



LEVERHULME  
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# The AdSleep Project: sleep, memory and education in the teenage years



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# Background



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- Over **50% of teenagers** sleep for less than the 8–10-hour recommendation.
- Poor **sleep quality** and increased **sleepiness** are also common.
- A multitude of biological and behavioural factors at play here:

Academic



Extracurricular



Physical Arousal



Caffeine Use



Entertainment



Emotional Arousal



Blue light



Sugar Consumption

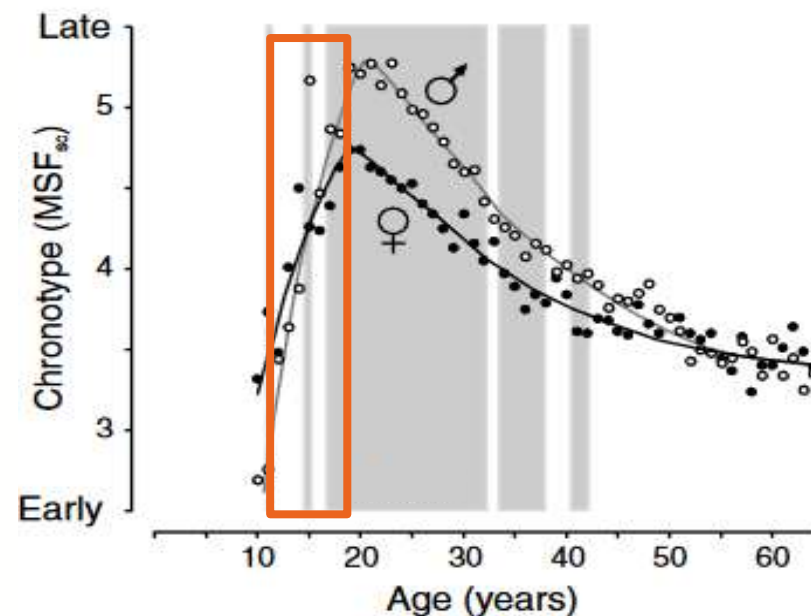


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# Background



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- Sleep plays an important role in **memory formation**.
- What are the implications of changes to sleep across adolescence for memory?
- Sleep **before** learning for **encoding** AND sleep **after** learning for **consolidation**.

## Aim 1

How are sleep changes in adolescence associated with encoding and consolidating new information?



# Aims



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How are sleep changes in adolescence associated with encoding and consolidating new information?

## Aim 2

How are sleep changes in adolescence associated with educational outcomes, and how do detriments in encoding and consolidation mediate this relationship?



# Aims



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How are sleep changes in adolescence associated with encoding and consolidating new information?

## Aim 2

How are sleep changes in adolescence associated with educational outcomes, and how do detriments in encoding and consolidation mediate this relationship?

## Aim 3

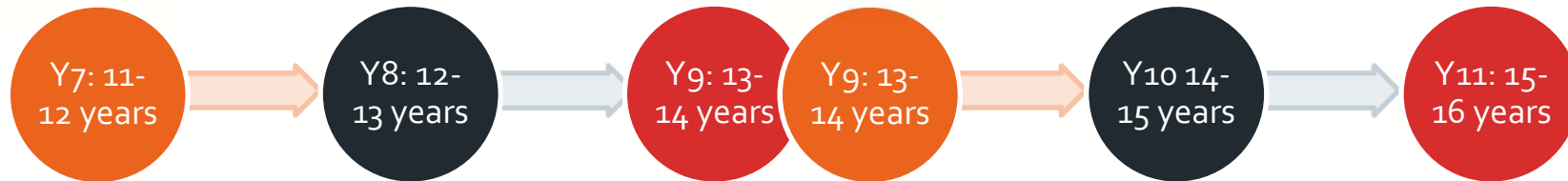
How does an app-based intervention to improve sleep hygiene impact encoding and consolidation ability?

# Aims 1 and 2



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Cohort 1 (n = 224)





# Aims 1 and 2

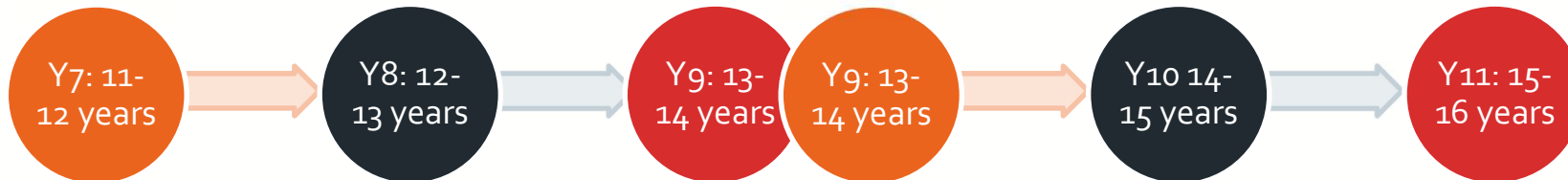


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Cohort 1 (n = 224)



Cohort 2 (n = 265)



- Sleep diary
- Media diary
- Actiwatchers

- Word learning task
- Immediate cued recall
- Sleep and media diary

- Delayed cued recall
- Sleep and media diary
- ESS-CHAD – sleepiness
- PSQI – quality
- ASHS – hygiene
- MEQr – chronotype
- Self-rated school performance
- Puberty

- NGRT - reading
- Attainment data
- Teacher-rated performance
- Attendance
- Latenesses
- Attitude to learning
- Homework completion
- GCSE grades

# Changes in sleep Y7 vs. Y9



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- **Chronotype:** Y9s show a greater preference for eveningness
- **Sleep diary:** Reflected in Y9s sleeping ~45 mins later (sleep onset 22:32 vs. later but all wake up ~06:45...
- ...Causing Y9s to have a shorter sleep duration (8hrs 7min vs. 7hrs 17min)
- **Sleep hygiene:** Y9s have significantly worse sleep hygiene than Y7s

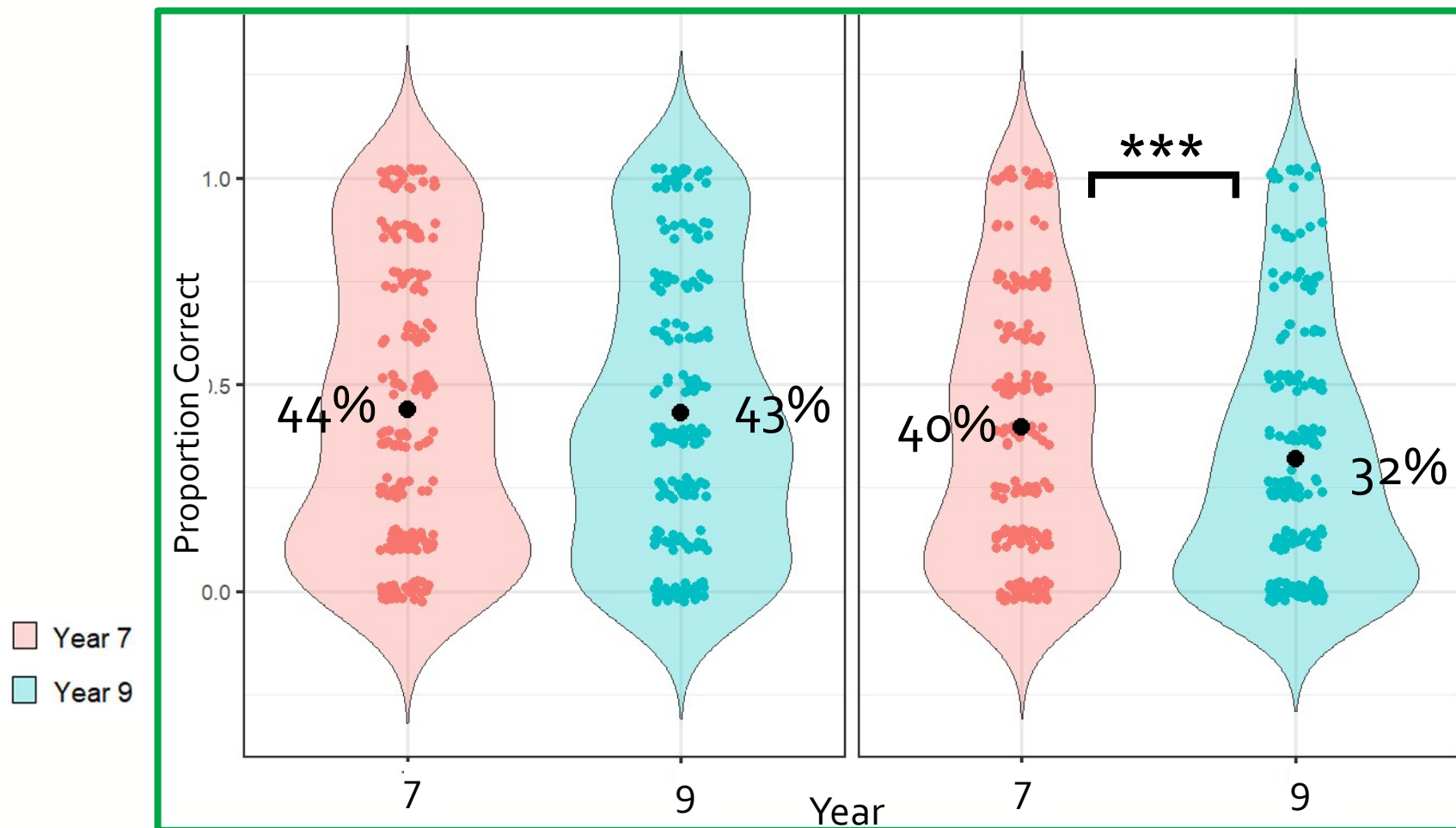
# Recall of word meanings



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## Immediate Test

## Delayed Test



# Is sleep associated with memory?



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- Sleep duration predicts how many words Y7 pupils can memorise (longer sleep associated with better memory)
- Sleep hygiene predicts memory for words in both age groups
  - particularly behaviours that lead to physical arousal close to bedtime, e.g. caffeine consumption and physical exercise

# App-based digital intervention to improve teenage sleep



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# Snoozify: Teen Sleep Coach Protocol



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Intervention (n = 250)

Control (n = 250)

1-week baseline sleep/media diaries

Cognitive tasks

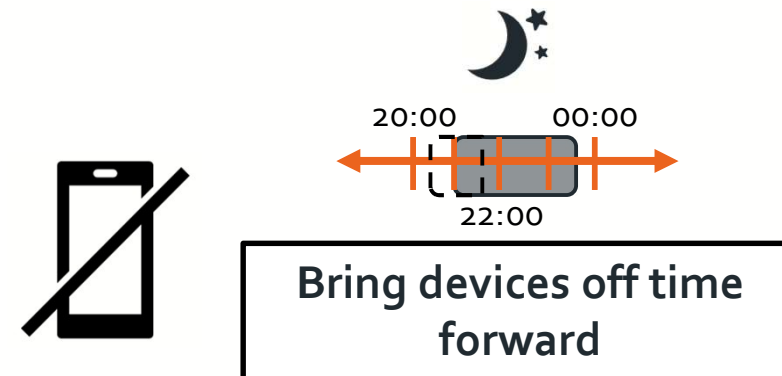
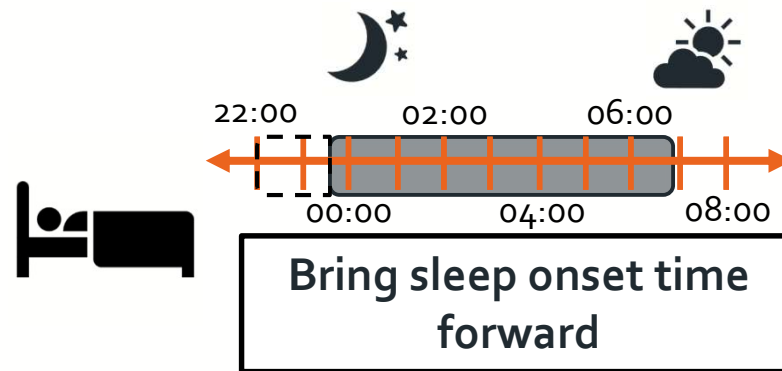


4-week app-based  
intervention



4-week sleep/media  
recording

Cognitive tasks



# Snoozify: Teen Sleep Coach

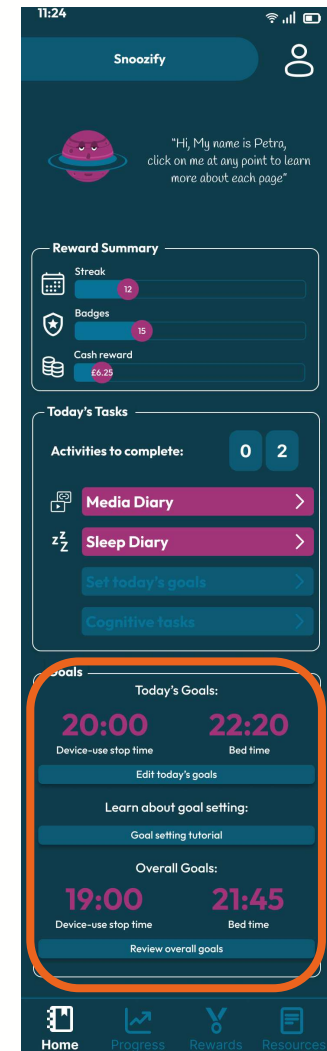
## Goal-setting



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## Goals

- User-guided *goal-setting approach*.
- **Overall goal** set at beginning (e.g., to be asleep by 21:45).
- **Daily goals** (e.g., sleep 5 mins earlier than yesterday).
- Mascot encourages **earlier goals** (*modelling*).
- **Notifications** sent 1-2 hours before goal approaching (*environmental restructuring*).



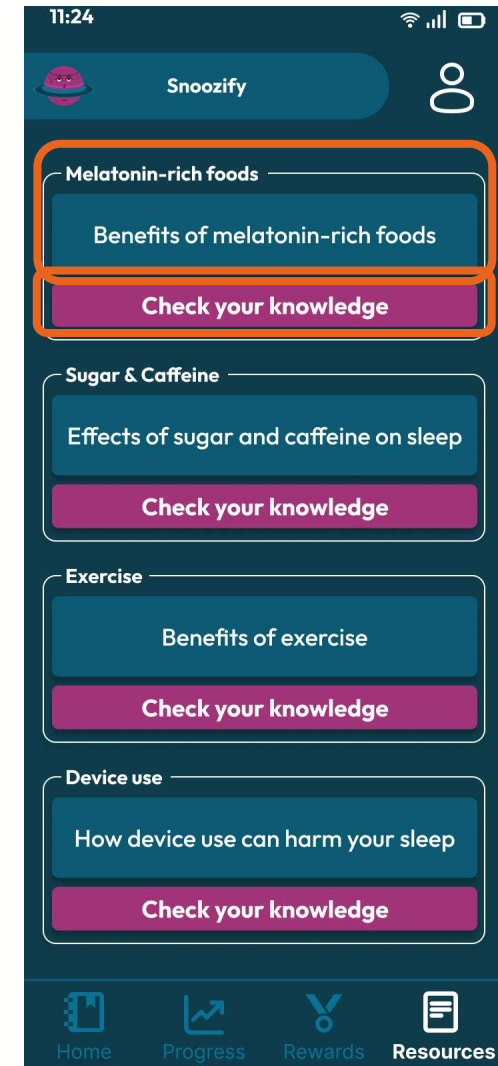
# Snoozify: Teen Sleep Coach

## *Sleep education*



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- **Bitesize information** on sleep hygiene topics (*education/persuasion*).
- Healthier **alternatives** e.g., reading vs. devices, hibiscus lemonade vs. caffeine.
- **Topics** also to include napping and activities in bed based on data from longitudinal study.





# Snoozify: Teen Sleep Coach

## Monitoring



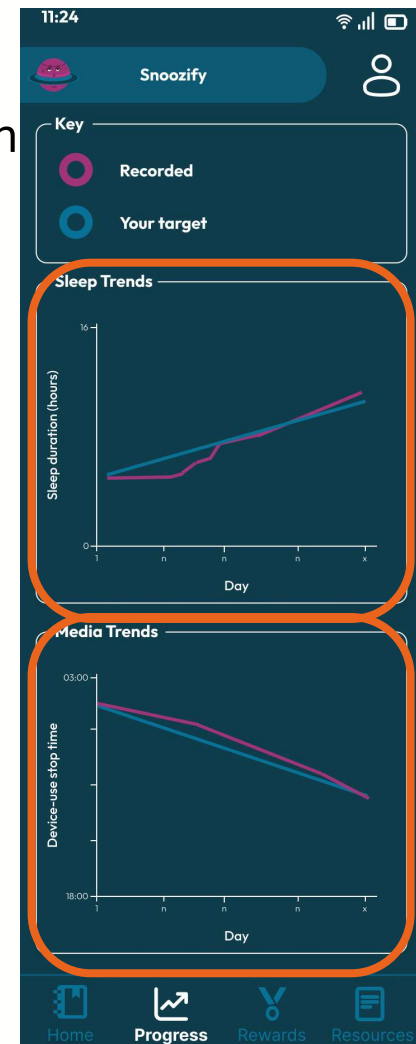
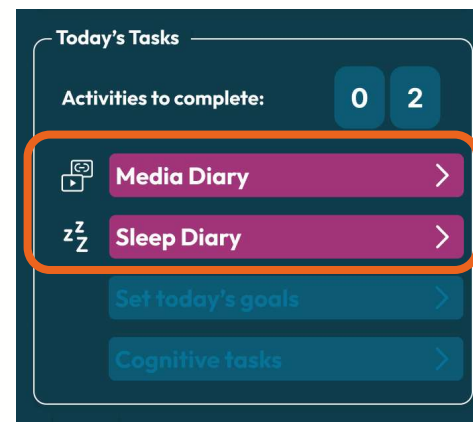
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### Sleep/Media Diaries

- Track behaviour and **semi-personalised feedback** based on alignment with goals.
- Sleep education through feedback (*education/persuasion*).

### Progress Charts

- Sleep onset** and **devices off times** plotted against goals.
- Self-monitoring of behaviour** – adjust goals accordingly and visualise progress.



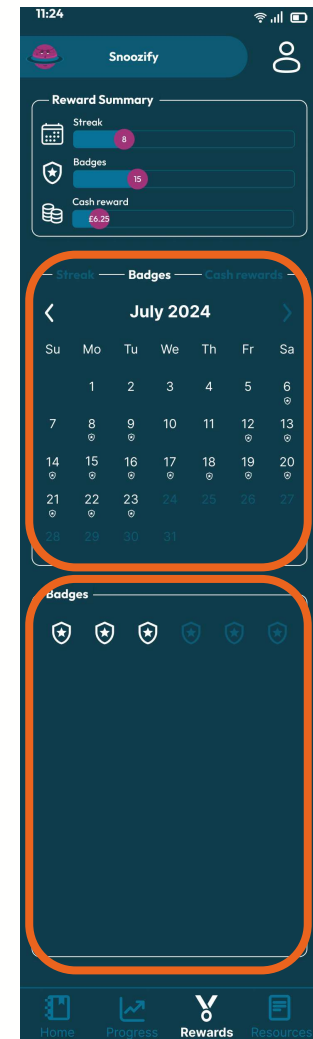
# Snoozify: Teen Sleep Coach

## Rewards



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- Three different types of rewards (*incentivisation*):
  - 1) **Cash** – encourage data entry.
  - 2) **Badges** – encourage behaviour change.
  - 3) **Streaks** – encourage engagement/commitment.



We are recruiting  
schools to take part in  
an experiment to test  
Snoozify! **Register  
interest here:**



Thank you!



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