

# Effects of indoor daylight control on middle school students

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<b>Registration date</b> 28/07/2020	<b>Overall study status</b> Completed	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
<b>Last Edited</b> 28/07/2020	<b>Condition category</b> Other	<input type="checkbox"/> Individual participant data <input type="checkbox"/> Record updated in last year

## Plain English summary of protocol

### Background and study aims

Natural light is changing in intensity and spectrum during the day. Experiencing it is a crucial factor, influencing the circadian rhythm cognitive performance, concentration and daytime sleepiness. This is also true for students. Intelligent shading systems can improve the indoor daylight supply. This controlled, single-blinded longitudinal intervention study investigated the effects of a new shading system on cognitive performance, stress and wellbeing in healthy middle school students.

### What does the study involve?

New shading systems will be installed in four classrooms of the middle school of Adnet (Salzburg, Austria). In two classrooms conventional shading systems will be installed (control-condition). The other two classrooms will be equipped with the new shading system. This new shading system leads much more daylight into the building, than conventional systems, while reflecting direct sunlight to prevent the building from overheating. During the intervention period, all children will live at home, maintaining their usual lifestyle. Participating students will be asked to perform a concentration test, to fill out some questionnaires and salivary samples will be collected.

### Who can participate?

Only students from the 7th and 8th grade of the middle school of Adnet, Salzburg, Austria can participate in this study.

### What are the possible benefits and risks of participating?

No risks are expected.

### Where is the study run from?

The Paracelsus Medical University of Salzburg (Austria)

### When is the study starting and how long is it expected to run for?

January 2015 to June 2016

Who is funding the study?

This project is funded by Salzburg state (funding scheme: Trans4Tech)

Who is the main contact?

Dr Arnulf Hartl

## Contact information

### Type(s)

Scientific

### Contact name

Dr Arnulf Josef Hartl

### ORCID ID

<https://orcid.org/0000-0001-9626-6425>

### Contact details

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## Additional identifiers

### Clinical Trials Information System (CTIS)

Nil known

### ClinicalTrials.gov (NCT)

Nil known

### Protocol serial number

415-E/1857/2-2015

## Study information

### Scientific Title

Physiological and psychological effects of indoor daylight control on middle school students

### Acronym

Trans4Light

### Study objectives

**Primary Hypothesis:** An increased indoor daylight supply improves cognitive performance, quality of life and stress in middle school students.

**Secondary Hypothesis:** An increased indoor daylight supply in classrooms reduces power consumption.

### **Ethics approval required**

Old ethics approval format

### **Ethics approval(s)**

Approved 16/03/2015, Ethics Committee of Salzburg (Stefan-Stief-Gasse 2, Postfach 527, 5010 Salzburg, Austria; +43 (0)662 8042 0; ethikkommission@salzburg.gv.at), ref: 415-E/1857/2-2015

### **Study design**

Controlled single-blinded longitudinal intervention study with two intervention groups and constructive implementation

### **Primary study design**

Interventional

### **Study type(s)**

Quality of life

### **Health condition(s) or problem(s) studied**

Cognitive performance, quality of life and stress in middle school students

### **Interventions**

New shading systems were installed in four identical classrooms in the selected middle school. These shading blades prevent the building from overheating in summer months. Common blades (schlotterer 80R) were installed in two classrooms, while two classrooms were equipped with shading blades in a special design (schlotterer RETROLux 80D), which enables them to reflect more daylight into the rooms. All students, parents and teachers were blinded. The RETROLux 80D blades block direct sunlight in summer, while reflecting more non-direct daylight than conventional shading systems. The participating students spent on average 5 days per week and 5-8 h per day in their classrooms. During the intervention, all children lived at home, maintaining their usual lifestyle.

One class of each grade was randomly assigned to the special shading system. The intervention time was 3 semesters (~1.5 years). During the intervention time of 1.5 years, data was collected at five timepoints:

T1 = baseline, March 20; T2 = June 2015; T3 = November 2015; T4 = March 2016; T5 = June 2016.

### **Intervention Type**

Other

### **Primary outcome(s)**

1. Salivary cortisol (as a biomarker for stress) measured by ELISA at T2-T5
2. Salivary melatonin (as a biomarker for circadian rhythm) measured by ELISA at T2-T5
2. Daytime sleepiness assessed using the Pediatric Daytime Sleepiness Scale (PDSS, German translation) questionnaire at T1- T5

T1 = baseline, March 20; T2 = June 2015; T3 = November 2015; T4 = March 2016; T5 = June 2016.

### **Key secondary outcome(s)**

1. Attention and concentration assessed using the d2-Revision (d2-R) test at T1-T5
2. Health-related quality of life in children assessed using the KINDL-R questionnaire at T1-T5
3. Stress processing assessed using the German Coping Questionnaire for Children and Adolescents (SVF-KJ) questionnaire at T1-T5
4. Participant's assessment of stress measured using an inverse visual analogue scale measured every week during the intervention period of 3 semesters
5. Participant's assessment of daytime sleepiness measured using an inverse visual analogue scale measured every week during the intervention period of 3 semesters
6. Participant's assessment of concentration measured using an inverse visual analogue scale measured every week during the intervention period of 3 semesters
7. Participant's assessment of wellbeing measured using an inverse visual analogue scale measured every week during the intervention period of 3 semesters
8. Participant's assessment of fatigue measured using an inverse visual analogue scale measured every week during the intervention period of 3 semesters
9. Daylight and artificial light composition measured using a spectrometer continuously throughout the intervention
10. Indoor carbon dioxide concentration measured using a CO2-meter continuously throughout the intervention
11. Room temperature measured using a digital hygro-thermometer continuously throughout the intervention
12. Relative humidity measured using a digital hygro-thermometer continuously throughout the intervention
13. Power consumption measured using a power meter continuously throughout the intervention

T1 = baseline, March 20; T2 = June 2015; T3 = November 2015; T4 = March 2016; T5 = June 2016.

### **Completion date**

23/06/2016

## **Eligibility**

### **Key inclusion criteria**

Students of the 7th and 8th grade of the Middle School of Adnet (aged 12-15)

### **Participant type(s)**

Healthy volunteer

### **Healthy volunteers allowed**

No

### **Age group**

Child

### **Lower age limit**

12 years

### **Upper age limit**

15 years

**Sex**

All

**Total final enrolment**

85

**Key exclusion criteria**

Students of the 5th and 6th grade of the Middle School of Adnet

**Date of first enrolment**

17/03/2015

**Date of final enrolment**

17/04/2015

## Locations

**Countries of recruitment**

Austria

**Study participating centre**

**Paracelsus Medical University Salzburg**

Institute of Ecomedicine

Strubergasse 22

Salzburg

Austria

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## Sponsor information

**Organisation**

Paracelsus Medical University

**ROR**

<https://ror.org/03z3mg085>

## Funder(s)

**Funder type**

Government

**Funder Name**

Salzburg state (funding scheme: Trans4Tech)

## **Results and Publications**

**Individual participant data (IPD) sharing plan**

Data can be requested from Arnulf Josef Hartl (arnulf.hartl@pmu.ac.at). Data will be available as an Excel sheet and will be shared by email. The data is fully anonymised by 4-digit ID. Consent from participants was obtained to use their data for scientific purposes only. Data will be only accessible for scientific research (e.g. power calculations, meta-analysis).

**IPD sharing plan summary**

Available on request