

Digital Sleep Hygiene Intervention for Young Adults (18-25) With Late-Night Smartphone Use in the UK

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Module Name: Population Health and Digital
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in Practice



AIM

- ▶ To improve sleep hygiene among young adults by reducing late-night smartphone use through real-time AI-driven nudges, habit-tracking, and personalised behaviour change prompts.
- ▶ **Target Group:** University students and young professionals (18–25 years)



Activity

Activity Content

- 1. Baseline Sleep and Smartphone Assessment:** Participants sync their phone's screen-time logs + complete a sleep questionnaire.
- 2. AI-Based Sleep Tracking:** The app monitors sleep patterns, bedtimes, duration, and night awakenings.
- 3. Blue-Light & Behaviour Nudges**
 - Push notifications reminding users to wind down
 - Prompts to activate blue-light filters
 - Gentle “digital cut-off time” reminders
 - Suggestions for alternative pre-sleep routines
- 4. Weekly Feedback Reports:** Visual summaries + recommendations, gamified improvement badges.
- 5. Peer Challenge:** Friendly competition to maintain healthy nighttime digital routines.

Introduction

- Sleep hygiene refers to the daily habits, behaviours, and environmental factors that support healthy, restorative sleep. Poor sleep hygiene, such as late-night smartphone use, irregular bedtimes, and exposure to blue light, can disrupt the body's natural circadian rhythm. Strengthening sleep hygiene is essential for improving overall well-being, cognitive performance, and mental health, especially in young adults (Furihata et al, 2025).



(Source: Turmerry, 2022)



Justification

Signature _____

Date _____

Why Focus on Young Adults (18–25 years)?

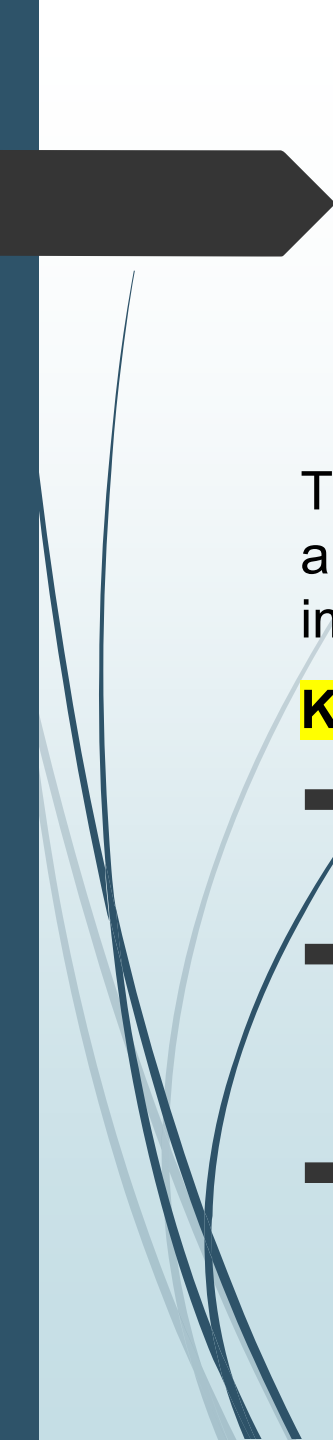
- Around 70% of university students in the UK report using their smartphones in bed at night, contributing to reduced sleep quality and disrupted sleep routines (Caba-Machado et al, 2024).
- Blue light suppresses melatonin, delaying sleep onset and reducing REM sleep (Hyder et al, 2024).
- Rising rates of digital addiction, anxiety, and fatigue in this age group (Hyder et al, 2024).
- Late-night screen use is linked to lower academic performance, impaired concentration, and daytime dysfunction (Hyder et al, 2024).

Effects of Late-Night Smartphone Use

- Exposure to blue light suppresses melatonin, delaying sleep (Nauman et al, 2023).
- Increased sleep disturbances and reduced sleep quality (Luqman et al, 2021)
- Heightened mental stimulation, making it harder to wind down (Nauman et al, 2023).
- Greater risk of digital addiction and dependency (Nauman et al, 2023).
- Impaired next-day focus, mood, and academic/work performance (Luqman et al, 2021)



(Source: Mr Mattress, 2025)



AI-Based Sleep-Tracking and Behaviour Nudging Mobile App

The AI-Based Sleep-Tracking and Behaviour Nudging App uses intelligent monitoring and personalised prompts to help young adults reduce late-night smartphone use and improve their sleep hygiene.

Key features include:

- **Machine-learning sleep pattern detection:** The app uses AI to analyse sleep duration, timing, and quality to identify individual sleep patterns (Hanci, 2022).
- **Real-time blue-light exposure and screen-time analysis:** It continuously monitors device use and blue-light levels to detect behaviours that may disrupt sleep (Oh et al, 2022).
- **Personalised nudge system based on user behaviour:** The app delivers tailored reminders and prompts that encourage healthier night-time routines (Oh et al, 2022).



- **Digital wellbeing dashboard:** Users can view easy-to-understand summaries of their sleep trends, screen habits, and progress (Oh et al, 2022).
- **Optional integration with wearable devices:** The app can sync with smartwatches or fitness trackers for more accurate sleep and activity data (Hanci, 2022).
- **Predictive “sleep risk” alerts based on behaviour patterns:** AI forecasts when users are likely to experience poor sleep and sends proactive warnings (Le et al, 2024).
- **Smart bedtime mode that automatically dims the screen and limits notifications:** The app reduces visual and digital distractions by adjusting the device environment at night (Le et al, 2024).
- **Gamified rewards to motivate consistent, healthy sleep habits:** Users earn badges and achievements for maintaining positive sleep behaviours over time (Oh et al, 2022).

Why This Technology?

- **High smartphone ownership among young adults:** Most students and young workers rely heavily on smartphones, making mobile interventions easy to access and widely applicable (Hanci, 2022).
- **Immediate accessibility and real-time feedback:** The app provides instant insights and prompts, helping users recognise unhealthy patterns as they happen (Hanci, 2022).
- **Proven effectiveness of digital nudges for behaviour change:** Small, timely reminders have been shown to influence healthier decisions without requiring major effort from users (Oh et al, 2022).
- **Integrates sleep and screen-time data for personalised insights:** Combining behavioural and sleep metrics allows the app to tailor recommendations to each user's unique habits.
- **Low-cost, scalable, and easy to implement:** A mobile-based solution can reach large student populations with minimal resources, making it sustainable for public health use (Oh et al, 2022).

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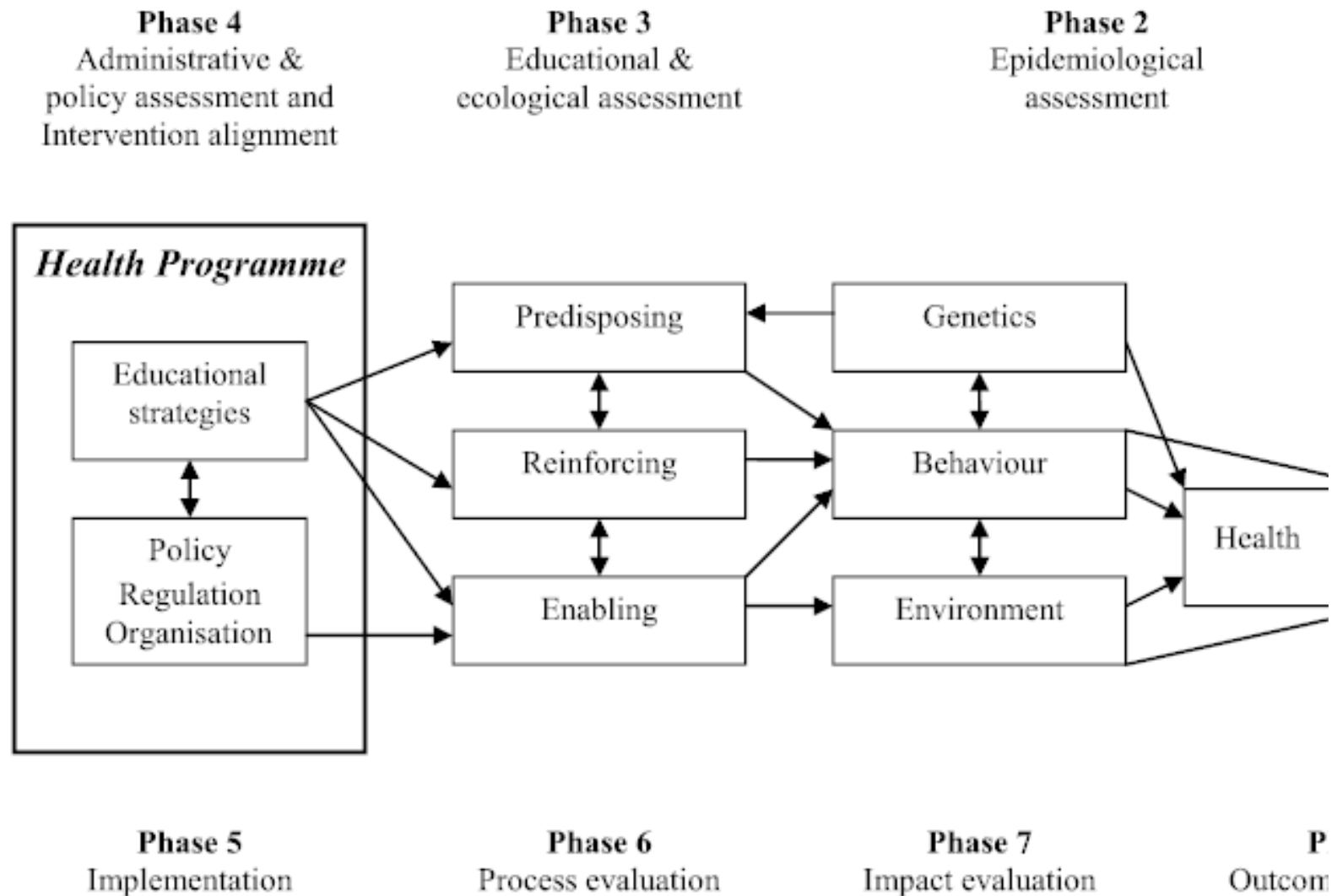
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SECTION 2

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CHOSEN PLANNING MODEL

- The intervention is guided by the PRECEDE–PROCEED Model (Kim et al., 2022).
- Offers a systematic structure for planning health promotion.
- Considers behavioural, social, and environmental influences on sleep.
- Supported by evidence-based practice (Porter, 2016).



PHASE 1 – SOCIAL ASSESSMENT

Examines students' quality of life, lifestyle routines, and stress levels.

Uses surveys, interviews, and focus groups for data collection.

Identifies how digital habits affect well-being and daily functioning.

late-night phone use increases 59% chances of insomnia (Berman, 2025).



PHASE 2 – EPIDEMIOLOGICAL ASSESSMENT



Identifies key sleep issues such as insomnia, fatigue, and mood disturbances.



Examines links between excessive smartphone use and poor sleep outcomes.



Uses university health surveys and baseline assessments to gather data.



App-collected metrics help quantify bedtime delays and sleep disruption (Alamoudi et al. 2024).



PHASE 3 – EDUCATIONAL & ECOLOGICAL ASSESSMENT

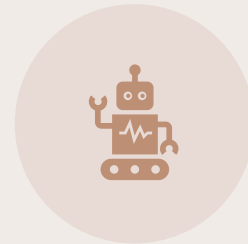
Predisposing	Predisposing factors include low awareness of sleep hygiene and blue-light effects.
Enabling	Enabling factors involve constant smartphone access and easy app availability (Alamoudi et al. 2024).
Reinforcing	Reinforcing factors include peer norms, notifications, and gamified rewards.



PHASE 4 – INTERVENTION ALIGNMENT



Aligns strategies with identified behavioural and environmental needs.



AI sleep tracking delivers personalised feedback based on user patterns (Alamoudi et al. 2024).



Behavioural nudges encourage reduced late-night phone use through timed prompts.



Gamified rewards support motivation, guided by the Fogg Behaviour Model and nudge theory.



1

Pilot the digital sleep app over a 4–6-week period.

2

Recruit participants through university emails, social media, and campus posters.

3

Monitor daily engagement, bedtime routines, and nudge responsiveness (Almourad et al., 2021).

4

Track adherence, as similar pilots report 70–80% weekly app-use retention.

PHASE 5 – IMPLEMENTATION



PHASE 6 – PROCESS EVALUATION



Monitor app downloads, daily activity levels, and response rates to nudges (Vu and Tagliabue, 2025).



Gather qualitative feedback on usability, satisfaction, and overall experience.



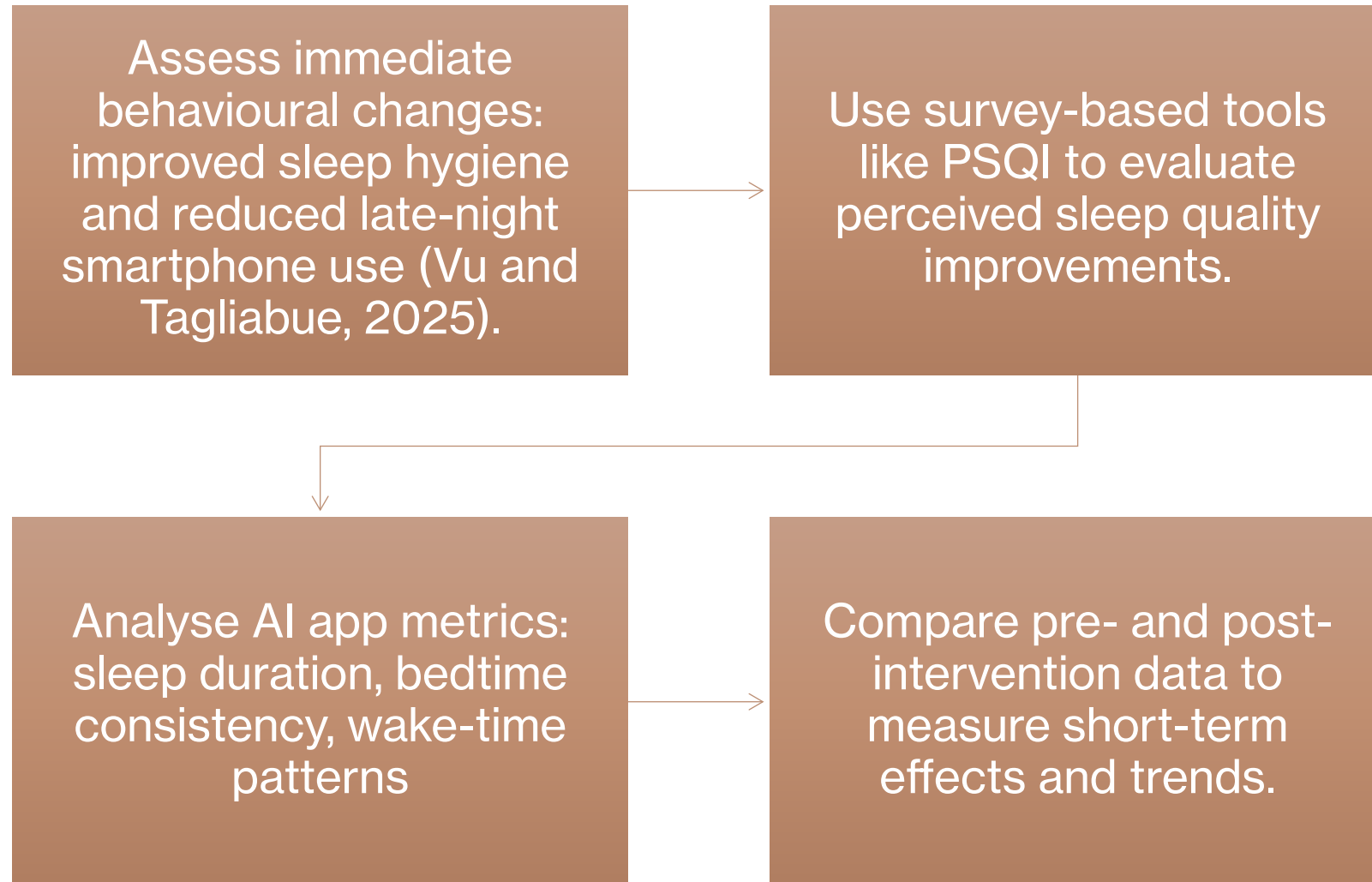
Measure changes in nightly screen-time patterns.



Track the percentage of users achieving 7–8 hours of sleep during the pilot.

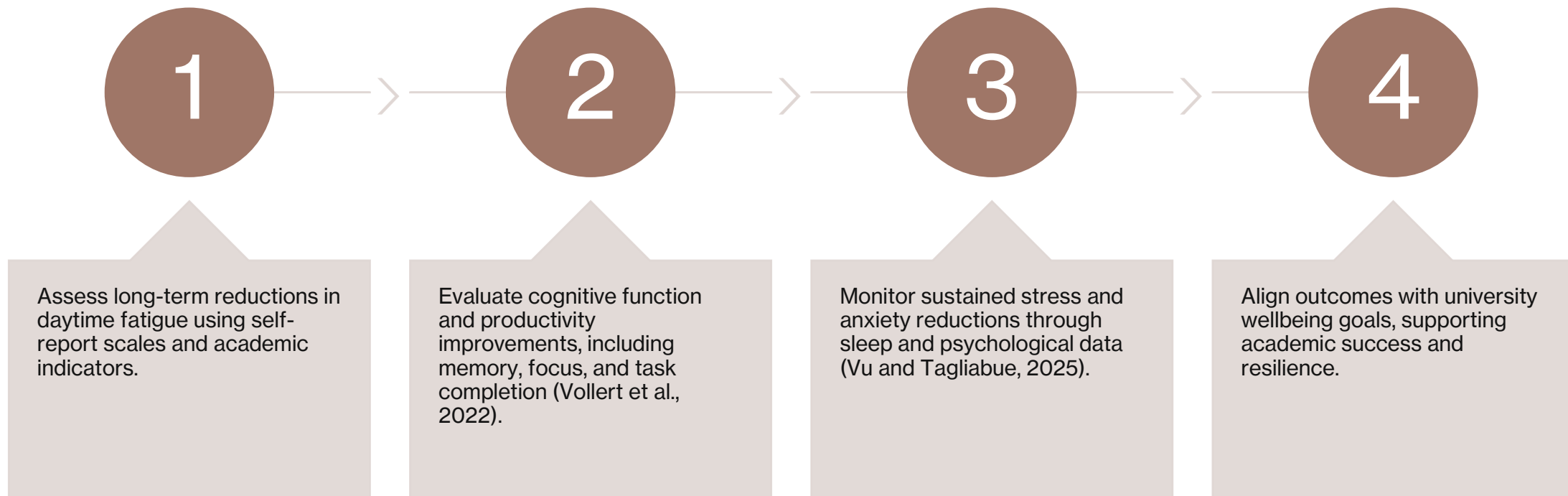


PHASE 7 – IMPACT EVALUATION



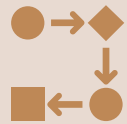


PHASE 8 – OUTCOME EVALUATION

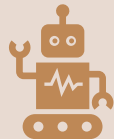




SUMMARY



PRECEDE-PROCEED model ensures structured, evidence-based, and theory-driven intervention design



AI-driven sleep tracking, behavioural nudges, and gamification support sustained improvements in sleep hygiene.



Promotes healthier lifestyles, better daytime functioning, academic performance, and overall well-being

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HEALTHY SLEEP APP



(Sutterstock,n.d.)

SECTION 3

Digital Sleep Hygiene Intervention for 18–25 Years

NAME: Akash Baria (2428541)



CONTENTS



01

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Roles

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01

Stakeholders & Roles



Young Adults as Core Users

Young adults aged 18–25 are the primary target group. Their late-night smartphone habits negatively impact sleep quality (Akram, Gardani and Akram, 2023). Their willingness to change these behaviours is crucial for the intervention's success and long-term outcomes, as they directly influence engagement and adherence (Yardley et al., 2021).

Universities and Student Wellbeing Services

Universities and student wellbeing services play a vital role in promoting the intervention. They can integrate the sleep hygiene app into existing mental health and wellbeing programs, providing direct access to large groups of students who match the intended user population (UKHSA, 2024).

Primary Stakeholders in Digital Sleep Intervention



Employers of Young Workers

Employers of young workers benefit from improved sleep among their staff, which reduces fatigue, workplace errors, and poor concentration (Firth et al., 2021). They can support participation through workplace wellbeing and occupational health schemes, enhancing overall productivity.

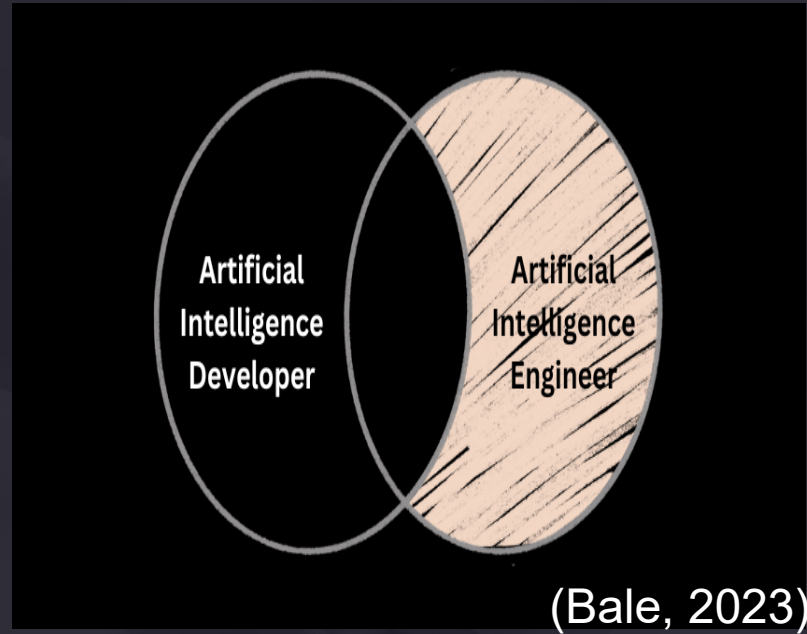
Secondary Stakeholders & Ecosystem Support

App Developers & AI Engineers

- Build and improve the app's AI features, ensuring accurate sleep tracking, personalised nudges and accessible user interfaces (Brown, O'Connor and Keogh, 2022).
- Handle continuous updates and algorithm improvements.

Public Health Bodies (NHS Digital, UKHSA)

- Ensure the intervention aligns with national digital health strategies and safety standards (UKHSA, 2024). Provide professional guidance for evidence-based delivery.



Cybersecurity & Data Protection Specialists

- Protect user data through encryption, secure servers and privacy-by-design approaches (ICO, 2023).
- Ensure compliance with legal obligations.

Mobile OS Providers (Apple/Google)

- Provide essential APIs for screen-time analytics and blue-light monitoring (Ofcom, 2023).
- Influence long-term technical compatibility and performance.



Stakeholder Contributions to Implementation



01

Universities' Role in Promotion

Universities provide communication channels to promote the app to students and offer support services that reinforce healthy sleep behaviors (UKHSA, 2024). They integrate the intervention into existing wellbeing programmes, ensuring widespread adoption among the student population.

02

Developers' Role in Maintenance

Developers maintain app performance, fix bugs, optimise AI algorithms, and ensure accessibility across different devices (Brown et al., 2022). They continuously update the app to improve functionality and user experience.

03

Public Health Bodies' Role in Validation

Public health bodies support evidence-based practice, validate the safety and efficacy of the intervention, and guide ethical digital delivery. They ensure the intervention meets national health standards and guidelines.

04

Data Protection Officers' Role in Compliance

Data protection officers oversee GDPR compliance, evaluate privacy risks, and protect sensitive personal data (ICO, 2023). They ensure that user information is handled securely and in accordance with legal requirements.

02

Barriers to Adoption





Technical Accuracy & Reach

Barriers

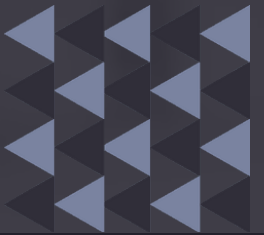
Limiting

Device variation: Different sensors, operating systems and screen behaviours lead to inconsistent tracking accuracy and user experience (Firth et al., 2021).

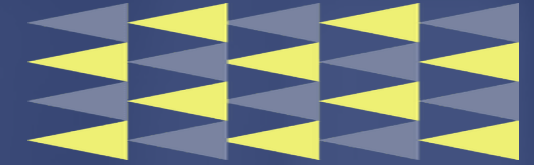
High battery drain: Continuous monitoring and background processes may discourage long-term use (Doherty and Doherty, 2018).

Internet dependence: AI processing and data syncing require stable internet access, which is not available to all young adults (Ofcom, 2023).

Sensor limitations: Poor accuracy in light or movement detection may damage user trust and lead to disengagement (Firth et al., 2021).



Behavioural Resistance Among Young Adults



Habitual Late-Night Use

Smartphone use provides entertainment, connection, and stress relief, making it difficult to change late-night habits. Young adults often prioritise other activities over sleep, leading to irregular sleep routines and resistance to behavior change (Cain and Gradishar, 2019)..

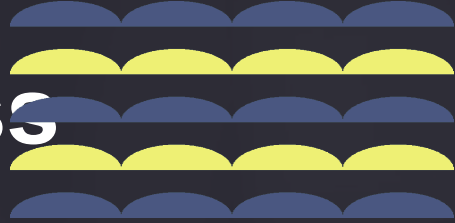
Notification Fatigue

Young adults frequently ignore or disable digital reminders, reducing the effectiveness of sleep hygiene interventions. This notification fatigue can undermine the impact of behaviour change nudges embedded in the app (Doherty and Doherty, 2018).

Low Prioritisation of Sleep

Deadlines, shift work, and social pressures cause irregular sleep routines among young adults (Yardley et al., 2021).. They often do not prioritise sleep, making it challenging to engage them in sleep hygiene interventions.

Socio-Economic Gaps in Digital Access



01

**Digital
Inequality**

Not all young adults own modern smartphones capable of AI-driven sleep tracking. Limited access to high-spec devices can exclude certain groups from benefiting from the intervention, widening health inequalities (van Deursen, 2020).

02

**Limited Data or
Wi-Fi Access**

Limited data or Wi-Fi access affects the ability to sync sleep data, receive updates, and use the app consistently. Financial and employment pressures can further exacerbate these issues, posing significant barriers to adoption (Ofcom, 2023).

Organisational Hurdles in Institutions



Resource Limitations

Universities may lack the necessary staff, funding, or digital support structures to effectively promote the intervention. Resource limitations can hinder the integration of the sleep hygiene app into existing wellbeing programs (UKHSA, 2024).



Low Employer Engagement

Workplaces may not prioritise sleep hygiene or digital wellbeing support. Low employer engagement can limit the reach and impact of the intervention among young workers (Yardley et al., 2021).



Technical Integration Challenges

Aligning new tools with existing wellbeing systems requires investment, training, and IT support. Technical integration challenges can delay or prevent the successful implementation of the intervention (Brown et al., 2022).



Sustainability Challenges

Ongoing maintenance, updates, and support require long-term financial commitment. Sustainability challenges can threaten the continued availability and effectiveness of the intervention (Doherty and Doherty, 2018).

03

Legal & Ethical Duties



GDPR Compliance for Sensitive Sleep Data

Sensitive Data Handling

Sleep metrics, screen-time patterns, and behaviour data are classified as sensitive health information (ICO, 2023). These must be handled in accordance with GDPR principles, ensuring user privacy and data protection.



Explicit Informed Consent

Users must provide explicit informed consent, understanding what data is collected, how it is used, and who can access it. A Data Protection Impact Assessment (DPIA) is required to identify and minimise privacy risks.



Data Protection Impact Assessment (DPIA):

Required to identify and minimise privacy risks (ICO, 2023).

Data security: Encryption, secure cloud storage and restricted access need to be implemented to ensure safe data handling.



Ethical Principles in AI Health Nudging



(de Looper, 2024)

Transparency in AI Recommendations

AI recommendations must be transparent, clearly explaining how they are generated and why. This ensures users understand the basis for the suggestions and can make informed decisions (Floridi and Cowls, 2019).

Fairness and Bias Prevention

Algorithms must be regularly checked to ensure they do not disadvantage certain groups. Fairness and bias prevention are crucial to maintain ethical standards and ensure the intervention benefits all users equally (Brown et al., 2022).

User Autonomy and Control

Users must have full control over notifications, data settings, and opting out. This respects user autonomy and allows them to manage their engagement with the intervention (Yardley et al., 2021).

Digital Inclusion & Fairness Safeguards

Inclusive Design Considerations

The intervention must consider those with limited device access or lower digital skills. Design elements like offline functionality, low-spec device compatibility, and multilingual interfaces ensure digital inclusion and fairness (van Deursen, 2020).



**DIGITAL
INCLUSION**

Access to Application

(Ministry of Technology, 2025)

04

Synthesis & Next Steps



Summary of Critical Success Factors



01

- Effective implementation relies on coordinated involvement across students, universities, developers and public health bodies (UKHSA, 2024).

02

- Barriers include technical constraints, behavioural habits, socio-economic inequality and organisational limitations (Yardley et al., 2021).

03

- GDPR compliance ensures trust, legal protection and responsible data use (ICO, 2023).
- Ethical design promotes fairness, transparency and inclusion within AI-based health interventions (Floridi and Cows, 2019).

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SECTION 4:

Benefits and Implications of Digital Sleep Hygiene Intervention

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Introduction

- AI-based sleep-tracking app with personalised feedback
- Behavioural nudges to reduce late-night smartphone use (Vu and Tagliabue, 2025)
- Designed for university students and young workers
- Aims to improve sleep hygiene, boost wellbeing, and support healthier digital habits





Individual Health Benefits

Increases sleep duration and quality through AI-guided routines (Verma et al., 2023)

Reduces stress and anxiety linked to poor sleep

Improves daytime alertness and cognitive performance



Behavioural Benefits

Cuts down on smartphone addiction during late-night use with nudges (Vu and Tagliabue, 2025).

Promotes thoughtful and deliberate device utilization.

Healthy behaviours are being rewarded through gamification (Ilhan et al., 2022).

Helps the young adult to develop a long-lasting habit.



Academic/Workplace Benefits

Improves concentration, attention, and mental functioning (Aziz et al., 2025).



Enhances performance and productivity.

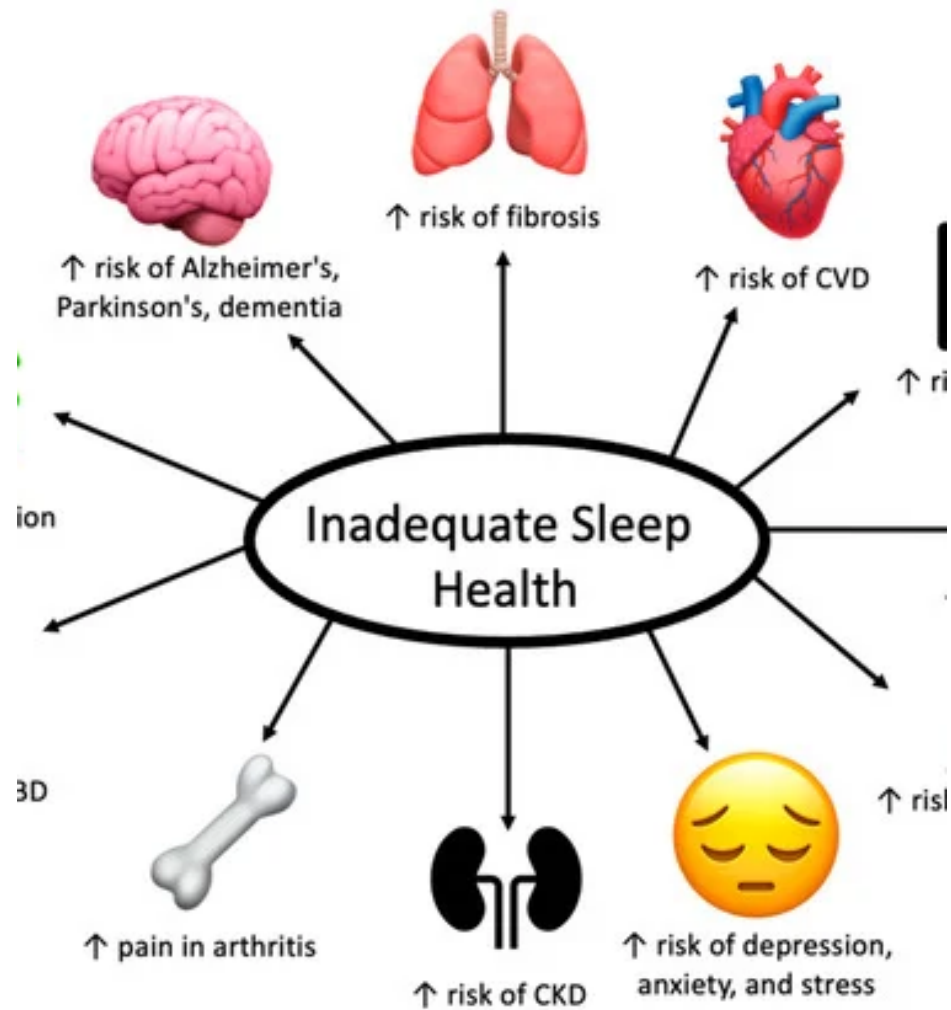


Minimizes work-related absenteeism.



Favorable to general educational performance, as well as professional output.

Social Benefits



(Feingold and Smiley, 2022)



A better mood strengthens human relations.



Encourages favorable interpersonal interaction.



Promotes healthy sleeping among peers.



Minimizes social interferences due to lack of sleep (Simon and Walker, 2018).

Economic Benefits



Reduced healthcare costs from fewer sleep-related issues



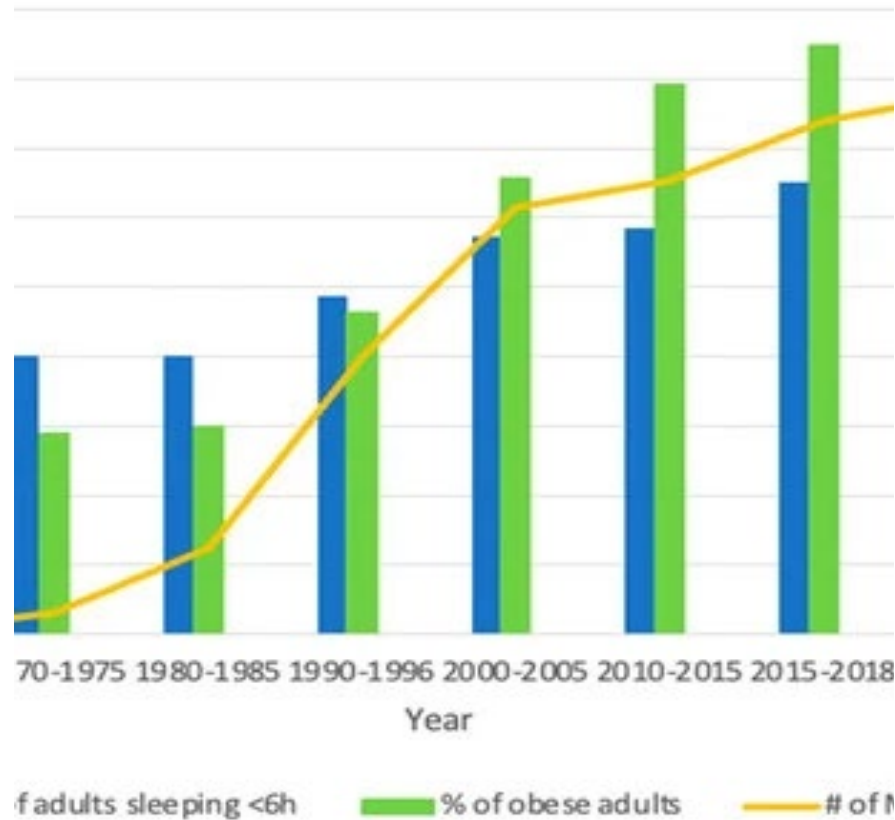
Cost-effective, app-based, and scalable intervention (Vollert et al., 2022)



Preventive approach lowers long-term mental health treatment expenses



Efficient use of university and public health resources

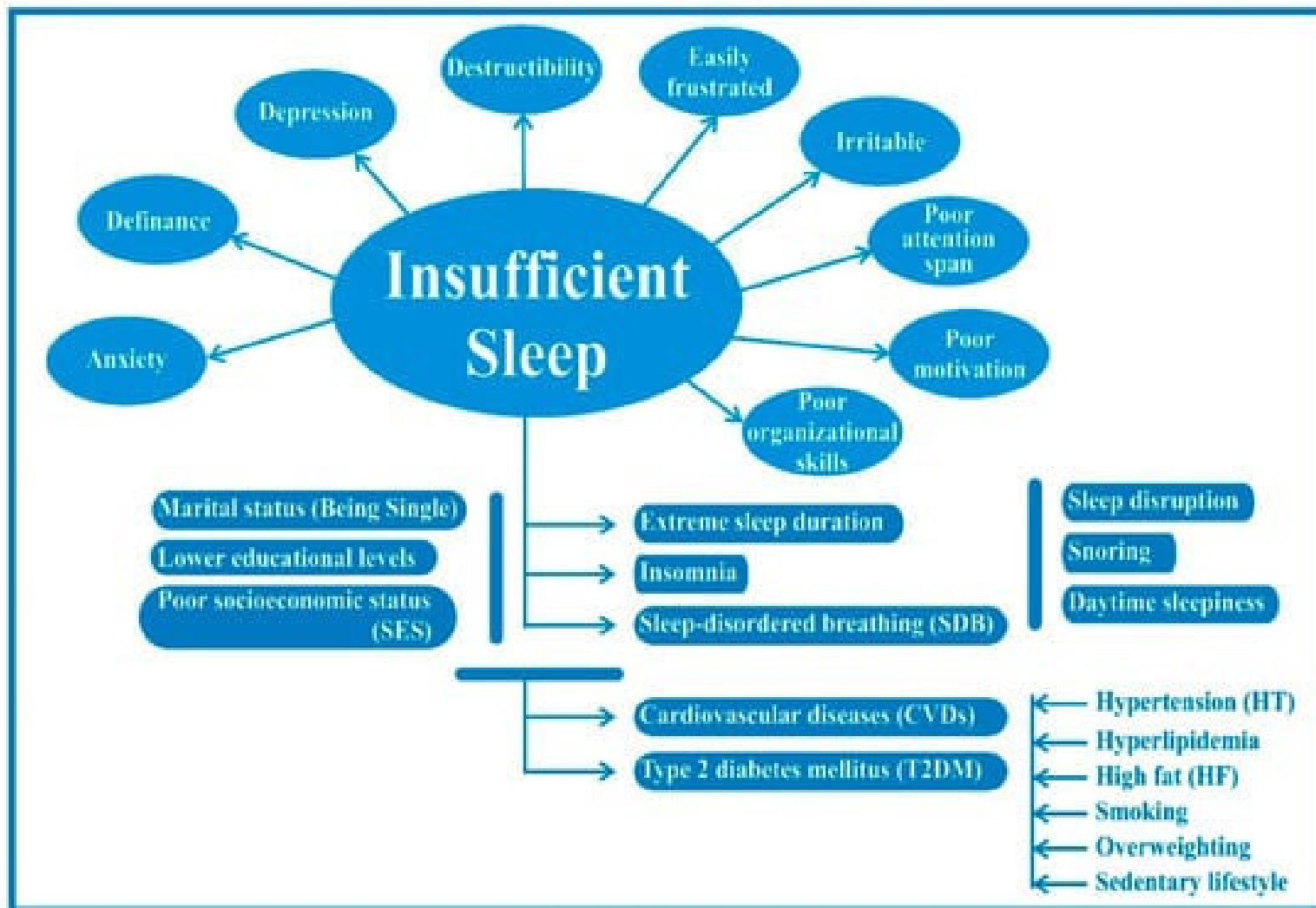


(Feingold and Smiley, 2022)



Policy Implications

Integrate	Integrate digital health tools into university wellness policies
Encourage	Encourage institutional support for tech-based sleep interventions (Verma et al., 2023)
Provide	Provide evidence to inform national guidelines on sleep and technology use
Promote	Promote adoption of preventive digital health strategies



(Chattu et al., 2018)

Research Implications

Study digital health interventions in real-world student and workplace settings

Generate data for AI-behavioural research and sleep science (Aziz et al., 2025)

Identify effective strategies for improving sleep hygiene

Contribute to evidence-based best practices in digital health promotion



Educational Implications



Educate students on sleep hygiene and responsible technology use (Aziz et al., 2025)



Integrate content into health education modules or wellness workshops



Promote awareness of the effects of late-night smartphone use (Karasneh et al., 2022)



Encourage adoption of lifelong healthy digital habits



Long-Term Public Health Impact

Decrease the poor sleep hygiene in young adults (Vollert et al., 2022).

Reduced long-term psychopathology associated with sleep deprivation.

Promote healthy use of technology among the young people (Karasneh et al., 2022).

Fund more community health programs to support the well-being.



Summary

Individual, technology-based, and evidence-based treatment.



The benefits are spread across health, behaviour, academic/work, policy, research, and education.



Funds the sustainable public health promotion among the youths.

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Thank You!