Daily Life Sampling Workshop

Introduction

10.6.25

Gratitude

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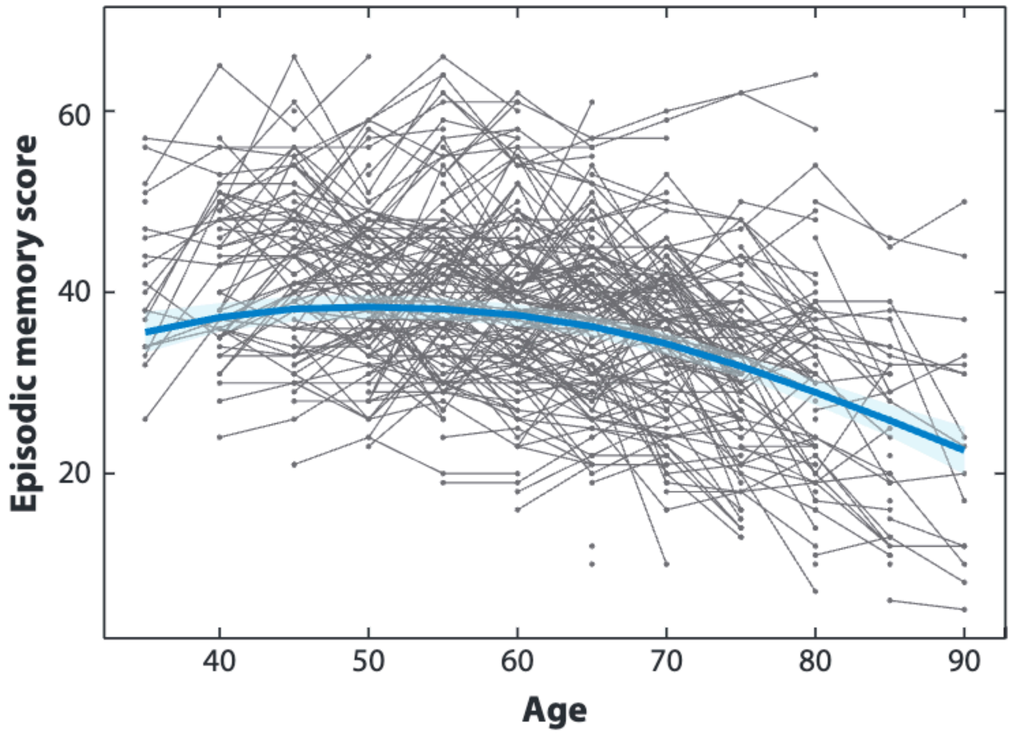
Roadmap

- Making the case for daily life sampling methods in aging research
  - Aging and emotion
  - Clinical populations
- Hands-on tutorials
  - Study design + practical considerations
  - Quality control and data cleaning (+ R code)
  - Analyzing intensive longitudinal data—multilevel modeling (+ R code)

Importance of understanding daily life

- Considerable heterogeneity across both individuals and contexts observed in many domains over the life span (Stine-Morrow, 2007)

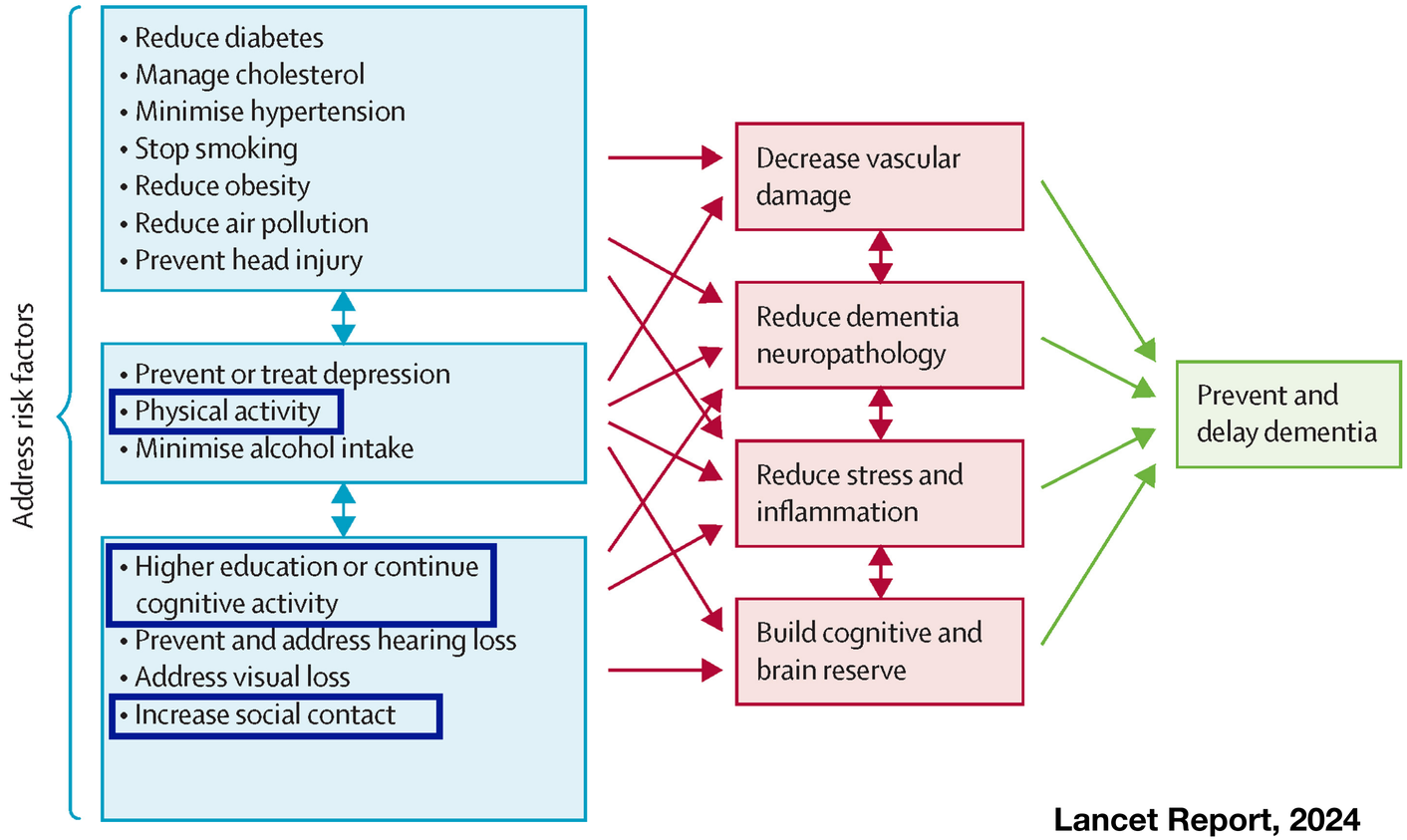
- Processes captured in the lab may not reflect daily life function (Salthouse, 2010)



Nyberg & Pudas, 2019

Importance of understanding daily life

- Many modifiable factors associated Alzheimer's disease can be best captured in daily life contexts



Lancet Report, 2024

Defining Daily Life Measures

- Not a single research method—umbrella term used to describe a diverse set of approaches
- Ambulatory Assessments [AA] (Trull & Ebner-Priemer, 2014)
  - Mobile cognitive assessments
  - Passive sensing
    - GPS geolocation, heart rate, sleep, auditory environment, screenomics
  - Ecological Momentary Assessment [EMA] (Shiffman et al. 2008)
    - Daily Diaries (Bolger et al., 2003)
    - Experience Sampling Method [ESM] (Csikszentmihalyi & Larson, 2014)

Features of Daily Life Measures

- Daily life ecology
- Repeated within-person sampling
- Real-time assessment

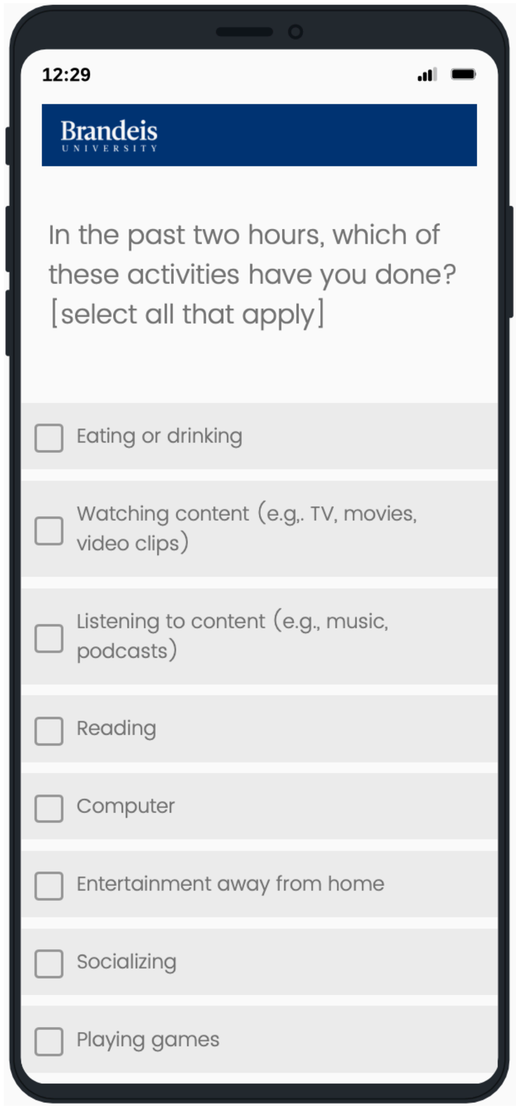
Daily Life Methods

Laboratory

Crawford et al., 2022

Daily Life Ecology: Contexts

- Daily life activities
  - Mental demand, physical demand, motivation
- Affect
  - Coupling between affect and experiences in daily life
- Audio recordings [Electronically activated recorder; EAR] (Mehl, 2017)
- Geolocation



Daily Life Ecology: Social Interactions

- Daily life sampling provides access to complex web of social interactions and dynamics across many different contexts
  - Information about older adults' social partners and their wellbeing (Zhaoyang et al., 2018)
  - Influence of social attributes on self-control behavior (Castrellon et al., 2024)
  - Loneliness (Zhaoyang et al., 2022)

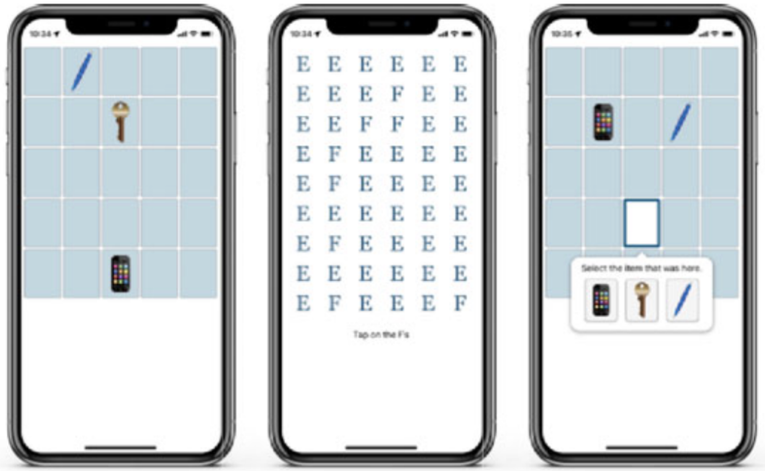
Daily Life Ecology: Physiology

- Passive sensing of physical activity — actigraphy, fitness wearables
  - Affective responses to exercise in younger and older adults (Stojanovic et al., 2024)
  - Associations with dopamine receptors (Dang et al., 2017)
- Heart rate variability (Liu et al., 2021)
- Sleep (e.g., Oura rings)

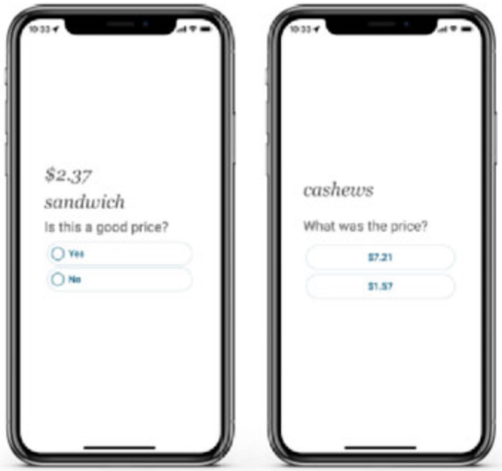
Daily Life Ecology: Cognition

- Ambulatory cognitive assessments have been successfully measured in older adults (with and without cognitive impairments (Nicosia et al., 2023)
  - Relationships with age, AD pathology (Berron et al., 2024; Nicosia et al., 2023)
- Decision making paradigms have also been adapted for repeated daily life administration (Hewitt et al., 2025)

Working Memory



Associative Memory



Nicosia et al., 2023

Repeated Within-Person Sampling: Variability

- Variability in cognition has been associated with later cognitive declines in older adulthood (Lövdén et al., 2007)
    - Linkages to both neuromodulator systems (MacDonald et al., 2006) and AD pathology (Nicosia et al., 2023)
- Cognitive variability measured in daily life is associated with preclinical AD pathology (Aschenbrenner et al., 2023)
- Many other dynamic processes in daily life amenable to quantification with daily life sampling (e.g., affect)

Repeated Within-Person Sampling: Variety

- Activity diversity (Lee et al., 2018; 2021; 2023)
  - Associated with emotional well-being, cognition, and hippocampal volume
- Experiential diversity (Heller et al., 2020)
  - Related to positive affect; striatal-hippocampal coupling
- Social diversity (Lee et al., 2023)
  - Linkages to loneliness

Low Diversity **High Diversity**

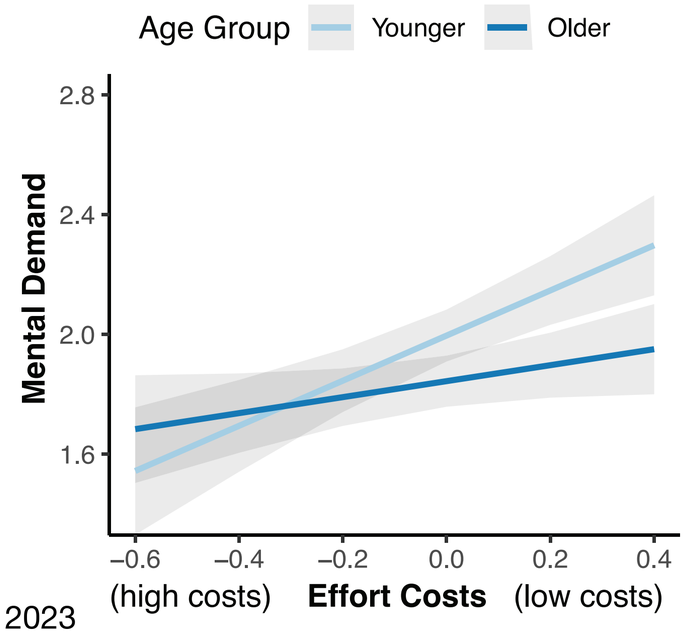
Heller et al., 2020

Real-time Assessment: Measurement

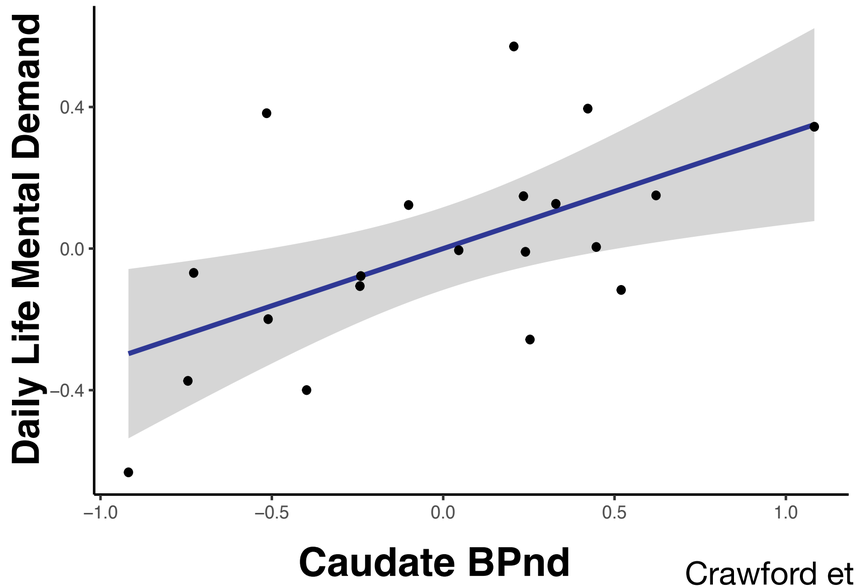
- Limits retrospective responses biases common in self-report questionnaires (Barrett et al., 1998)
  - Retrospective responses biases have been shown to be more pronounced in older adults with declines in fluid cognitive functioning (Klumb & Baltes, 1999)
  - Positivity biases in the recall of information in older adults (Neubauer et al., 2020)
- Repeated real-time assessments can also help to more reliably measure a construct, relative to one-time laboratory assessments
  - Show stronger relationships with indices of neurodegeneration (Allard et al., 2014)

Extending from the Lab to Daily Life

- Processes measured in the lab can be extended to daily life
  - Behavioral tasks: People with greater motivation (in lab) have higher levels of mental demand in their daily life activities
  - Neuroimaging: Higher caudate dopamine receptors availability was associated with greater mental demand of daily life activities



Crawford et al., 2023



Crawford et al., in press