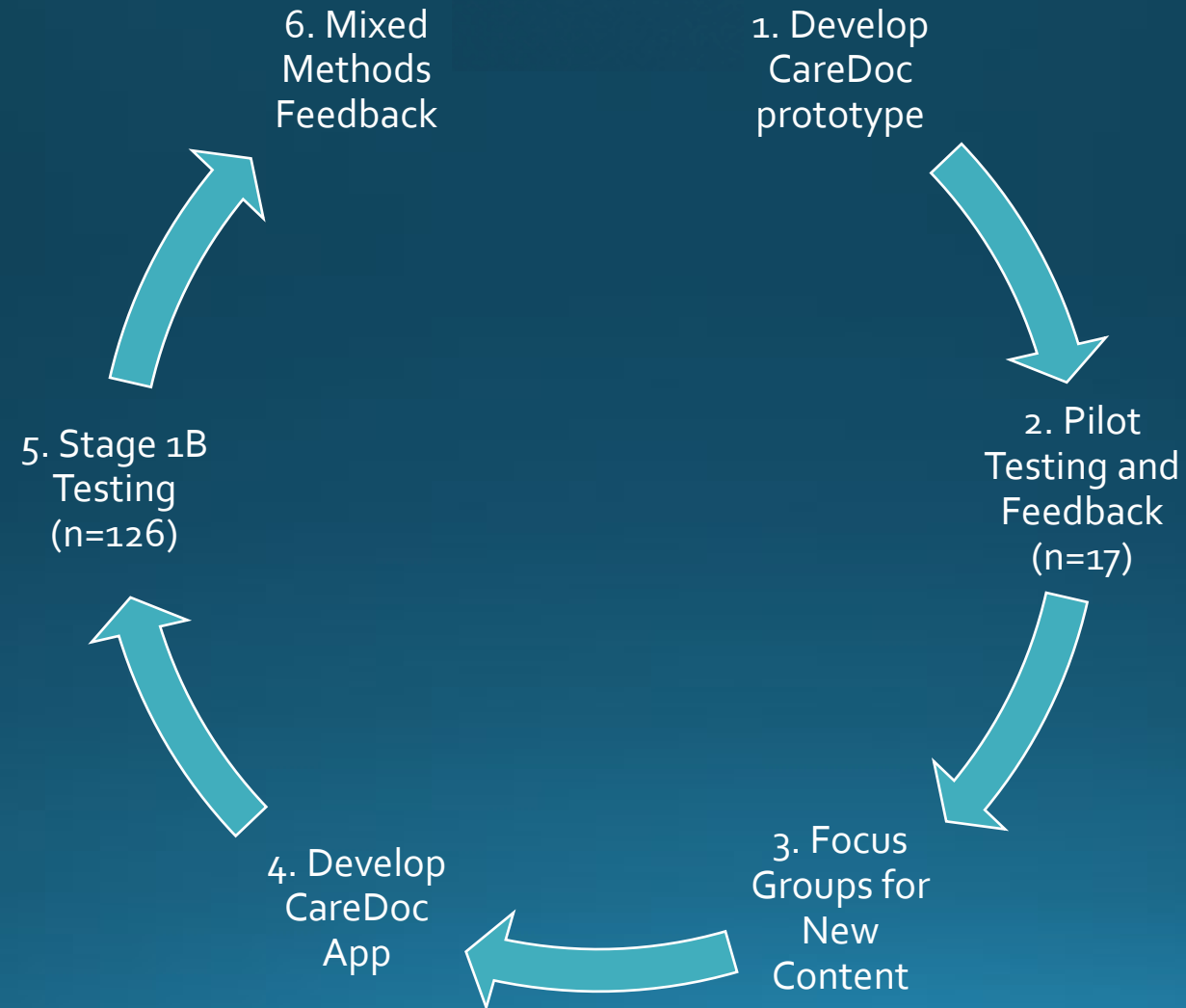


- Sikder et al., JMIR Aging, 2019
 - Mentalizing Imagery Therapy for family dementia caregivers (N=17)
 - Received mobile App + technical support

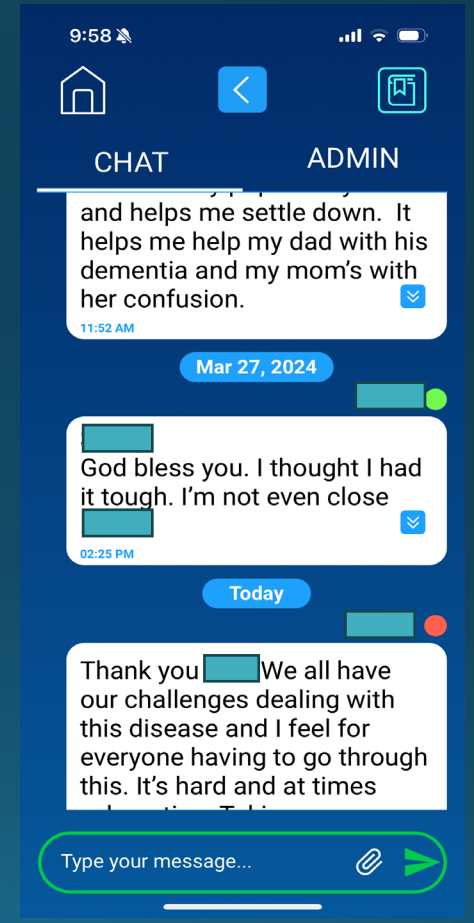
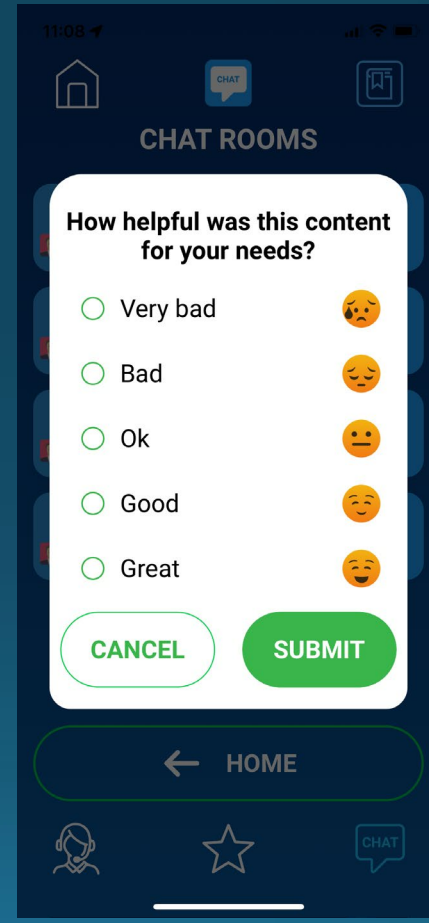
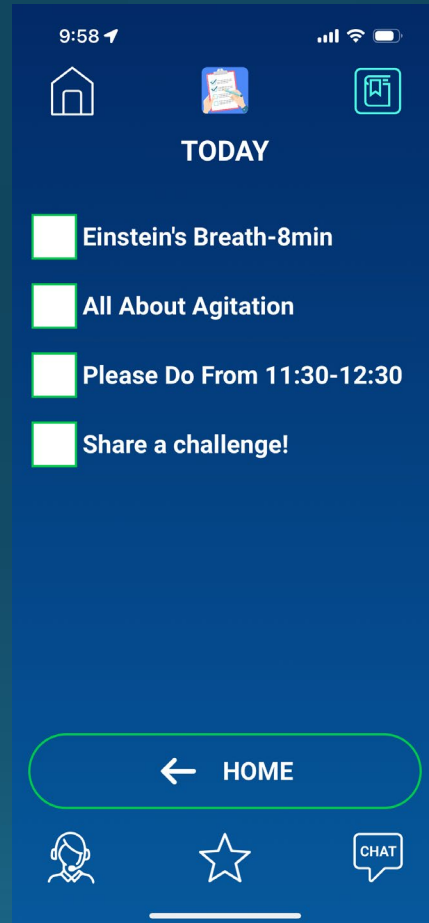
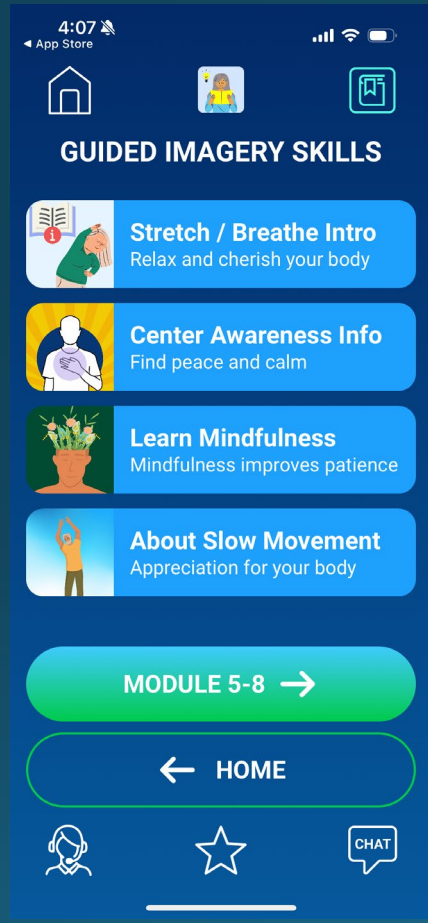
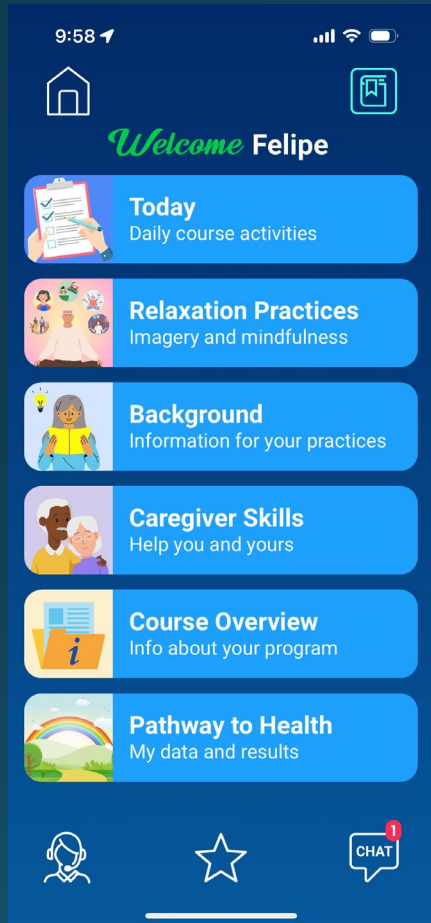


- Subjective benefits “calm,” “lowered stress,” and provided an “anchor” for their mood.
- Half with benefits for perspective taking
- Complex reframing?
 - Able to see their loved one as a “light and the inspiration” in them
 - Finding “comfort” in connectedness
 - Re-contextualizing themselves as part of a larger whole, discovering “a more positive way of looking at the negative.”

User Centered Design Process of Mobile MIT with Caregiver Skills



New CareDoc App—English and Spanish!



Randomized Controlled Trial of MIT+CS vs CS: App + optional virtual groups

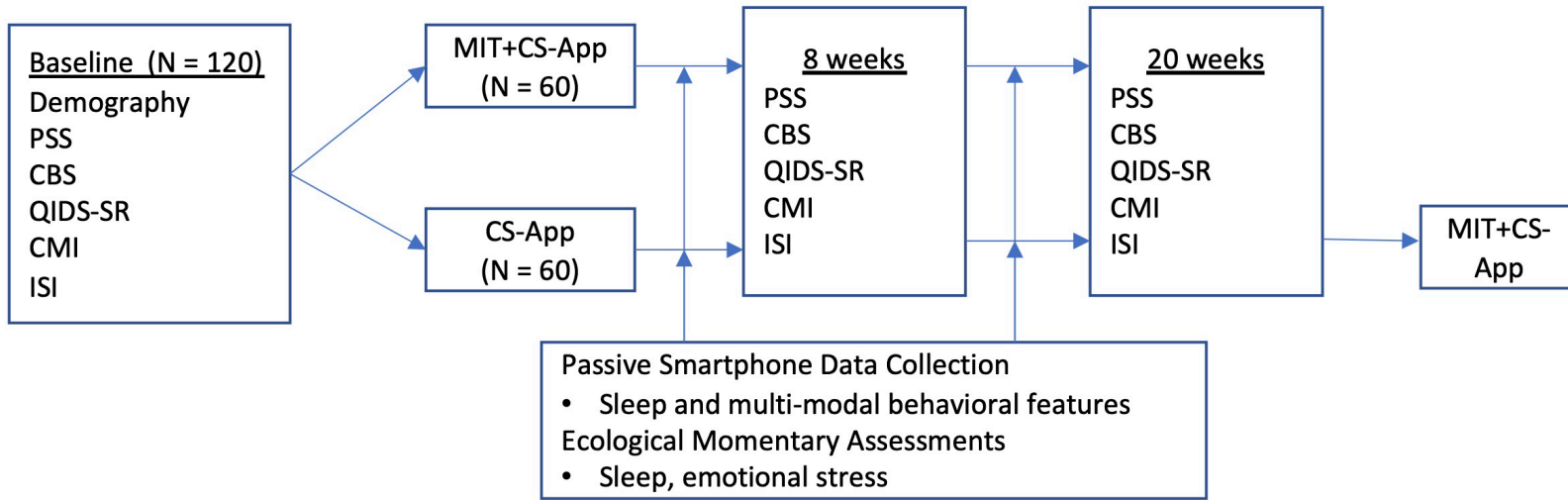
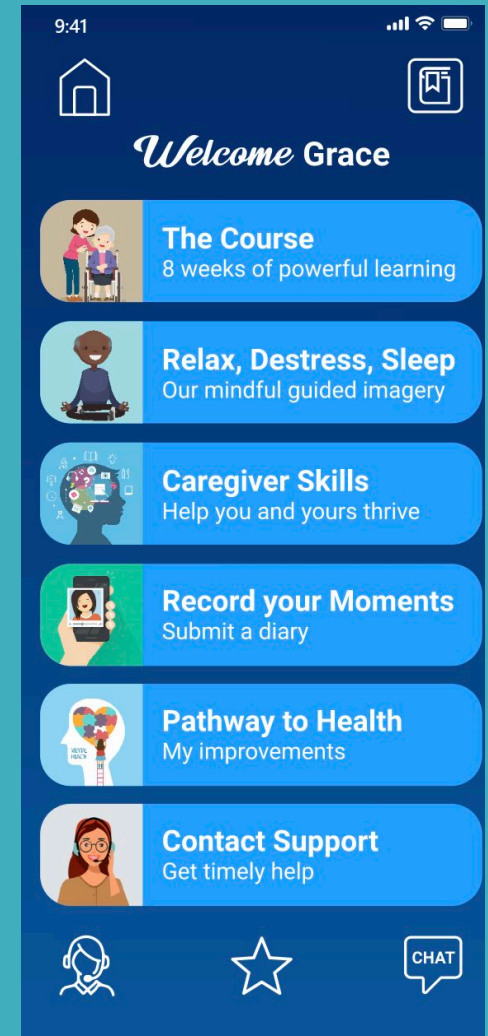
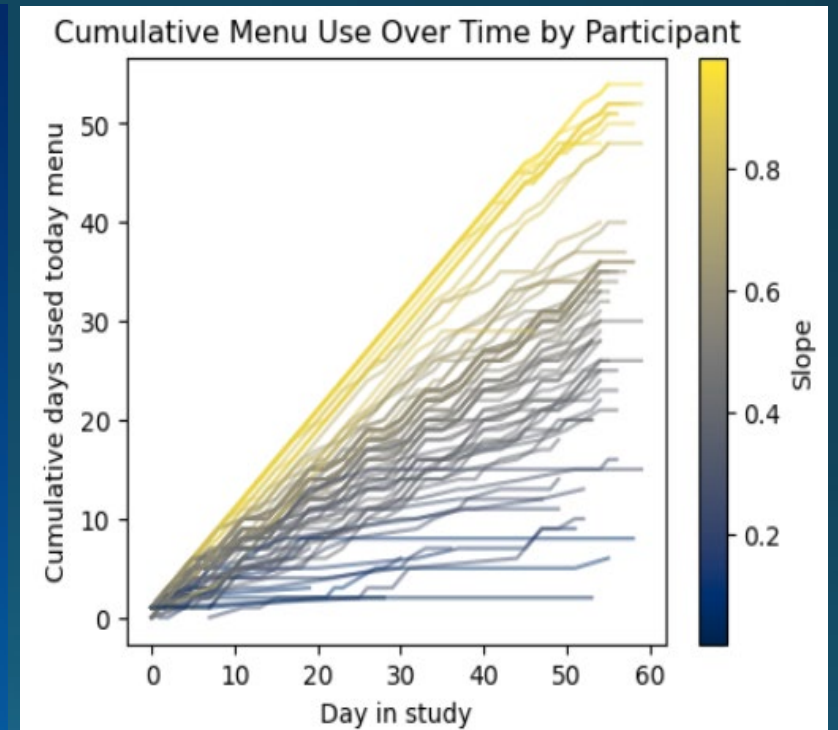
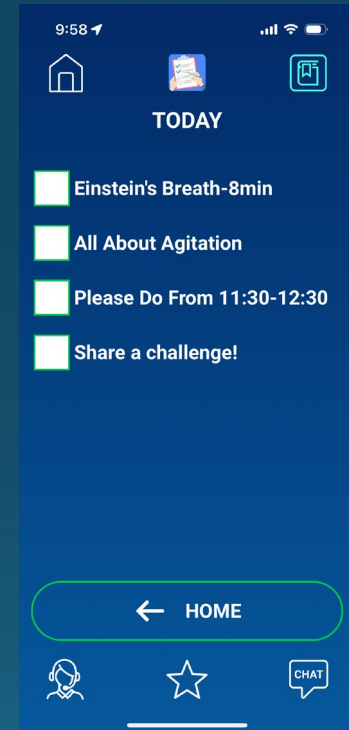
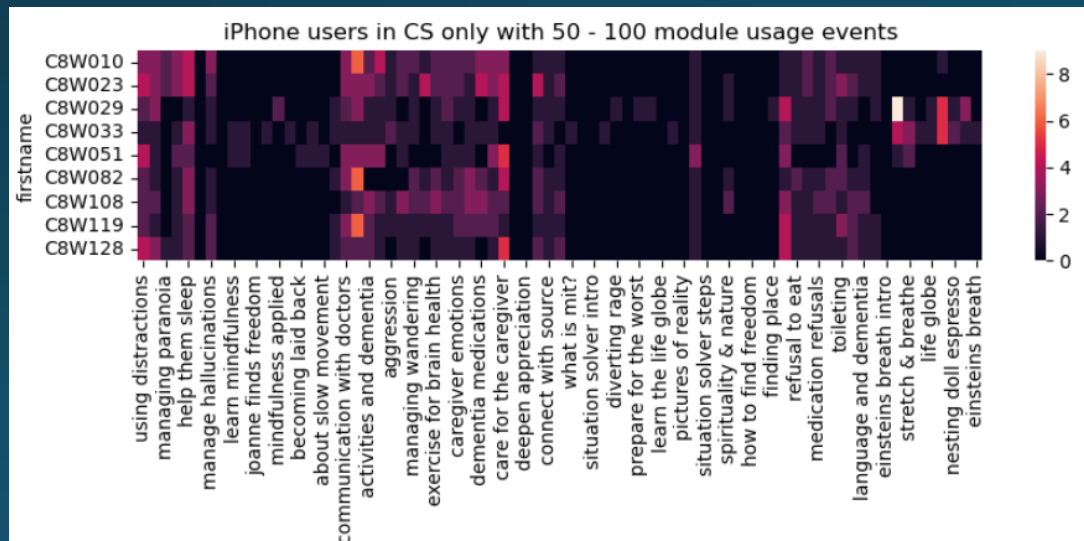
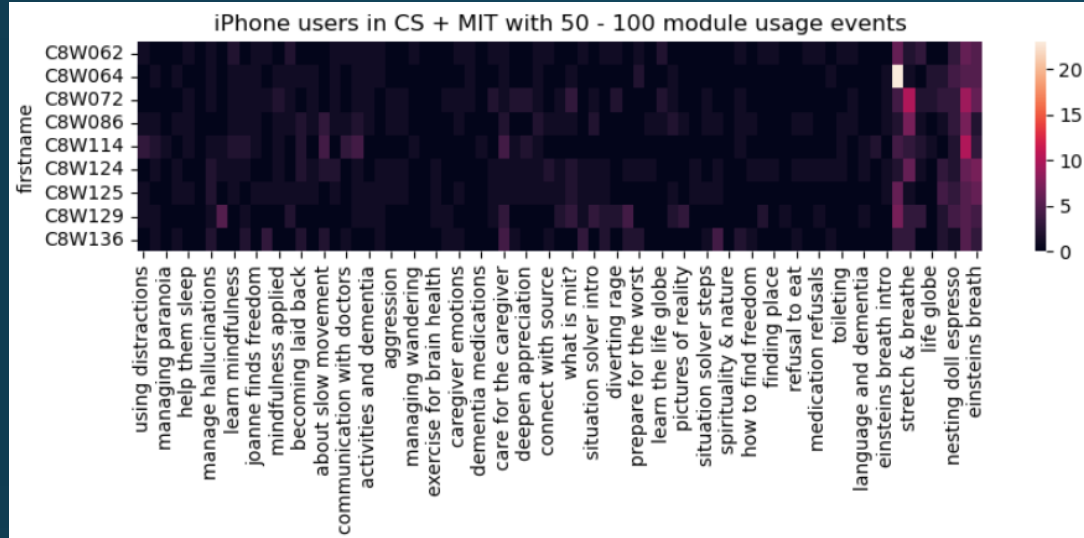


Figure 2. Trial Flow. App = smartphone application; CBS = Zarit Caregiver Burden Scale; CMI = Caregiver Mastery Index; CS = Caregiver Skills; ISI=Insomnia Severity Index; MIT = Mentalizing Imagery Therapy; PSS = Perceived Stress Scale; QIDS-SR = Quick Inventory of Depressive Symptoms – Self Report. Ecological momentary assessments occur every other day.



Personalizing module selection via today menu



MRT Study design funded by MassAITC

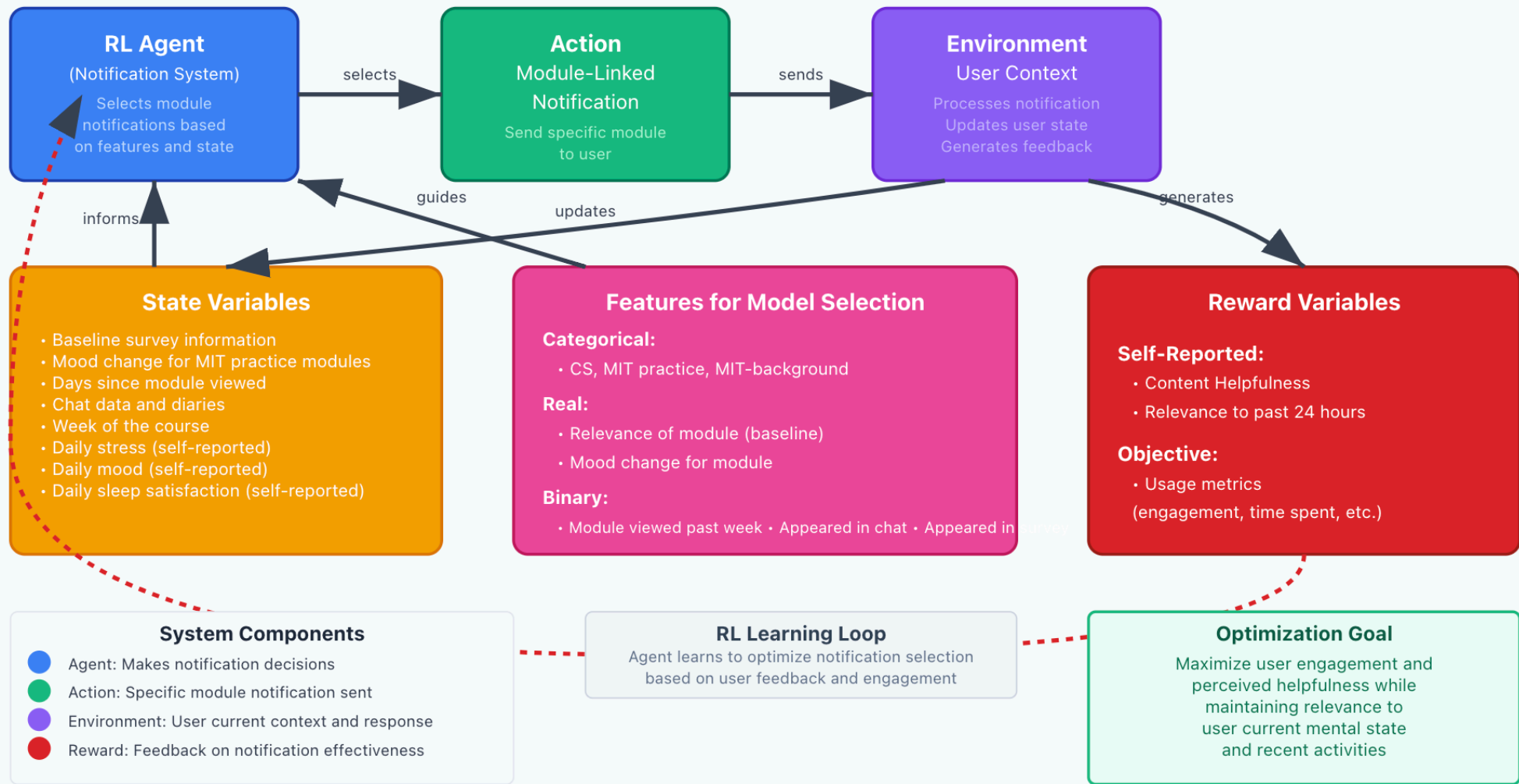
- Participants: 40 family AD/ADRD caregivers
- Length: 3 months
- 3 notifications a day (user specified ranges): CS module, MIT module, survey
- Today menu determined by RL algorithm
- Notifications sent at:
 - User-defined two-hour preference windows
 - Target for whenever user is already on phone
 - Average time in range



How does the agent choose the action?

- Pure exploration scenario
 - 74 modules choose 4 Today Menu slots = 1,150,626 possibilities for each day
 - Not going to have enough actions to facilitate learning!
- Feature-weight adjustment
 - Common set of features describes all of the modules
 - Assign a numeric score to each feature
 - The RL algorithm applies multipliers to weight each feature score
- The RL algorithm learns how to weigh the features better, to prioritize some and deprioritize others
- RL algorithm will learn how to weigh the features based on the state of the caregiver and reward from prior actions
- State includes week of the intervention, symptoms, etc

Reinforcement Learning System for Module-Linked Notifications



Thank you!

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Mobile App Trial

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