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Digital phenotyping for sleep, cognition, and mental health in older adults: a feasibility study and implications for cognitive behavioral therapy for insomnia

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Declaration of Actual or Potential Conflict of Interest

Name of Speaker/Moderator/Moderator/Author/Other: ***Rola Harmouche***

I have no actual or potential conflict of interest related or unrelated to the content of this presentation.

MONTRÉAL
12th CSS Congress
It's time to talk about sleep.

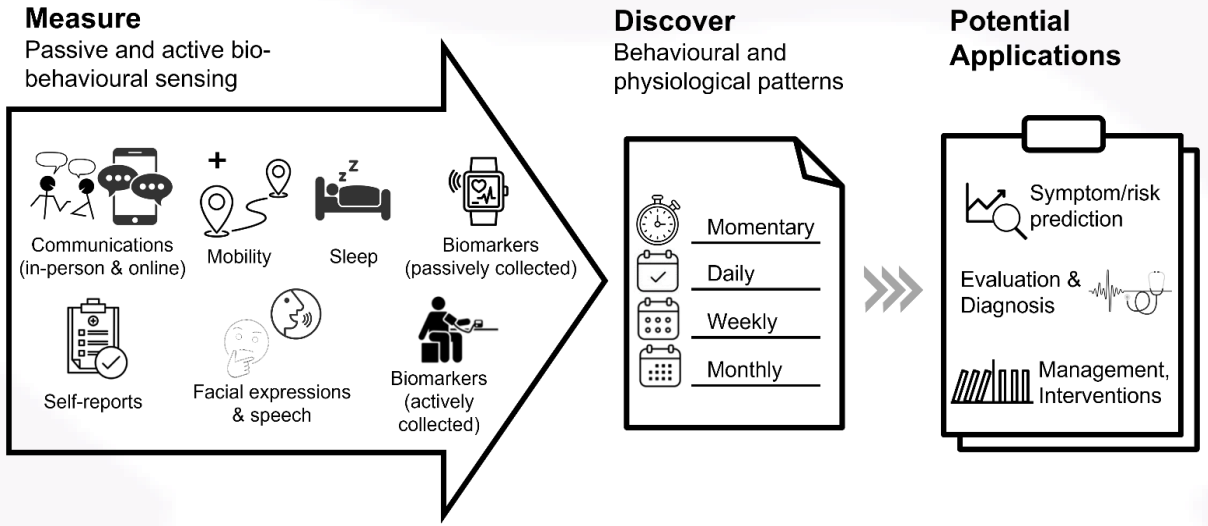
MONTRÉAL
12e Congrès de la SCS
C'est l'heure de parler de sommeil.

Digital Phenotyping for Sleep, Cognition, and Mental Health in Older Adults: A Feasibility Study and Implications for Cognitive Behavioral Therapy for Insomnia

Rola Harmouche, National Research Council Canada

What is Digital Phenotyping

- Use of data collected from various digital devices such as wearables, connected objects and smartphones (sensors and apps) to extract meaningful patterns and correlations to eventually gain insights into human behavior and health status



"From Theory to Real-World Practice: Clinical Integration of Digital Therapeutics," Psychiatric Times.
https://www.psychiatrictimes.com/view/from-theory-to-real-world-practice-clinical-integration-of-digital-therapeutics

Digital Phenotyping (DP) for Cognitive Behavioral Therapy for Insomnia (CBT-I)

- Obtain automatic and objective measures of sleep
- Derive digital phenotypes that can inform / personalize a smart phone - based intervention

Telephony

Sleep

Location from GPS

Steps

Digital Phenotypes

Multi-component intervention

Sleep Hygiene	Stimulus Control	Sleep Restriction	Relaxation	Cognitive	Wrap-Up
appropriate bedroom environment avoiding screen-based devices before bedtime avoiding coffee or alcohol consumption	using bedroom only to sleep leaving bedroom- when cannot fall asleep	restricting sleep times increasing in-bed sleep times	taking short and long relaxations during the day	restructuring undesired thinking patterns	going over each component to prevent the relapse of insomnia

B. Erten Uyumaz, L. Feijs, and J. Hu, "A Review of Digital Cognitive Behavioral Therapy for Insomnia (CBT-I Apps): Are They Designed for Engagement?," International Journal of Environmental Research and Public Health, vol. 18, no. 6, Art. no. 6, Jan. 2021, doi: 10.3390/ijerph18062929.

Methods: Development and Validation of a DP Platform

Refined platform, tailored self-reports, integrated additional sensors

mindLAMP

DigiSensing

25 participants (5 insomniac)
65+ years old
Comfortable with technology
+/- subjective cognitive decline

Onboarding

Cognitive and behavioural tests / Questionnaires

Data collection: 14 days

Passive data

Smartphone

Actigraph

Sleep tracking mat

EEG headband

Active data

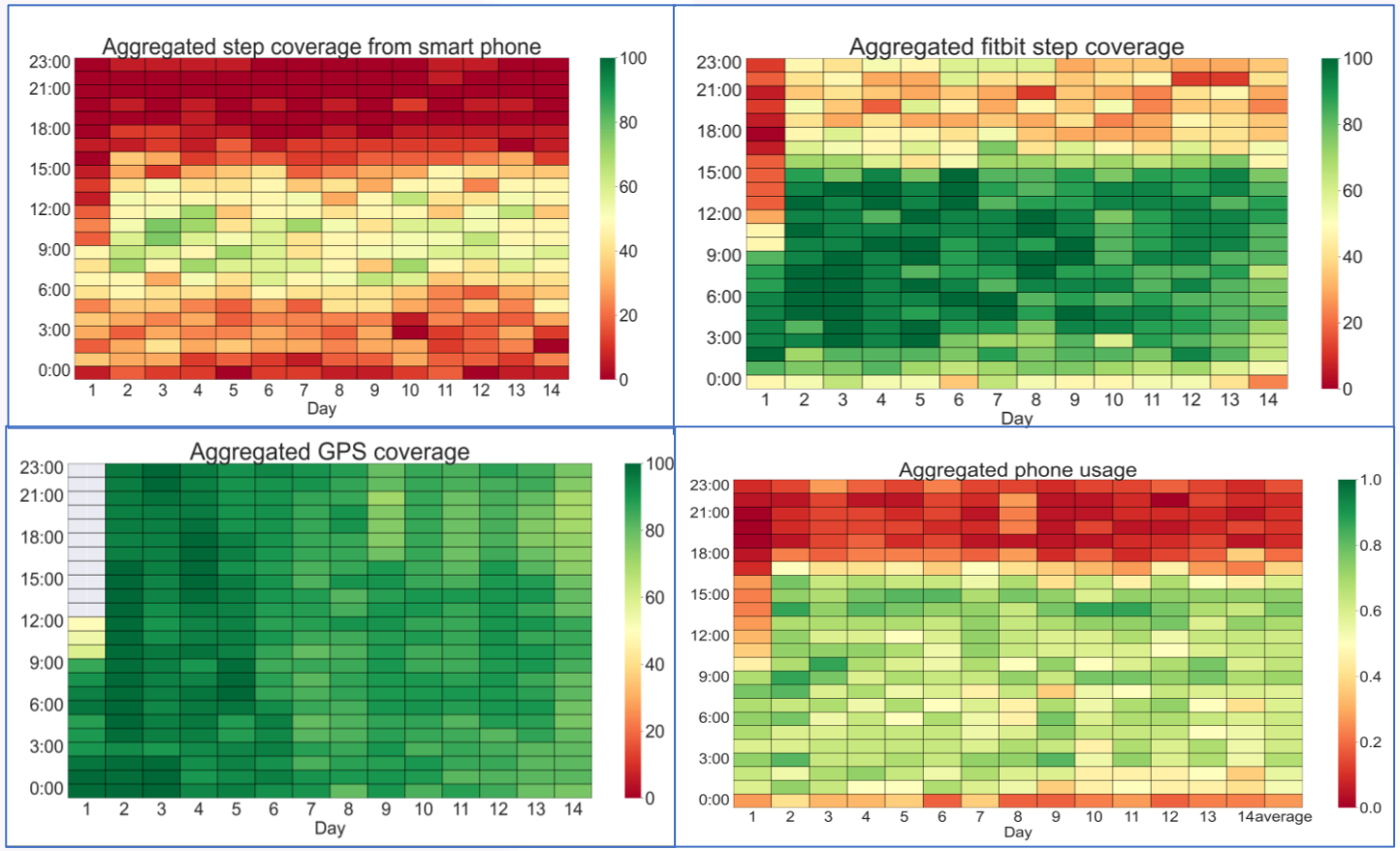
Self reports/ cognitive tests

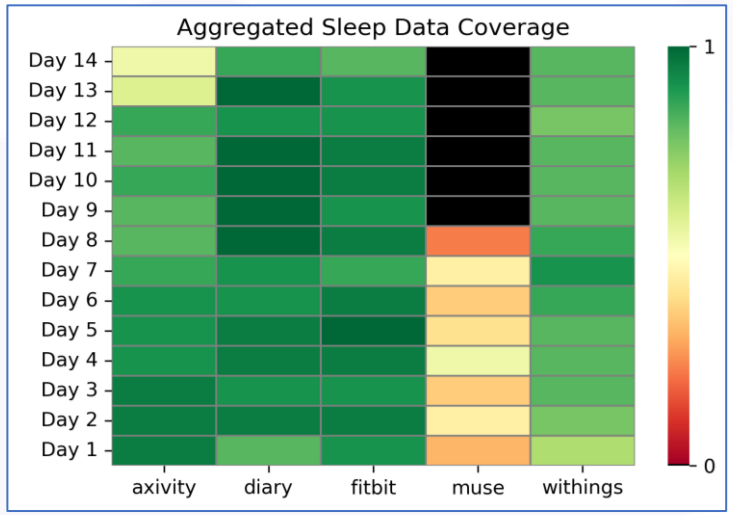
Offboarding

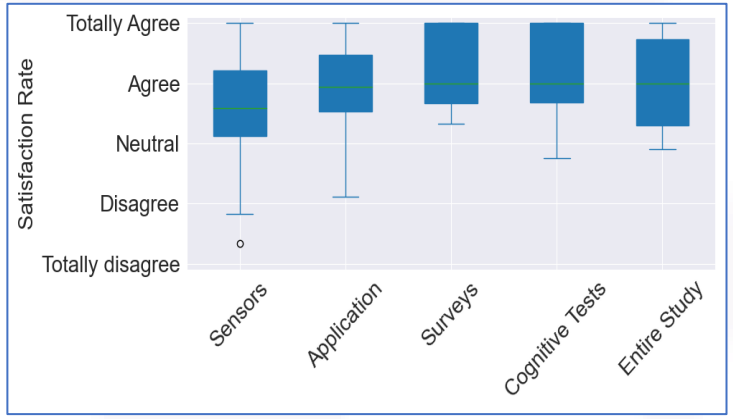
User satisfaction questionnaire

- Recruitment and study execution feasibility
- Data collection and analysis feasibility
- User satisfaction

Results- Feasibility Within Older Adults



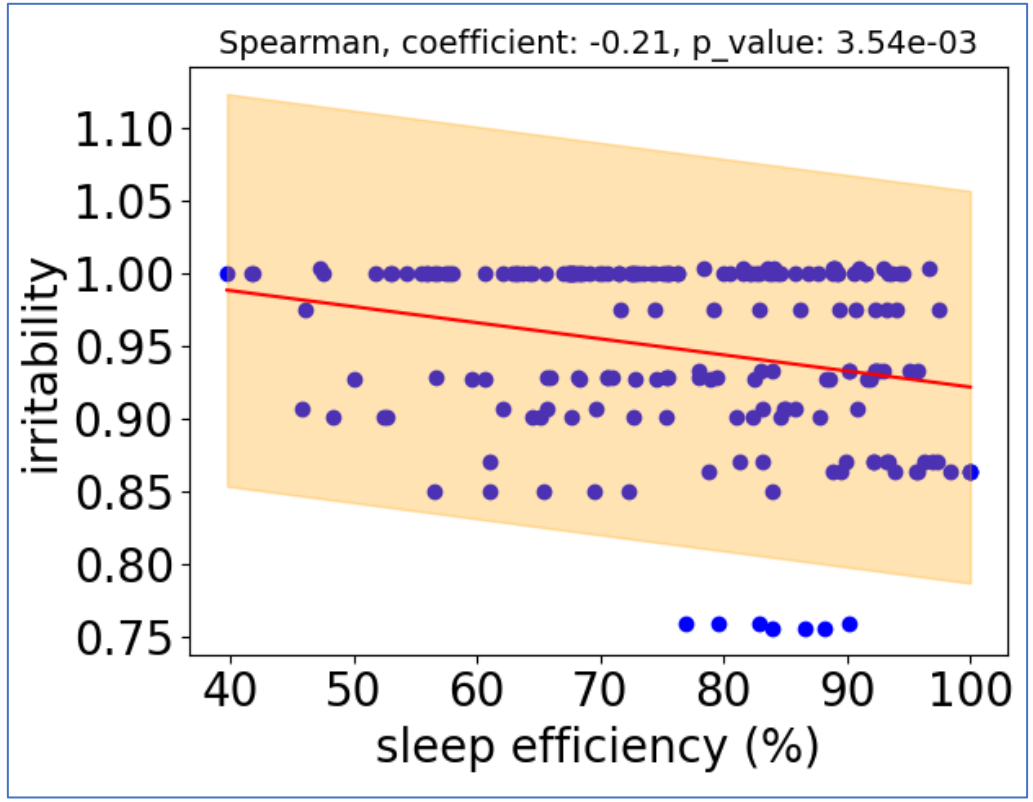


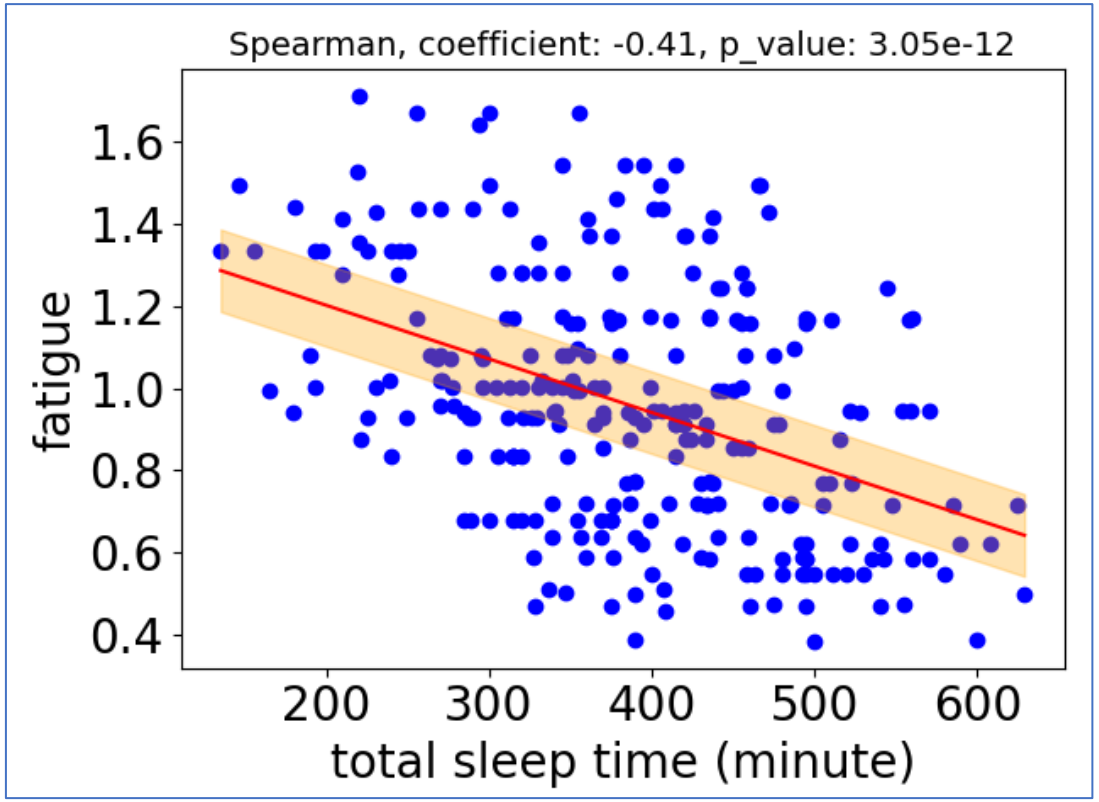


Excellent except for steps from phone

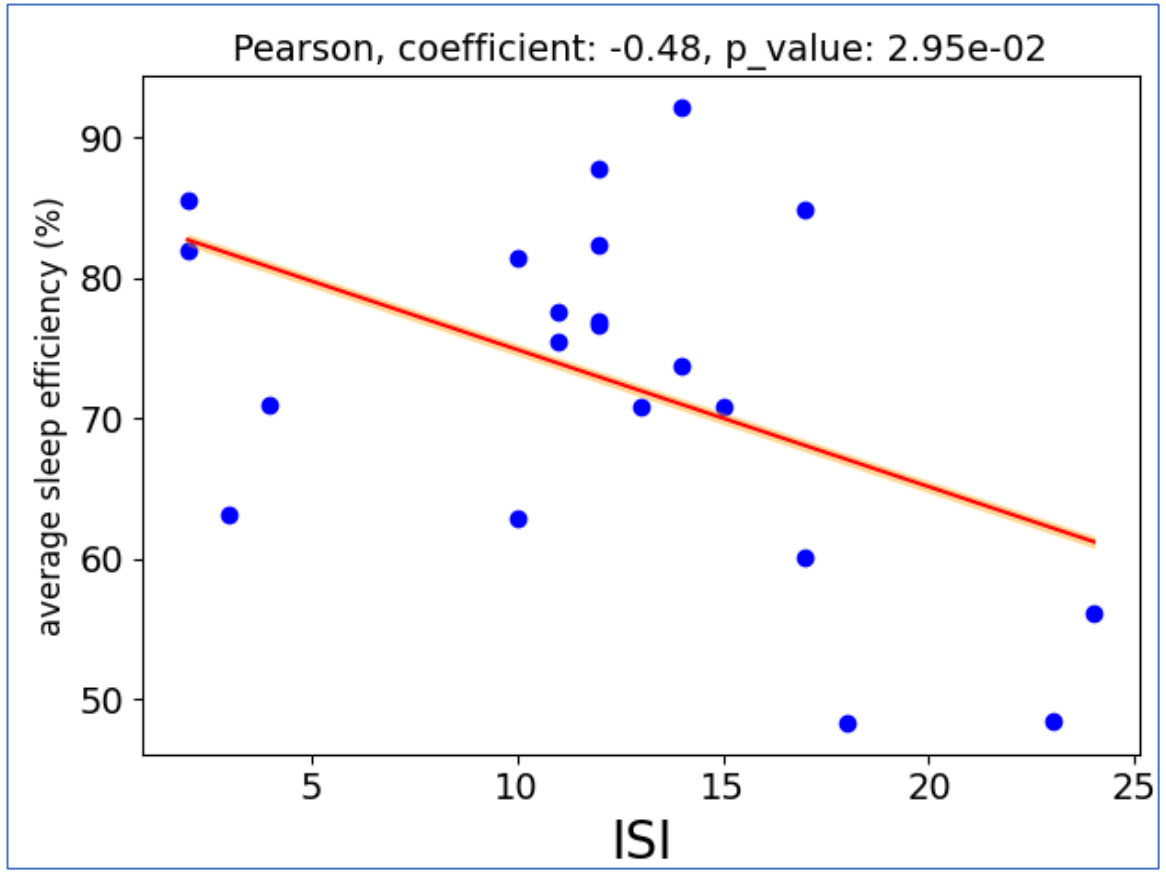
Red: < 50% Green > 80%

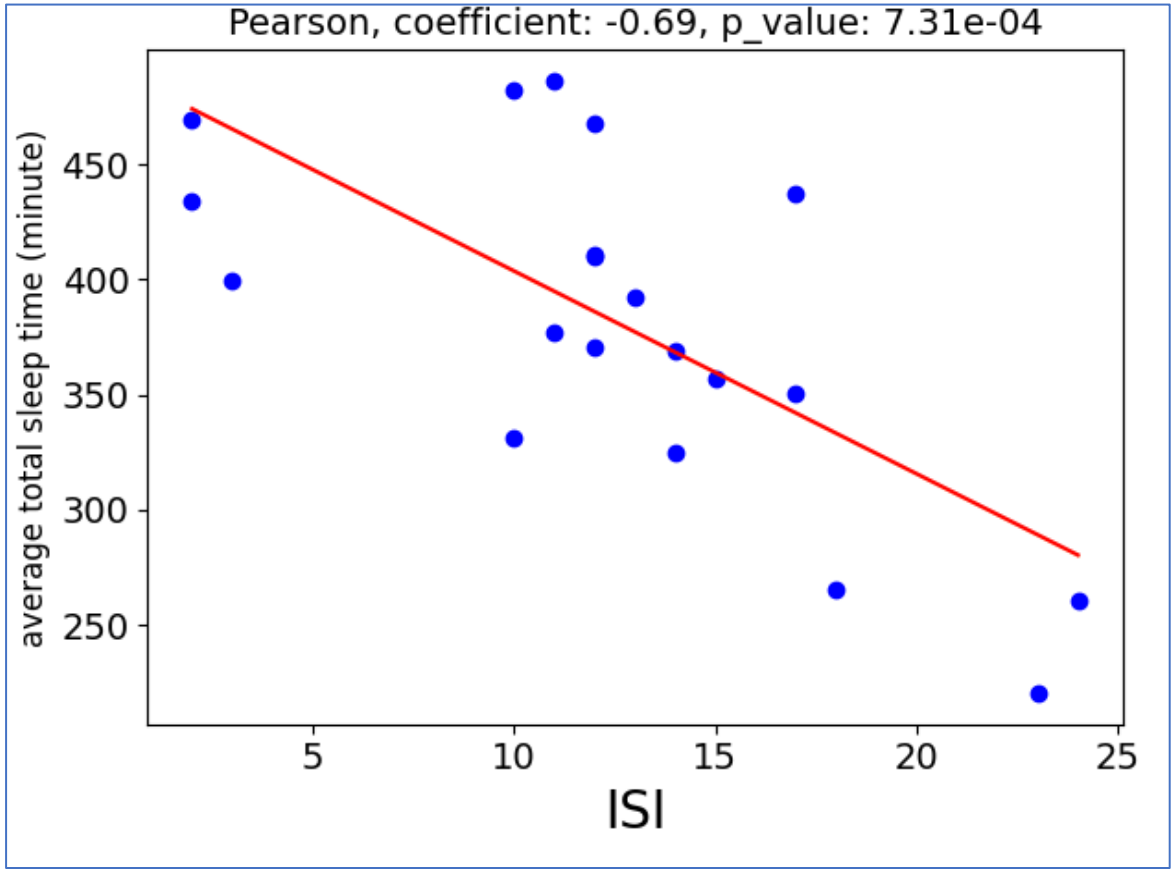
Results – Correlations Between Sleep Metrics and Well-Being





Results – Correlations Between Sleep Metrics and Baseline ISI





Results – Spearman Correlations Between Derived Phenotypes and Daily Self-Reports

Feature	Anxiety	Irritability	Stress	Fatigue
Number of Steps from Fitbit	**-0.17****	0.01	**-0.19*****	-0.05
Call Duration	**-0.33*****	-0.11	**-0.23*****	**-0.19****
Number of Visited Locations (GPS)	-0.02	**0.17****	0.05	0.07

Conclusions and Ongoing Works

- Ongoing pilot study: 10-week CBT-I intervention leveraging the platform (50 people)
- Digital phenotyping framework could be used to automatically inform CBT-I interventions