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Pilot study of a mobile health app to optimise light exposure among older adults in Singapore

Submission date
01/08/2025

Recruitment status
No longer recruiting

Registration date
04/08/2025

Overall study status
Completed

Last Edited
03/09/2025

Condition category
Other

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

Plain English summary of protocol
Background and study aims
As people age, they often spend more time indoors and receive less natural light, which can affect their sleep, mood and overall health. The LightSPAN study aims to test whether a new smartphone app called LightUP can help older adults improve their exposure to healthy light levels during the day and reduce light at night. This small-scale pilot study will help us understand if the approach is practical and acceptable before running a larger trial.

Who can participate?
We are looking for generally healthy older adults aged 60 and over who live in the community in Singapore, can walk independently, speak and read English, and own and use a smartphone.

What does the study involve?
Participants will be randomly assigned to use either the full version of the LightUP app or a basic version without guidance. Everyone will wear a small light-measuring device on their chest and an activity tracker on their wrist for three weeks. They will use the app to log sleep and mood daily and will attend two health assessment visits. At the end of the study, participants will give feedback on their experience.

What are the possible benefits and risks of participating?
Participants may learn more about the importance of light for their health and receive personalised insights about their daily routines. The study may help improve future health tools for older adults. Risks are minimal but may include minor discomfort from wearing the devices or increased awareness of light exposure. The research team will provide support and advice throughout the study.

Where is the study run from?
The study is run by TUMCREATE in Singapore and will take place at selected Active Ageing Centres supported by Lions Befrienders.

When is the study starting and how long is it expected to run for?
June 2025 to September 2025

Who is funding the study?
The study is funded by the National Research Foundation Singapore (NRF2022-THE004-0002) as part of the LightSPAN project.

Who is the main contact?
The principal investigator is Prof Dr Manuel Spitschan. You can contact the study team by email at contact.lightspan@tum-create.edu.s

Contact information

Type(s)
Principal investigator

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Additional identifiers

Study information

Scientific Title
A randomised, double-blind trial of a chronotherapeutic mobile health behaviour change intervention targeting optimal light exposure among older adults in Singapore: pilot and feasibility trial

Study objectives
The principal objective of this pilot and feasibility trial is to evaluate the feasibility, acceptability, and usability of a chronotherapeutic mobile health (mHealth) behaviour change intervention, delivered via the LightUP app, to optimise light exposure among community-dwelling older adults in Singapore.

The specific objectives are:
1. To assess the feasibility and acceptability of implementing the LightSPAN mHealth intervention, including recruitment, adherence, study procedures, and technical implementation.
2. To evaluate the usability and acceptability of the LightUP app as perceived by older adult participants.
3. To assess the acceptability of wearable light and activity monitoring devices used in the study.
4. To qualitatively evaluate participant feedback to inform refinements for the main trial.

This study does not test a formal hypothesis but will inform the design and methodology of a future definitive randomised controlled trial.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 19/06/2025, Parkway Independent Ethics Committee (PIEC) (HarbourFront Tower One, 1 HarbourFront Place, #03-02, Singapore, 098633, Singapore; +65 6277 8272; piec@ihhhealthcare.com), ref: PIEC/2024/041

Primary study design
Interventional

Study design
Interventional double-blinded randomized controlled pilot and feasibility trial with parallel group assignment and a 3-week period

Study type(s)
Prevention, Quality of life, Safety, Efficacy

Health condition(s) or problem(s) studied
Prevention of circadian disruption, poor sleep, and mood disturbances in community-dwelling older adults

Interventions
Participants will be randomly assigned in a 1:1 ratio to either the intervention group (full LightUP app) or the control group (placebo app) using a double-blind design. The intervention group will receive the LightUP mobile health application, which delivers behaviour change

strategies to optimise light exposure through daily feedback, goal setting, self-monitoring, and educational content. The control group will receive a placebo version of the LightUP app, which includes the same data logging features but without behaviour change content or feedback. Both groups will wear a chest-mounted light logger (ActLumus) and a wrist-worn activity tracker (Garmin Vivosmart 5) daily for 3 weeks. Data from the light logger will be synchronised with the app to monitor light exposure. Participants will also complete daily mood and sleep diaries via the app.

Randomisation will be conducted using computer-generated block randomisation with the R package blockTools, stratified by age, sex, and recruitment location to ensure balanced allocation across key demographic variables. Study staff responsible for conducting assessments will be blinded to group assignment to minimize bias.

Intervention Type
Behavioural

Primary outcome(s)
Feasibility of the LightSPAN intervention measured using participant recruitment rates, retention rates, adherence to the intervention protocol, and completeness of data collection over a 3-week study period.

Key secondary outcome(s)
1. Usability of the LightUP app measured using the mHealth App Usability Questionnaire (MAUQ) at week 3 (post-intervention).
2. Acceptability of the LightUP app measured using an adapted Technology Acceptance Model (TAM) questionnaire at week 3.
3. Acceptability of wearable devices measured using an adapted Technology Acceptance Model (TAM) questionnaire at week 3.
4. Daily light exposure patterns measured using the ActLumus light logger continuously over the 3-week study period.
5. Rest-activity cycles and digital phenotypes (e.g. sleep, heart rate, steps) measured using the Garmin Vivosmart 5 continuously over the 3-week study period.
6. Daily mood ratings measured using the Single-Item Mood Scale (SIMS) within the LightUP app daily over the 3-week study period.
7. Daily sleep diary within the LightUP app over the 3-week study period
8. Participant feedback on intervention experience collected through qualitative discussions at week 3.
9. NASA Task Load Index scale at week 3.
10. Cognitive performance assessed at week 3 using NIH Toolbox tests (Dimensional Change Card Sort, Face Name Associative Memory Exam, Face Name Associative Memory Exam Delay, Flanker Inhibitory Control and Attention, Oral Symbol Digit, Picture Sequence Memory Form A, Rey Auditory Verbal Learning, Rey Auditory Verbal Learning Delay, Pattern Comparison Processing Speed Test).
11. Sleep quality assessed at week 3 using the Pittsburgh Sleep Quality Index (PSQI).
12. Physical activity measured at week 3 using the Physical Activity Scale for the Elderly (PASE).
13. Mood states assessed at week 3 using the Brief Mood Introspection Scale (BMIS).

Completion date
05/09/2025

Eligibility

Key inclusion criteria
1. Aged 60 years or older
2. Community-dwelling and residing in Singapore
3. Capable of independent mobility with or without assistive devices
4. Functionally independent (Lawton IADL score >8 for females, >5 for males)
5. Proficient in speaking, reading, and writing in English
6. Currently owns and uses a smartphone
7. Not enrolled in any other ongoing research studies
8. Willing and able to wear study devices daily and attend study assessments
9. Provides written informed consent to participate in the study

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Senior

Lower age limit
60 Years

Sex
All

Total final enrolment
26

Key exclusion criteria
1. Cognitive impairment (Montreal Cognitive Assessment score <26 for <10 years of education, <27 for ≥10 years)
2. Depressive symptoms (Geriatric Depression Scale score >6)
3. Significant physical impairment impacting daily activities
4. Current diagnosis that interferes with daily function or presence of severe terminal illness or psychiatric conditions
5. Uncorrected or permanent visual impairment, diagnosis of eye diseases, or ocular abnormalities
6. Uncorrected hearing impairment
7. Residing in ageing care facilities or nursing homes
8. Currently involved in other ongoing research studies
9. Inability or unwillingness to comply with study procedures (e.g., wearing devices, attending visits, using the app)

Date of first enrolment
07/08/2025

Date of final enrolment
15/08/2025

Locations

Countries of recruitment
Singapore

Study participating centre
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Sponsor information

Organisation
TUMCREATE Limited

Funder(s)

Funder type
Research organisation

Funder Name
National Research Foundation Singapore

Alternative Name(s)
National Research Foundation-Prime Minister's office, Republic of Singapore, Singapore National Research Foundation, National Research Foundation of Singapore, National Research Foundation, Singapore, National Research Foundation, Singapore (NRF), nrfsg, NRF Singapore, NRF

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
Singapore

Results and Publications

Individual participant data (IPD) sharing plan

The datasets generated and/or analysed during the current study will be published as a supplement to the results publication and/or connected dataset.

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?
Study website	Study website	11/11/2025	11/11/2025	No	Yes