The COMIC Study –
Investigating brain and memory development in childhood

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Background

The mature human memory system allows both the recollection of specific details of past events and the generalization from past experiences in new situations. In early life, toddlers struggle with memories for specific events[1], while memory generalization skills are readily available[2]. Entering middle childhood, memories become more specific, evidenced by increases in pattern separation[3] – the ability to distinguish similar experiences – and pattern completion[4,5] – the ability to retrieve wholistic memories from partial cues. At the same time, generalization skills continually advance as well[6]. While it is clear that these memory components undergo changes in this developmental period, longitudinal data are missing to map their trajectories and covariation as well as understand their associated neural structures. The current study addresses this gap by following 4- to 8-year-old children for 3 years using an accelerated longitudinal design.

Methods

Accelerated longitudinal design

N_{T1} = 174
N_{T2} = 96 (ongoing)
N_{T3} = 5 (ongoing)

Sleep diary

Actigraphy

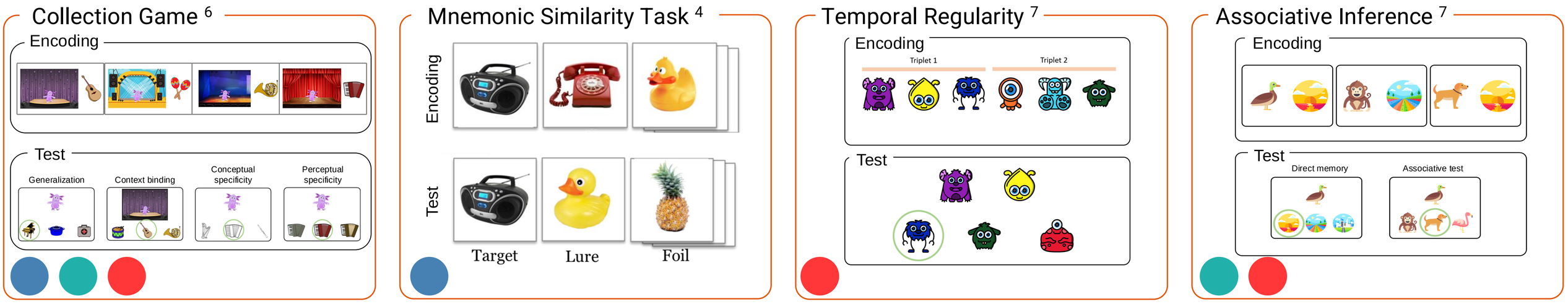
Sleep & environmental questionnaires

Sleep EEG

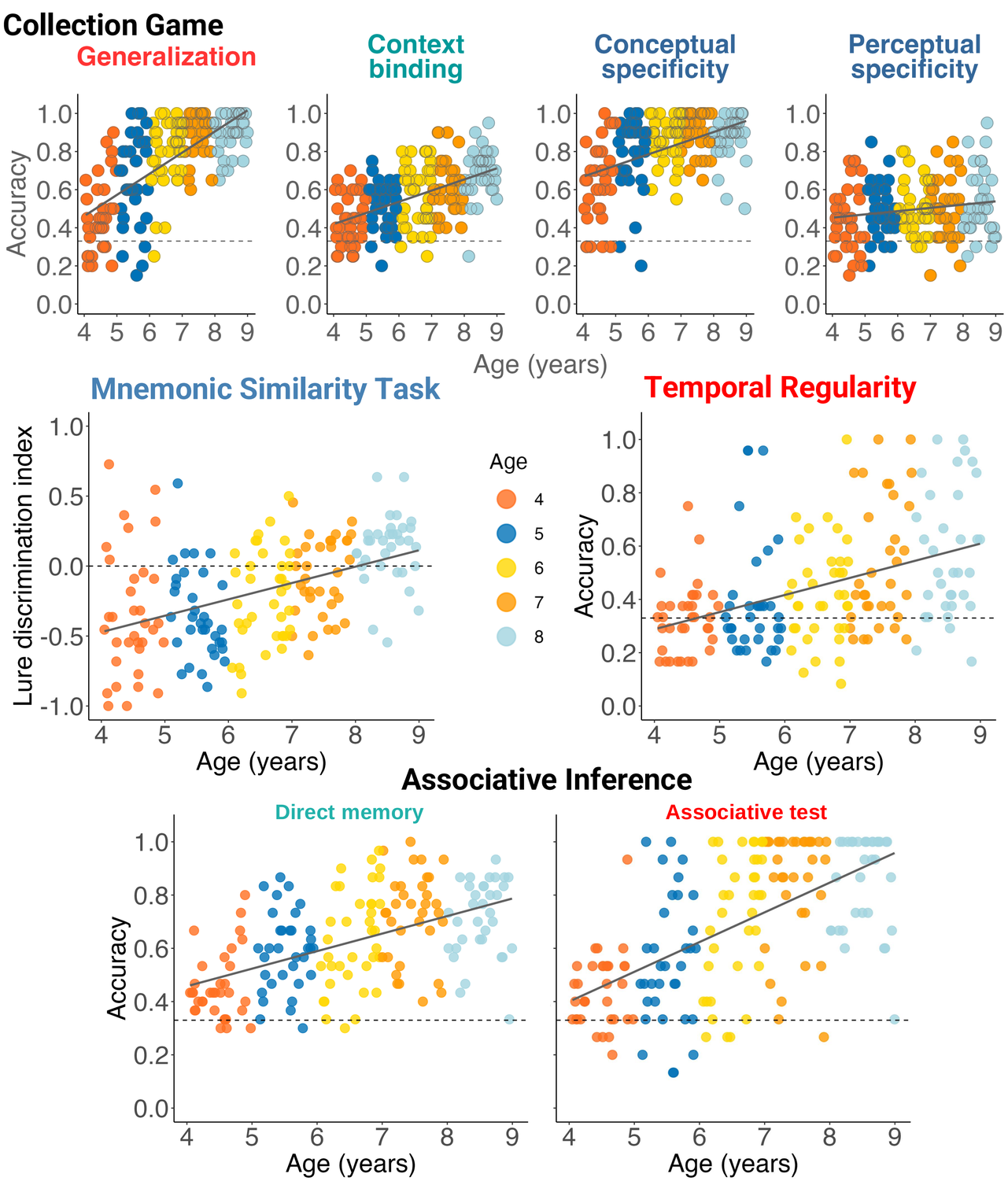
Structural MRI (T1w & high-resolution hippocampus PDw images)
Diffusion weighted imaging

Memory tasks
Cognitive covariates (working memory, vocabulary, processing speed)

Memory task battery



Cross sectional age differences in memory tasks



Behavioral data preparation pipeline

Conclusion & Outlook

- Task battery shows expected cross sectional age differences across different memory component processes
- Planned first data release of behavioral data (memory task battery and cognitive covariates) in BIDS format from T1 in the foreseeable future with successive releases for other parts of data set
- Launch of website for accessing data and receiving release updates
- Outlook of upcoming projects:
  - Change-change relations between hippocampal subfields and memory component processes
  - White matter connectivity between hippocampus and prefrontal cortex & generalization performance

References

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