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How sex hormones influence melatonin suppression by evening light in healthy adults

Submission date
09/01/2026

Recruitment status
Recruiting

Registration date
18/01/2026

Overall study status
Ongoing

Last Edited
15/01/2026

Condition category
Other

[_] Prospectively registered
[X] Protocol
[_] Statistical analysis plan
[_] Results
[_] Individual participant data
[X] Record updated in last year

Plain English summary of protocol

Background and study aims
Light exposure in the evening can reduce the hormone melatonin, which is involved in sleep regulation. People differ widely in how strongly their melatonin levels are suppressed by light, and sex hormones may contribute to these differences. This study investigates how natural and contraceptive-related sex hormones influence melatonin suppression and sensitivity of the eye to light.

Who can participate?
Healthy adults aged 23–35 years, including naturally cycling women, women using oral contraceptives, and men.

What does the study involve?
Participants attend five evening laboratory sessions. During each session, saliva samples are collected to measure melatonin levels, pupil responses to light are measured, and participants are exposed to either dim light or bright light using a virtual reality headset.

What are the possible benefits and risks?
There are no direct health benefits. Risks are minimal and may include temporary eye discomfort or changes in sleepiness following evening light exposure.

Where is the study run from?
Max Planck Institute for Biological Cybernetics (Germany)

When is the study starting and how long is it expected to run for?
January 2026 to December 2027

Who is funding the study?
Max Planck Society (Germany)

Who is the main contact?
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Contact information

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Study information

Scientific Title
Influence of sex steroid hormones on melatonin suppression and retinal light sensitivity during evening light exposure in healthy adults

Acronym
SHINE

Study objectives

1. To assess whether endogenous and exogenous sex steroid hormones influence the degree of melatonin suppression induced by evening light exposure
2. To determine whether sex steroid hormones influence retinal light sensitivity, measured using melanopsin-mediated pupil responses

Ethics approval required
Ethics approval required

Ethics approval(s)
approved 10/11/2025, TUM Ethics Committee (Office of the TUM Ethics Committee TUM School of Medicine and Health, Munich, 81675, Germany; +49 (0)89 4140 7737; ethikkommission@mri.tum.de), ref: 2025-468-S-NP

Primary study design
Interventional

Allocation
N/A: single arm study

Masking
Open (masking not used)

Control
Uncontrolled

Assignment
Single-intervention, repeated-measures, within-subjects; three groups (naturally cycling individuals, individuals using the monophasic combined oral contraceptive pill, healthy male participants)

Purpose
Basic science

Study type(s)

Health condition(s) or problem(s) studied
Light-induced melatonin suppression; non-visual physiological responses to light

Interventions
This single-centre laboratory study uses a repeated-measures, within-subject design. Participants complete five evening laboratory sessions: one dim-light control session and four bright-light exposure sessions. Light exposure is delivered using a head-mounted virtual reality display providing approximately 90 lux melanopic equivalent daylight illuminance at eye level.

Melatonin suppression is assessed using repeated salivary melatonin measurements collected before, during, and after light exposure. Retinal light sensitivity is assessed using pupillometry with melanopsin-directed silent substitution stimuli. Naturally cycling participants are measured across four distinct menstrual cycle phases, oral contraceptive users across pill-cycle phases, and male participants across a matched time period.

Intervention Type
Other

Primary outcome(s)
1. Light-induced melatonin suppression: percentage reduction in salivary melatonin concentration during evening light exposure relative to dim-light control, measured using enzyme-linked immunoassay at each evening light exposure session

2. Pupil response amplitude to melanopsin-directed light stimulation measured using right-eye pupillometry using silent substitution stimuli at each laboratory session

Key secondary outcome(s))

Completion date
31/12/2027

Eligibility

Key inclusion criteria
1. Age 23–35 years
2. Good physical and mental health
3. Normal or corrected-to-normal visual acuity and normal colour vision
4. Regular sleep–wake behaviour
5. For naturally cycling participants: regular menstrual cycles (26–35 days)
6. For oral contraceptive users: stable intake of monophasic combined oral contraceptive for ≥6 months

Healthy volunteers allowed
Yes

Age group
Adult

Lower age limit
23 years

Upper age limit
35 years

Sex
All

Total final enrolment
0

Key exclusion criteria
1. Chronic medical, hormonal, ocular, neurological or psychiatric disorders
2. Regular use of systemic medication (except anti-allergic medication)
3. Shift work or inter-time-zone travel in the last month
4. Extreme chronotype or excessive daytime sleepiness

5. Current or recent pregnancy or breastfeeding
6. Intake of exogenous hormones other than contraceptive hormones
7. Substance abuse, excessive alcohol consumption, or recreational drug use

Date of first enrolment
15/01/2026

Date of final enrolment
15/06/2027

Locations

Countries of recruitment
Germany

Sponsor information

Organisation
Max Planck Society

ROR
https://ror.org/01hhn8329

Funder(s)

Funder type

Funder Name
Max-Planck-Gesellschaft

Alternative Name(s)
Die Max-Planck-Gesellschaft, Max Planck Society for the Advancement of Science, Max-Planck-Gesellschaft zur Förderung der Wissenschaften, Max Planck Society, MPG

Funding Body Type
Government organisation

Funding Body Subtype
Research institutes and centers

Location
Germany

Results and Publications

Individual participant data (IPD) sharing plan

De-identified individual participant data that underlie the results reported in publications arising from this study (including salivary melatonin concentrations, pupil response measures, and relevant demographic and experimental variables) will be made available.

Data will be shared following or as part of publication of the primary study results, after removal of all direct and indirect identifiers, in accordance with applicable data protection regulations.

Supporting documentation, including the study protocol and analysis code, will also be made available.

IPD sharing plan summary

Published as a supplement to the results publication

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Protocol (other)			09/01/2026	No	No