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Effects of exercise intervention on cognitive functions, emotional regulation and electrophysiological signals in sedentary young people with risky alcohol use: A pilot study

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Introduction

It has been reported that **young people** who take part in **risky alcohol use** (RAU) show several **cognitive deficits** paired with neurophysiological changes [1]. Parallel to this, alcohol **craving**, as well as **negative mood** and **anxious symptoms** seem to **diminish upon exercising**, as well as the cognitive functioning [2]. Our research group has found that **different types and intensities of exercise** can distinctly influence both brain function and cognition, as well as the relevance of designing exercise interventions according to the **individual needs** and characteristics of young populations. However, investigation is lacking about its impact on young people with RAU, which opens the possibility to study this **promising intervention**, and its effects on **anxiety reduction** and **improvement of cognitive faculties** [3].

Aim

Study the effects of **exercise program, lasting 1 month,** on **EEG and HRV resting state**, and **cognitive functions** in physically inactive young people with RAU (n=3) compared to a control (CO) group (n=3).

Hypothesis

Long-term **strength and cardiovascular exercise** will have a **positive impact on EEG signals and cognitive function**, as well as on **emotion-related variables** in both groups, especially in the **RAU condition**.

Methodology

PRE-EXERCISE ASSESSMENT

DAY 1

Resting-state:
5 min EO
5 min EC

Cognitive tests
CPT
TAVEC
REY figure test
TESEN
STROOP
FAS-PMR
Letters & Numbers
WCST

DAY 2

Basal salivary cortisol → 5 min stressful VR enviroment → 20 min delay

HR activity / EDA data acquisition throughout all experiment duration

Sample characteristics:
Mean age: 19.89 ± 2.35
AUDIT score (♂≥ 8,♀≥ 6)
<150 minutes of intense physical activity/week.

3 exercise sessions (30min)/week * 5 weeks

1	15’ strength + 5’ cardio 5x(3’ + 1’)	Supervised
2		
3		
4	12’ strength + 8’ cardio 5x(2’30” + 1’30”)	
5		
6		Guided - Autonomous
7	10’ strength + 10’ cardio 5x(2’ + 2’)	Supervised
8		
9		Guided - Autonomous
10	8’ strength + 12’ cardio 5x(1’30” + 2’30”)	Supervised
11		Guided - Autonomous
12		Supervised
13	12’ strength + 12’ cardio 5x(2’30” + 2’30”)	Guided - Autonomous
14		Supervised
15		Free - Autonomous

POST-EXERCISE ASSESSMENT

DAY 1

Resting-state:
5 min EO
5 min EC

Cognitive tests
CPT
TAVEC
REY figure test
TESEN
STROOP
FAS-PMR
Letters & Numbers
WCST

DAY 2

Basal salivary cortisol → 5 min stressful VR enviroment → 20 min delay

HR activity / EDA data acquisition throughout all experiment duration

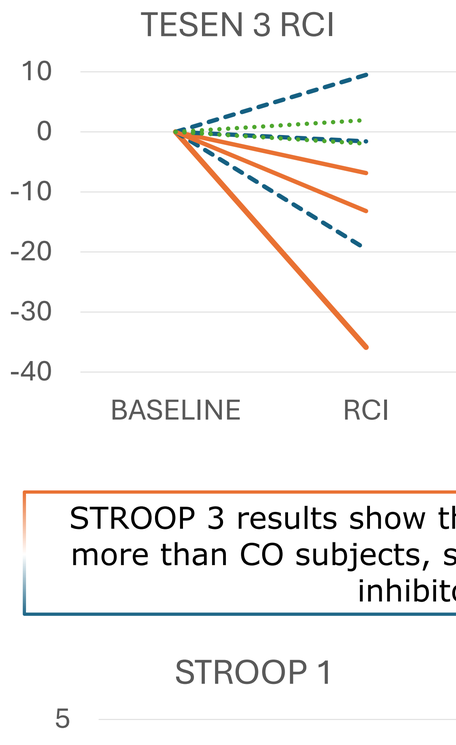
Results

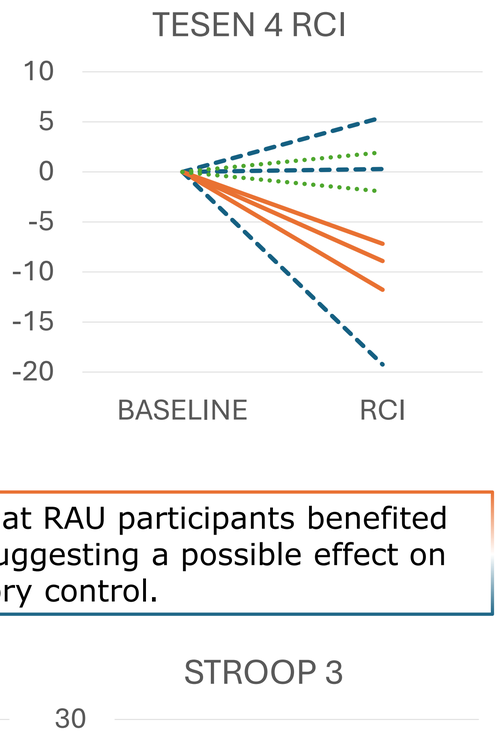
All RAU participants presented a Reliable Change Index (RCI) related to higher processing speed as seen on both TESEN conditions, whereas each CO participant presented a different pattern of change.

Each line represents a subject

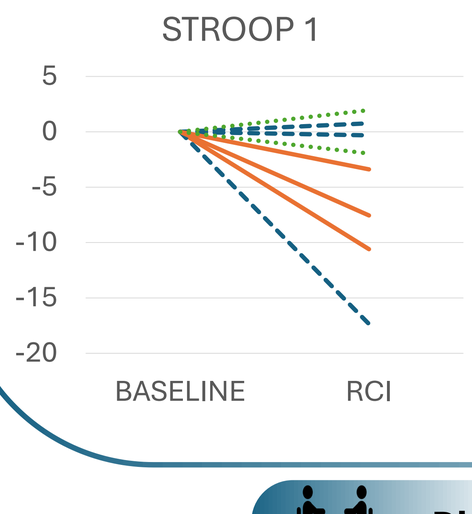
±1.96

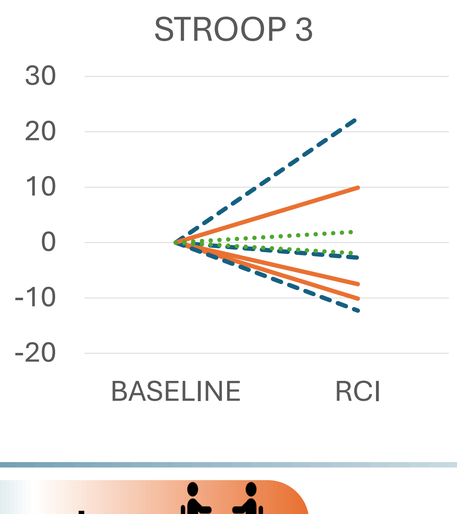
RAU
CO
RCI threshold



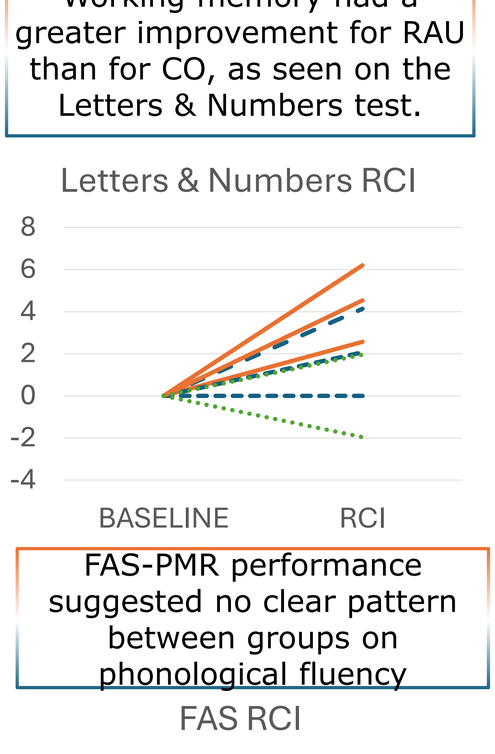


STROOP 3 results show that RAU participants benefited more than CO subjects, suggesting a possible effect on inhibitory control.

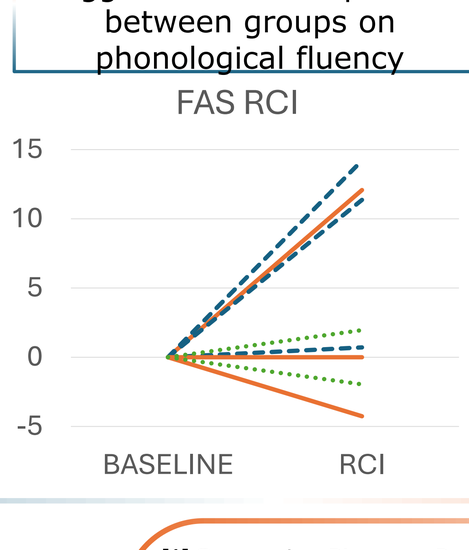




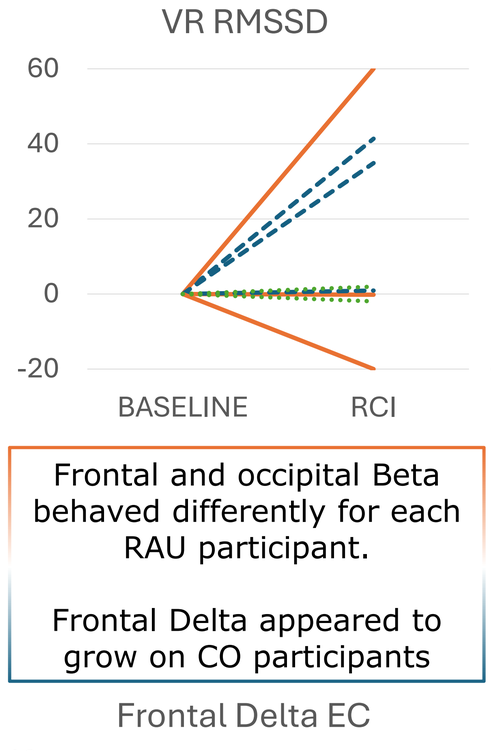
Working memory had a greater improvement for RAU than for CO, as seen on the Letters & Numbers test.

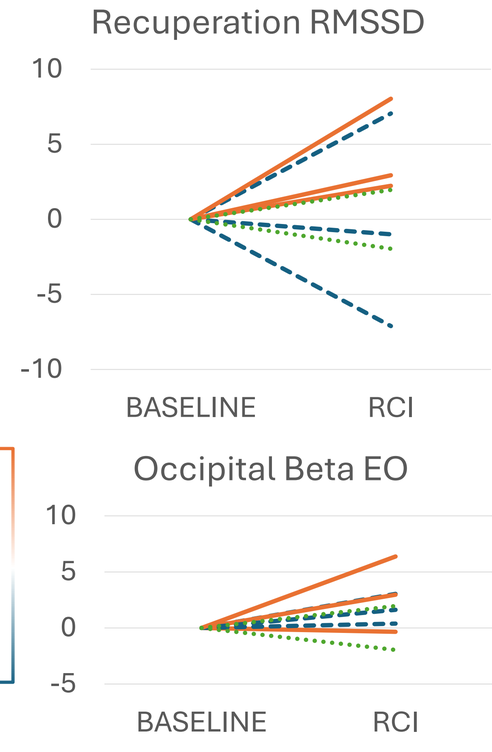


FAS-PMR performance suggested no clear pattern between groups on phonological fluency



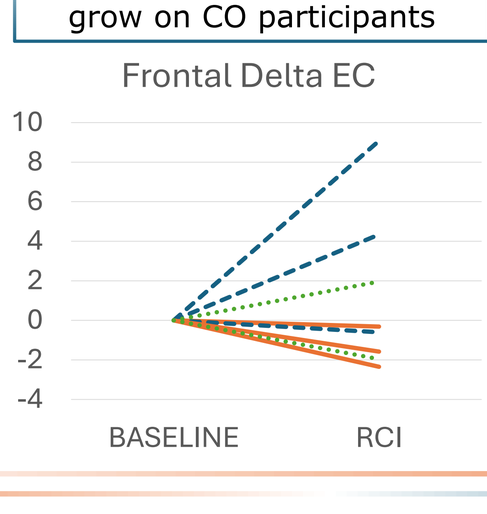
Contrary to CO, all RAU participants experimented a reliable change on their post VR RMSSD, suggesting a greater modulation of their parasympathetic system.

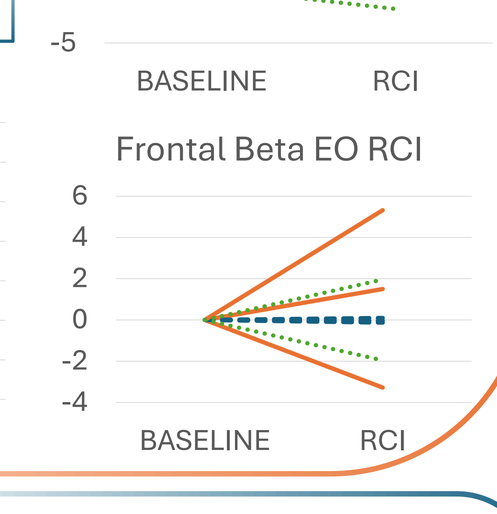




Frontal and occipital Beta behaved differently for each RAU participant.

Frontal Delta appeared to grow on CO participants





Discussion

Our **pilot study** suggests that a structured **exercise intervention** may be associated with a light improvement in some cognitive domains in **young people with RAU**, although changes were not consistent across all participants or measurements. These preliminary findings warrant further investigation in **larger samples**.

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