Neuro-cognitive effects of tyrosine supplementation in healthy older adults: A fNIRS-EEG study

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Ethical review	Approved WMO
Status	Completed
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON41819

Source
ToetsingOnline

Brief title
INTENSE

Condition

- Other condition
- Cognitive and attention disorders and disturbances

Synonym
cognitive decline

Health condition

cognitieve achteruitgang

Research involving
Human

Sponsors and support

Primary sponsor: Wageningen Universiteit
Source(s) of monetary or material Support: Europees Fonds voor Regionale Ontwikkeling (EFRO;EU en Provincie)

Intervention

Keyword: aging, cognitive control, prefrontal cortex, tyrosine

Outcome measures

Primary outcome

Changes in functional prefrontal activation as determined by oxygenated hemoglobin changes (µmol/L) induced by tyrosine supplementation, measured during response inhibition performance.

Secondary outcome

- Changes in functional prefrontal activation as determined by oxygenated hemoglobin changes (µmol/L) induced by tyrosine supplementation, measured during working memory performance.
- Changes in functional prefrontal activation as determined by deoxygenated hemoglobin changes (µmol/L) induced by tyrosine supplementation, measured during response inhibition performance and working memory performance.
- Changes in brain activity as determined by EEG frequency bands, induced by tyrosine supplementation, measured during response inhibition performance.
- Effect of blood pressure (mmHg), exhaled CO2 (%) and heart rate on the oxygenated and deoxygenated hemoglobin changes.
- Changes in behavioural performance on the response inhibition and working memory tasks, induced by tyrosine supplementation (preparatory slowing and stop-signal reaction time of stop-signal task and accuracy and reaction time of

n-back task.

- Changes in performance on the neuropsychological test battery, induced by

tyrosine supplementation.

Study description

Background summary

Dopamine neurons in the prefrontal cortex, a brain region involved in response inhibition and working memory, are highly tyrosine-dependent. The amino acid tyrosine is a precursor of dopamine and has been shown to reduce cognitive impairments in young adults during environmental stress such as cold induction, acoustic noise or a demanding task. Both prefrontal dopamine availability and prefrontal brain activity decline in the aging brain and therefore elderly might also benefit from tyrosine supplementation to improve cognitive functioning.

Study objective

We aim to assess the effects of tyrosine supplementation on prefrontal brain activation, as measured by a combination of fNIRS and EEG, during response inhibition and working-memory performance in older adults. We will also assess whether neuropsychological functioning - as measured by paper and pencil tests - will improve due to tyrosine supplementation.

Study design

We will use a double-blind, placebo-controlled, counterbalanced within-subject study design. Subjects will be tested twice using fNIRS-EEG, once on tyrosine supplementation and once on placebo, and will be pre-screened during an intake session.

Intervention

Subjects will receive 150 mg/kg body weight L-tyrosine powder or 50 mg/kg body weight of dextrin-maltose with 100 mg/kg cornstarch (placebo condition) in a randomized order. Both interventions will be dissolved in 200 grams of flavoured light banana flavored yoghurt on different test days.

Study burden and risks

Subjects will come to the lab three times: once for 1.5 hour intake session and two times for a 3.5 hour testing session (of which 75 minutes during fNIRS-EEG measurements). After dinner on the evening prior to and on the morning of the test session, subjects have to refrain from eating, drinking coffee or other stimulant containing drinks, as well as alcohol. Furthermore, during this time period subjects have to adhere to some simple restrictions with respect to medication and drug intake. The dosage of tyrosine can be administered safely to healthy humans without any known risk of serious adverse events.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

- Aged 60-75 years
- Right-handed

- Dutch speaking
- Normal or corrected to normal vision

Exclusion criteria

- Mini-Mental State Examination (MMSE) score of <24
- Estimated IQ of <85 (based on Nederlandse Leestest voor Volwassenen (NLV) -score)
- Hospital Anxiety and Depression Scale score of >11
- Current or past psychiatric disorder, such as psychosis or major depression
- Current or past neurological disorder, such as severe cerebral vascular disease (e.g. cortical stroke, subarachnoid hemorrhage), Parkinson*s disease, epilepsy, traumatic brain injury, central nervous system infection, brain tumor, and alcoholic encephalopathy. N.B. Transient Ischaemic Attack, lacunar infarction and white matter lesions are no exclusion criteria.
- Current severe systemic disease such as coronary artery disease, myocardial infarction < 6 months, heart failure (unstable), chronic obstructive pulmonary disease (unstable)
- Current endocrine or metabolic disorders such as hepatic or renal problems
- First degree family history of schizophrenia, bipolar disorder or major depressive disorder
- Thyroid problems, such as hyperthyroidism, subclinical hyperthyroidism (TSH <0.4 mU/L), hypothyroidism, thyroid cancer
- Using medication that can interfere with tyrosine*s action: monoamine oxidase inhibitors and other antidepressants, sympathomimetic amines, and opioids
- Following a low-protein diet as prescribed by a dietician or physician
- Use of tyrosine supplements within one month prior to visit
- Being allergic or having a dislike to the product carrier (banana-flavored yoghurt)
- Blood pressure < 90/60 mmHg or > 160/90 mmHg (use of antihypertensives are allowed)
- General medical conditions, such as repetitive strain injury (RSI), colorblindness or sensori-motor handicaps, which may confound the results of the study, as judged by the investigator
- Alcohol consumption of more than 14 (women) or 21 (men) units per week
- Habitual smoking, defined as more than a pack of cigarettes per week
- Current participation in another study, or a specific cognitive training study within the past six months, or a study using the same cognitive paradigm as the current study

Study design

Design

Study type:	Interventional
Intervention model:	Crossover
Allocation:	Randomized controlled trial
Masking:	Double blinded (masking used)

Control:	Placebo
Primary purpose:	Treatment

Recruitment

NL

Recruitment status:	Completed
Start date (anticipated):	10-06-2015
Enrollment:	32
Type:	Actual

Ethics review

Approved WMO

Date:	23-04-2015
Application type:	First submission
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

ID: 29556
Source: Nationaal Trial Register
Title:

In other registers

Register	ID
CCMO	NL52264.091.15