The order of sleep bouts may not affect procedural memory consolidation in preschoolers.

**METHODS**

Children learned a mirror tracing task in the evening and were assessed at two time points:
- **Immediate Recall**: immediately following initial learning
- **Delayed Recall**: the next day either before or after their nap

Performance was measured by average accuracy percentage (% of time spent drawing inside the shape template).

**INTRO**

- Naps are known to have either an immediate (post-nap) benefit or delayed (post-nap + post-overnight sleep) benefit on some types of learning in preschoolers:
  - Declarative memory → Immediate Benefit
  - Emotional memory → Delayed Benefit
  - Procedural memory → Delayed Benefit
- We aimed to explore if the delayed benefit seen in procedural memory is due to the amount of sleep needed or the order of sleep bouts.
- Hypothesis 1: **Overnight Sleep + Nap > Overnight Sleep Only** (Is there a delayed benefit?)
- Hypothesis 2: **Nap + Overnight Sleep > Overnight Sleep + Nap** (Does sleep order matter?)
- Alternatively, we predicted that the order of sleep may have no effect on procedural learning – and may be more reliant on the amount of sleep post-learning.
- Hypothesis 3: NREM stage 2 sleep will correlate with task improvement

**METHODS**

Participants were 16 preschool children (remote: n=8, age = 47.25 months; classroom: n=8, age = 48.13 months)

Remote children participated in 2 testing sessions, ~1 week apart:

- **Week 1**
  - Session 1: Evening tracing, 7 PM
  - Session 2: Immediately Recall, 1 PM
  - Nap, 1 PM
  - Session 2: Delayed Recall, 5 PM

- **Week 2**
  - Session 1: Evening tracing, 7 PM
  - Session 2: Immediately Recall, 1 PM
  - Overnight Sleep, 1 PM
  - Session 2: Morning/wake recall, 9 AM

In the Classroom group, children learned prior to a nap:

- **Classroom Study**
  - Nap + Overnight
  - Session 1: Morning/Wake tracing, 10 AM
  - Nap, 12 PM
  - Session 2: Delayed Recall, 9 AM

**RESULTS**

There were no baseline differences found in these analyses.

- **Hypothesis 1**: **Overnight Sleep + Nap > Overnight Sleep Only**
  - ON+Nap condition had significant improvement from immediate to delayed recall

- **Hypothesis 2**: **Nap + Overnight Sleep = Overnight Sleep + Nap**
  - Lack of a group effect and lack of a group X session interaction suggested similar task performance between groups

- **Hypothesis 3**: NREM stage 2 sleep is not correlated with task improvement.

**DISCUSSION**

- Sleep order might not matter!
- But getting enough sleep might…
- There is a delayed nap benefit on procedural memory.
- Children may just need two sleep bouts to improve on procedural learning task.
- Need to test more participants.

**REFERENCES**