UNIVERSITY OF JYVÄSKYLÄ DEPARTMENT OF PSYCHOLOGY

2024-2025

RESEARCH NOTIFICATION

Invitation to participate in research: "Personalised training to optimise learning through cardiorespiratory rhythm"

You are invited to participate in a study on "Personalised training to optimise learning through cardiorespiratory rhythms". The aim in this study is to determine whether learning can be enhanced by presenting stimuli at optimal moments of the respiratory and cardiac cycles in young, healthy adults. The study builds on previous findings that presenting stimuli during specific phases of respiration and heartbeat can enhance learning. Additionally, our preliminary results suggest that individual differences exist in how brain responses to external stimuli are linked to cardiorespiratory rhythm.

We are asking you to participate in this study because you are a healthy 20- to 35-year-old adult.

This information sheet describes the study and how to take part. In the attached document you will find information on how your data is used.

Participation in the study requires that you do not have:

- chronic headache or acute migraine
- dry eyes or eye discharge
- severe vision or hearing impairment
- diagnosed neurological disorders or problems caused by permanent head injuries (especially epilepsy)
- regular treatment with medicines that affect the central nervous system (epilepsy medicines); medicine for falling asleep is ok.
- heartbeat arrhythmia, medicines affecting heartbeat (especially beta blockers)
- chronic lung disease (asthma under control is ok)
- acute airway infections such as runny nose or cough
- hairstyle that prevents measuring, like rasta
- diagnosed attention deficit disorder or diagnosed language-specific disorder (e.g. dyslexia)
- diagnosed neurodegenerative disease, dementia

About 60 adult volunteer subjects will participate in the study. Participants will be randomly divided into two groups. Although the procedure will appear the same to participants, the stimuli will be presented at different phases of the respiratory and cardiac cycles in each group. This division allows us to investigate how the timing of stimuli relative to breathing and heartbeats influences responses. Note that this is a one-time participation, and you will not be contacted again afterward.

2. Voluntary participation

Participation in this study is voluntary. You can refuse to participate in the study, stop participating or cancel your previously given consent, without stating any reason for this and at any time during the study. This will have no negative consequences to you.

If you stop your participation in the study or withdraw your consent, the personal data, samples and other information collected about you until then will be used as part of the research material when it is necessary to ensure the research results.

3. Experimental protocol

In this experiment, we study if personalizing the timing of stimuli based on each participant's unique connection between cardiorespiratory rhythm phase and brain responses to auditory stimuli brings additional benefit to learning. In brief, in the laboratory, we will continuously monitor your heart rate, breathing and brain activity while you are watching a silent nature film. Intermittently, we will present tones. Then you will have a 30-minute break while we process the data to see when, in relation to heartbeat and respiration, your brain produced biggest responses to the tone. Then, you will resume watching a film while we present more tones and some airpuffs towards your eye. After the tasks we will ask you questions about the films you saw, so pay attention to the film.

The research is conducted at the Department of Psychology, University of Jyväskylä, in a laboratory space. Only one visit is required, and it lasts about 2.5 hours in total. The address of the laboratory is: Dept. of Psychology, University of Jyväskylä, Kärki-building, Mattilanniemi 6, 40100 Jyväskylä

We will pick you up from the downstairs lobby at the agreed time. In the laboratory, you will first get to know the information about the research and if you decide to participate in the research, you will sign the consent form.

Timeline of the experiment. Timing is approximate.

Preparations

First, you take a seat in the measurement room. To measure the electroencephalogram, or EEG, we will first measure your head circumference and mark the centre of the head using a makeup pencil, which can be easily washed off later. Following this, we will select the right size electrode cap and immerse it in an electrolyte solution made from a mix of distilled water, baby shampoo, and potassium chloride (salt). This solution helps improve signal quality obtained from the brain by reducing impedance. Then the cap is placed on the head, so that the EEG recording electrodes make contact to the surface of the skin. In addition, we will attach the electrodes needed to measure eye movement (electrodes around the eye) and heart rate (on the side, upper chest and neck), as well as a flexible belt over the clothes that is needed to measure body movement produced by breathing. These initial preparations last approx. 30 minutes, during which it is possible to take breaks.

Experiment

During this experiment you will be presented with a silent nature film, some tones and some airpuffs towards the eye. The study consists of two phases. In Phase 1, a simple tone is played repeatedly 450 times while you are watching a silent nature movie. This lasts ~20 minutes.

Then, your data is analysed during a 30-minute break as you are sitting in place resting. During this period, you can stand up, use the toilet etc. if you wish. Towards the end of the break, to ensure

optimal data quality, all electrodes will be thoroughly checked. Additionally, you are provided with modified safety goggles (plastic) designed to deliver an air puff towards the left eye. The pressure is adjusted so that the airpuff is only slightly annoying.

Next, in Phase 2, you will watch another silent nature movie. While watching the film on the monitor, you will hear neutral beep tones from the roof speaker and receive up to 60 airpuffs. This phase will take approx. 40 minutes. At the end of each Phase, you fill out a short questionnaire related to the movies or/and the stimuli. After this, the electrodes are removed, you can ask questions if you wish, and you can leave when you arep ready.

4. Possible benefits from the study

There is no individual feedback from the research and there is no direct benefit to the researched person. The results of the study deepen the understanding of the mechanisms of the bodily rhythms and its association with learning.

5. Possible risks, harm, and inconvenience caused by the study as well as preparing for these

The methods used in the study have no known significant side effects. Putting the EEG electrode cap in place may feel a little uncomfortable, as the scalp must be cleaned by gently rubbing it with a cotton tip applicator. When measuring EEG, we immerse the cap in saline and baby shampoo for good conductance, which is why you may want to wash your hair afterwards. The electrodes placed on the surface of the skin might result in some redness or skin irritation that should dissipate fast. During Phase 2, participants may experience mild discomfort from the air puffs delivered near the eye through the goggles. This sensation is generally brief and does not cause any lasting effects.

6. Study-related costs and compensations to the subject as well as research funding

Nothing is paid for participating in the study. It is free of charge to take part.

7. Informing about research results and research outcomes

The data collected in the research is put into such a form that any individual participant cannot be identified. Data is analysed and the results are published in international peer-reviewed scientific journals. In addition, preliminary results are presented at scientific congresses. An openly accessible version of all research reports is published in the JYX archive of the University of Jyväskylä. Depending on the interest (journalists contact us based on press releases), we will also talk about our research to a wider audience through media such as newspapers. If they wish, participants can get information about the results of the study by later contacting the responsible leader of the study. As said, no information from the study will be published that could identify an individual subject. The data protection notice tells you about the use of your personal data as part of the research (Appendix 5). It is not possible to give personal feedback about the research.

8. Insurance coverage for research subjects

The operations and participants are insured by the University of Jyväskylä. The insurance policies of the University of Jyväskylä only cover damages that are directly related to the given research task, and which have occurred during the actual instructed research task in remote research. The insurance does not cover damages that occur during breaks. The insurance policies of the University of Jyväskylä are not valid for studies carried out remotely if the participant’s hometown is not in Finland. The insurance includes patient insurance, liability insurance and voluntary accident insurance. The participants are insured against accidents, damages and injuries caused by an external cause during the research. Accident insurance is valid during the measurements and the trips immediately related to them.

9. Contact person for further information

The responsible person of the study:
Name: Praghajieeth Raajhen Santhana Gopalan

Phone number: +358505703772
Email: praghajieeth.r.santhana-gopalan@jyu.fi
Work address: Department of Psychology, PO Box 35, 40014 Jyväskylä University