Is intake of caffeine via a oral film as effective as an expresso?

Eugénia Fernandes (1), Fabiana Ribeiro (1), Ana Moreno (1), Patrícia Batista (2), Manuela Pintado (2), & Patrícia Oliveira-Silva (1)

(1) HNL/CEDH – Human Neurobehavioral Labortory/Research Centre for Human Development, Universidade Católica Portuguesa, Porto, Portugal

(2) CBQF – Centre for Biotechnology and Fine Chemistry – Associate Laboratory, Escola Superior de Biotecnologia, Universidade Católica Portuguesa, Porto, Portugal

Caffeine is the most consumed psychoactive drug in the world

Safe consumption of up to 400mg/day
(Toxic at 10 g)

Mostly consumed in drinks

Coffee consumption (kg per person per year):

Finland	12.0	
Portugal	4.3	
U.S.A	4.2	
U.K.	1.7	(Jan 2018)

"Appetitive" outcomes

↑ **physical performance**
(endurance sports)

↑ **burn calories and fat**
(short-term effects)

↑ **cognitive performance**
(e.g., sustained attention)

↓ **sleepiness and fatigue**

Disavantageous outcomes

Rapid gut absorption
99% in 45 min after intake

Risks of overconsumption
Nervousness, gastrointestinal and cardiac alterations

Carbonated and/or sugary
Problem to diabetics, obese, people on diets

Unknown concentrations
Most consumers not aware of amount ingered

Addiction
and withdrawal effects
(addiction pathways)

Unavailable to some
Dysphagia, geriatric and mental patients

CBQF's Orodispersible Film (OF) for delivery of caffeine

***In vitro* tests**

Sustained delivery of caffeine within a customized period

↑ stability and residence time of caffeine in contact with the buccal mucosa (↓↓ 1st-pass hepatic metabolism)
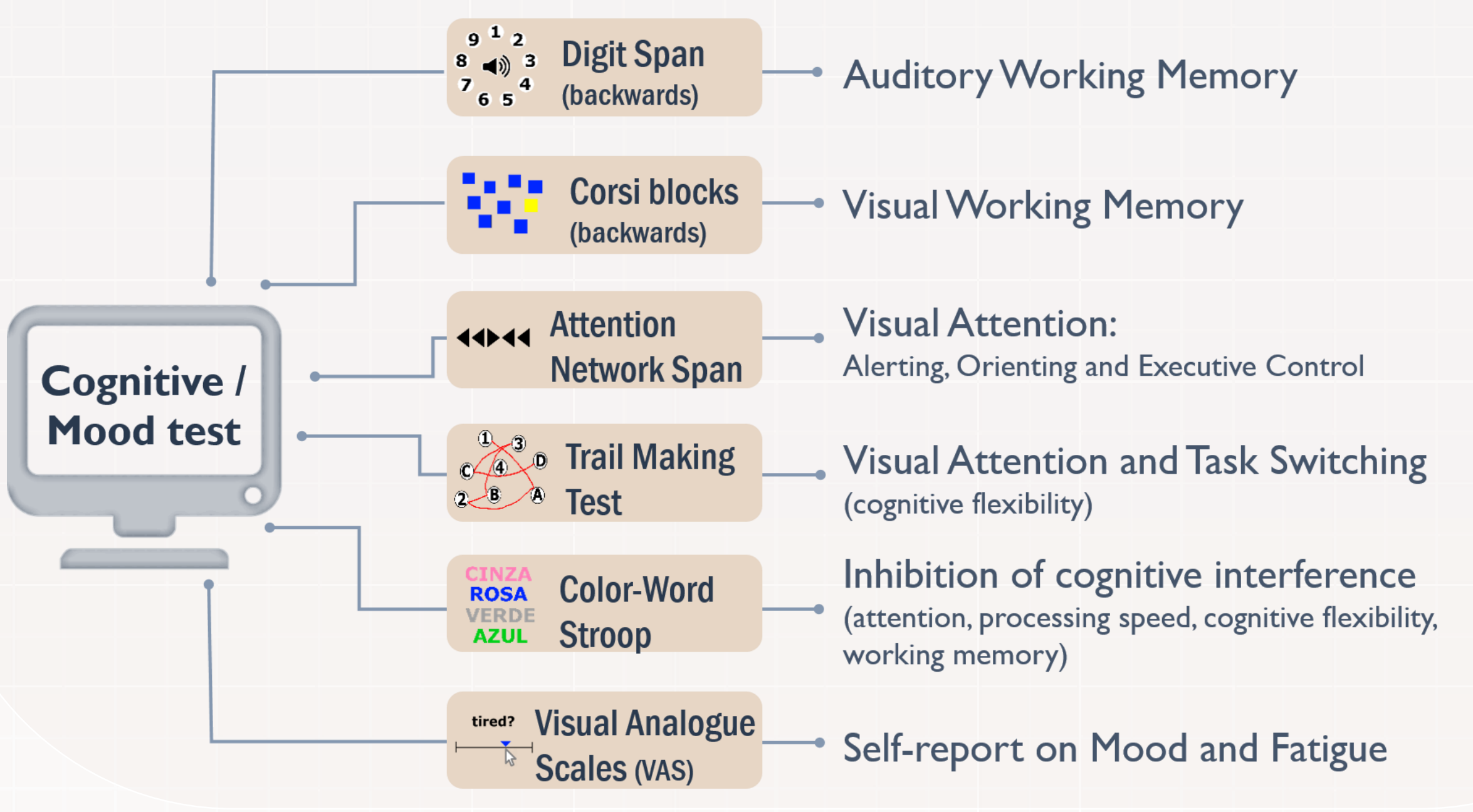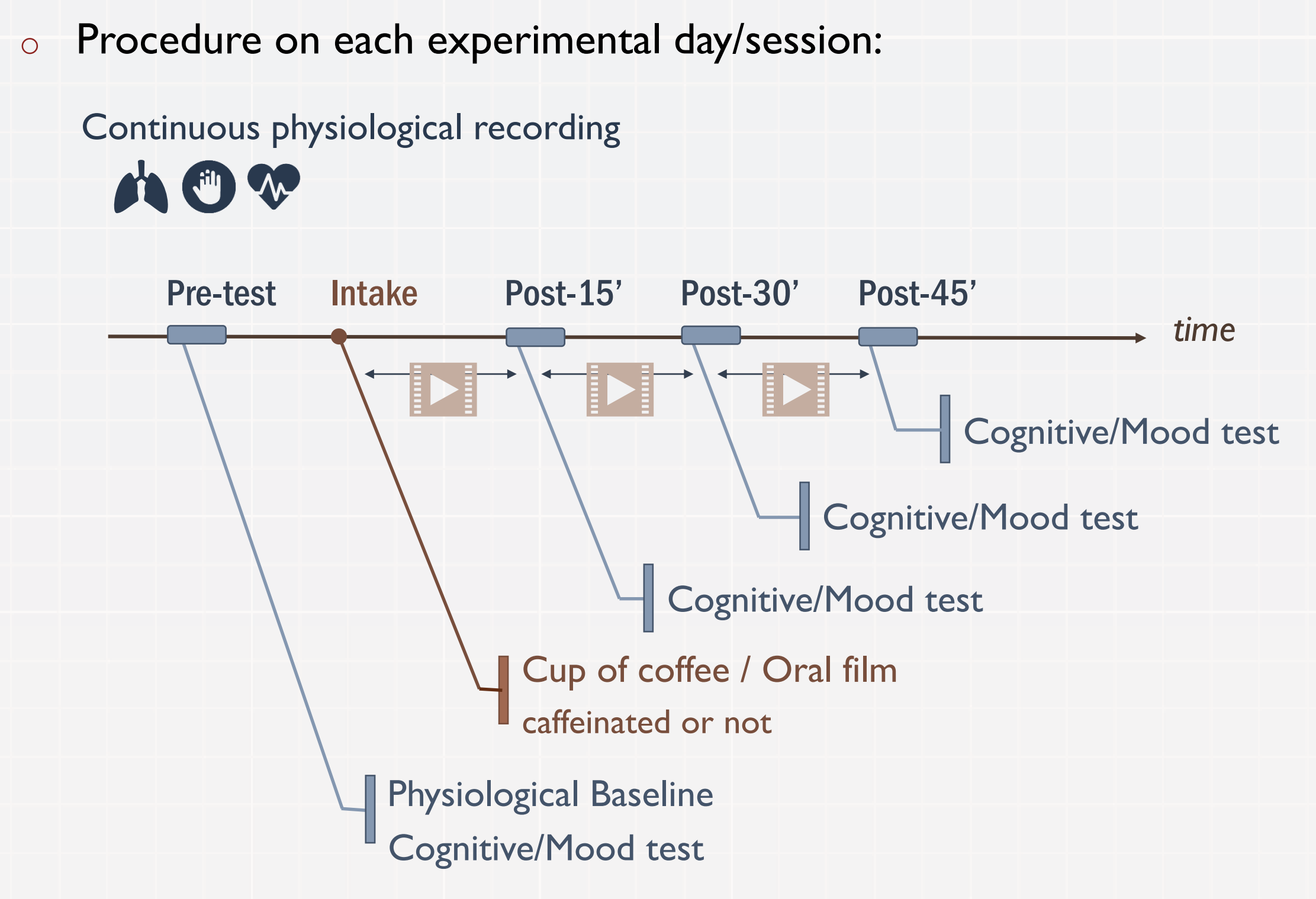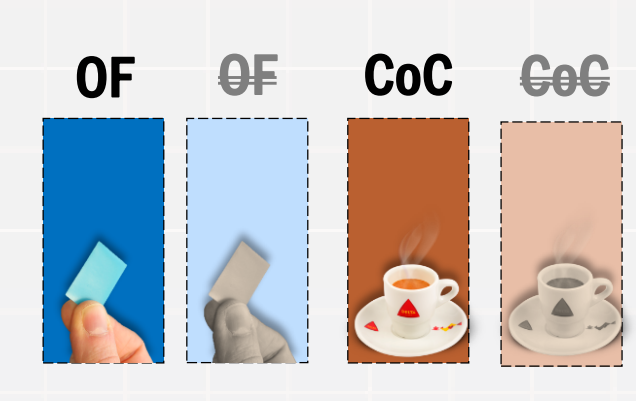
Psych. Study (experiment with human participants): psychophysiology of this OF

(1) Characterize the psychophysiology of caffeine intake via our novel OF

o Physiological correlates: Respiratory, Electrodermal and Cardiac activity (BIOPAC)

o Mood and cognitive performance

(2) Compare its effects with a traditional intake modality (espresso coffee) during Δt=45' post-intake
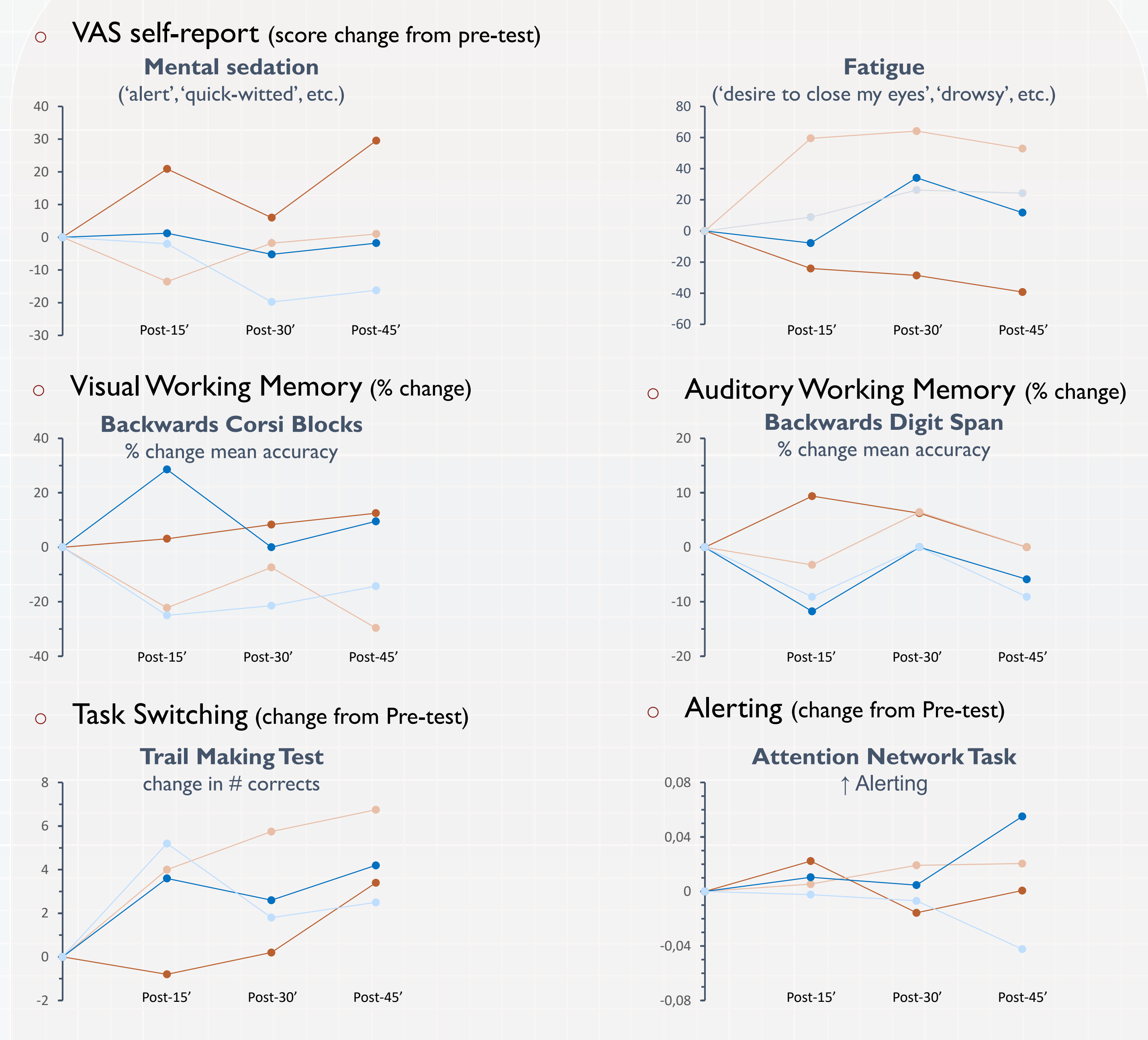
Methods

o Estimated $N = 20$ adults, moderate caffeine-consumers (as of yet, $N = 9$)

o Intra-subject, randomized, 4x4 Latin square counterbalanced, double-blind, controlled study

o 4 exp. days per participant:

OF: Orodispersible Film with caffeine
OF: Orodispersible Film without caffeine
CoC: Cup of coffee (1 espresso)
CoC: Cup of decaffeinated coffee

o Procedure on each experimental day/session:

Continuous physiological recording

Pre-test — Intake — Post-15' — Post-30' — Post-45' — time

Cognitive/Mood test

Cognitive/Mood test

Cognitive/Mood test

Cup of coffee / Oral film
caffeinated or not

Physiological Baseline
Cognitive/Mood test

Cognitive / Mood test:

- Digit Span (backwards) → Auditory Working Memory
- Corsi blocks (backwards) → Visual Working Memory
- Attention Network Span → Visual Attention: Alerting, Orienting and Executive Control
- Trail Making Test → Visual Attention and Task Switching (cognitive flexibility)
- Color-Word Stroop → Inhibition of cognitive interference (attention, processing speed, cognitive flexibility, working memory)
- Visual Analogue Scales (VAS) → Self-report on Mood and Fatigue

Preliminary Results

o VAS self-report (score change from pre-test)

Mental sedation
('alert', 'quick-witted', etc.)

Fatigue
('desire to close my eyes', 'drowsy', etc.)

o Visual Working Memory (% change)

Backwards Corsi Blocks
% change mean accuracy

o Auditory Working Memory (% change)

Backwards Digit Span
% change mean accuracy

o Task Switching (change from Pre-test)

Trail Making Test
change in # corrects

o Alerting (change from Pre-test)

Attention Network Task
↑ Alerting

- OF caffeine
- OF no caffeine
- CoC caffeine
- CoC decaf.

o **Physiological data**

☑ Pre-processing (visual inspection, triggers, filtering, smoothing...)

☐ Currently creating the cardiac, respiratory and electrodermal analysis templates (AcqKnowledge)

Contact Information

HNL   CBQF