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Physically active academic lessons in general upper secondary school - student study

Submission date	**Recruitment status**	[X] Prospectively registered
27/12/2023	No longer recruiting	[X] Protocol
Registration date	**Overall study status**	[_] Statistical analysis plan
11/01/2024	Completed	[_] Results
Last Edited	**Condition category**	[_] Individual participant data
10/03/2026	Other	[X] Record updated in last year

Plain English summary of protocol

Background and study aims

Physical activity has been successfully integrated in academic lessons in primary schools showing promising results on cognition and student engagement. However, there is a lack of knowledge about its effects and feasibility for individual situated learning processes in upper secondary school students. This study aims to examine the students' experiences and perceptions and acute effects of physically active learning and physically active breaks on students' situational engagement (behavioral, cognitive, and emotional engagement, disaffection and competence experiences) and cognitive prerequisites of learning (alertness and executive functions), and factors modifying these effects (physical and mental load, perceived physical and academic competence).

Who can participate?

We will invite the math and foreign language students from grades 1 and 2 in general upper secondary school to reach 120 students (mean age 17 years).

What does the study involve?

The clusters (students in the same classes) are randomized (by lottery) into three intervention arms, which undergo following treatments in different order: Treatment 1) Physically active math /foreign language lessons with physically active learning (20 minutes of physical activity is integrated into learning goals), Treatment 2) Physically active math/foreign language lessons with physically active breaks (two five-minute breaks, including physical activity not related to learning goals), and Treatment 3) Typical, traditional math/foreign language lessons without physically active learning or physically active breaks (control group).

What are the possible benefits and risks of participating?

Participation in the study does not include any risks; study practices are part of a regular school day. The multidisciplinary study project increases the understanding students' experiences, engagement, and effects in physically active academic lessons in upper secondary school. The project provides essential evidence-based recommendations of physically active classroom practices for teachers and teacher education to support the development of subject teachers' competence and, above all, to enhance students' learning and well-being in general upper secondary schools.

Where is the study run from?
The study will be run from Jamk University of Applied Sciences, Likes, Jyväskylä, Finland and University of Oulu, Finland

When is the study starting and how long is it expected to run for?
September 2023 to December 2024

Who is funding the study?
The study is funded by the Research Council of Finland (355350).

Who is the main contact?
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Additional identifiers

Protocol serial number
SA-355350

Study information

Scientific Title
Students' experiences and the acute effects of physically active academic lessons on students' situational engagement and cognitive prerequisites of learning in general upper secondary school

Acronym
PAAL-S

Study objectives
This study aims to explore the students' experiences and acute effects of physically active academic lessons on students’ situational engagement and cognitive prerequisites of learning in general upper secondary school. We examine:
1a. the students’ perceptions and experiences on students’ situational engagement and it’s relation to the physically active classroom practices and academic activities.
1b. the students’ perceptions and experiences on the usefulness of differently used physically active classroom practices during the academic lessons.
2a. how physically active learning and physically active breaks affect students’ alertness and executive functions during academic lessons?
We hypothesize that physically active learning and physically active breaks prevent the decline in alertness and executive functions during academic lessons.
2b. how physically active learning and physically active breaks affect students’ situational engagement?
We hypothesize that physically active learning and physically active breaks increase student’s situational engagement.
2c. how current physical and mental load modify the acute effects of physically active learning and physically active breaks on situational engagement and cognitive prerequisites of learning?
We hypothesize that current physical and mental load alter the effects of physically active learning and physically active breaks on situational engagement and cognitive prerequisites of learning.
2d. how perceived physical and academic competence of students modify the acute effects of PAAL on situational engagement and cognitive prerequisites of learning?

We hypothesize that the perceived physical and academic competence of students alters the effects of physically active learning and physically active breaks on situational engagement and cognitive prerequisites of learning.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 21/12/2023, Ethics Committee of Jamk University of Applied Sciences (PO BOX 207, Jyväskylä, FI-40101, Finland; +358 20 743 8100; tutkimuslupa@jamk.fi), ref: JAMK/4675/13.02/2023472673

Primary study design
Interventional

Study design
Cluster-randomized individual crossover trial

Study type(s)
Quality of life

Health condition(s) or problem(s) studied
Effects of physically active academic lessons in general upper secondary school

Interventions
The effectiveness of physically active academic lessons is examined with a cluster-randomized individual crossover trial. We recruit math and foreign language students from grades 1 and 2 in general upper secondary school to reach 120 students for the classroom measurements. The clusters (students in the same classes) are randomized (by lottery) into three intervention arms, which undergo the following treatments in a different order:
Treatment 1. Physically active math/foreign language lessons with physically active learning (20 min physical activity is integrated into learning goals)
Treatment 2. Physically active math/foreign language lessons with physically active breaks (two five-minute breaks, including physical activity not related to learning goals)
Treatment 3. Typical, traditional math/foreign language lessons without physically active learning or physically active breaks (control group)

Intervention Type
Behavioural

Primary outcome(s)
1. Alertness is assessed with a self-reported questionnaire (eKarolinska Sleepiness scale, KSS) at four times during the 75 min academic lesson in every treatment.
2. Executive functions are evaluated with a modified version of the Eriksen flanker task in the beginning and the end of the 75 min academic lesson in every treatment.
3. Situation-specific engagement is assessed with the computer-based InSituations (InSitu) instrument at the end of the 75 min academic lesson in every treatment.
4. Students' perceptions and experiences are assessed with transcribed interviews of students.

Key secondary outcome(s)
1. Physical load (beat-to-beat heart rate, stress, recovery, sleep and physical activity metrics) is measured with Firstbeat Bodyguard 3 sensors at the baseline and during every treatment.
2. Mental load. Study burnout and engagement are measured with the Student Burnout Inventory (SBI-9) and Energy, Dedication and Absorption (EDA-9) questionnaires at the baseline.
3. Perceived physical competence is measured with a questionnaire including a modified Perceived Physical Competence Scale for Children (PPCS) and with questions for ability and desire to develop one's own physical ability at the baseline.
4. Perceived academic competence is assessed with a questionnaire including self-reported academic achievement score (AA) and self-perceptions (in math and foreign language) at the baseline.

Completion date

31/12/2024

Eligibility

Key inclusion criteria
Math and foreign language students from grades 1 and 2 in general upper secondary school

Participant type(s)
Learner/student

Healthy volunteers allowed
No

Age group
Mixed

Lower age limit
16 Years

Upper age limit
20 Years

Sex
All

Total final enrolment
0

Key exclusion criteria
Young people who are not able to participate in physical activities due to disability or health reasons will not be included in the analyses.

Date of first enrolment
12/02/2024

Date of final enrolment
30/11/2024

Locations

Countries of recruitment
Finland

Study participating centre
Jamk University of Applied Sciences
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Study participating centre
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Sponsor information

Organisation
JAMK University of Applied Sciences

ROR
https://ror.org/01dn2ng71

Funder(s)

Funder type
Research council

Funder Name
Academy of Finland

Alternative Name(s)
Academy of Finland, Suomen Akatemia, Finlands Akademi, AKA

Funding Body Type
Government organisation

Funding Body Subtype
Research institutes and centers

Location
Finland

Results and Publications

Individual participant data (IPD) sharing plan

The datasets generated during and/or analysed during the current study will be available upon request from (Tuija Tammelin, tuija.tammelin@jamk.fi).

IPD sharing plan summary

Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Participant information sheet		06/03/2024	06/03/2024	No	Yes
Protocol (preprint)		03/02/2026	10/03/2026	No	No
Study website	Study website	11/11/2025	11/11/2025	No	Yes