Rhythmic Abilities in Childhood

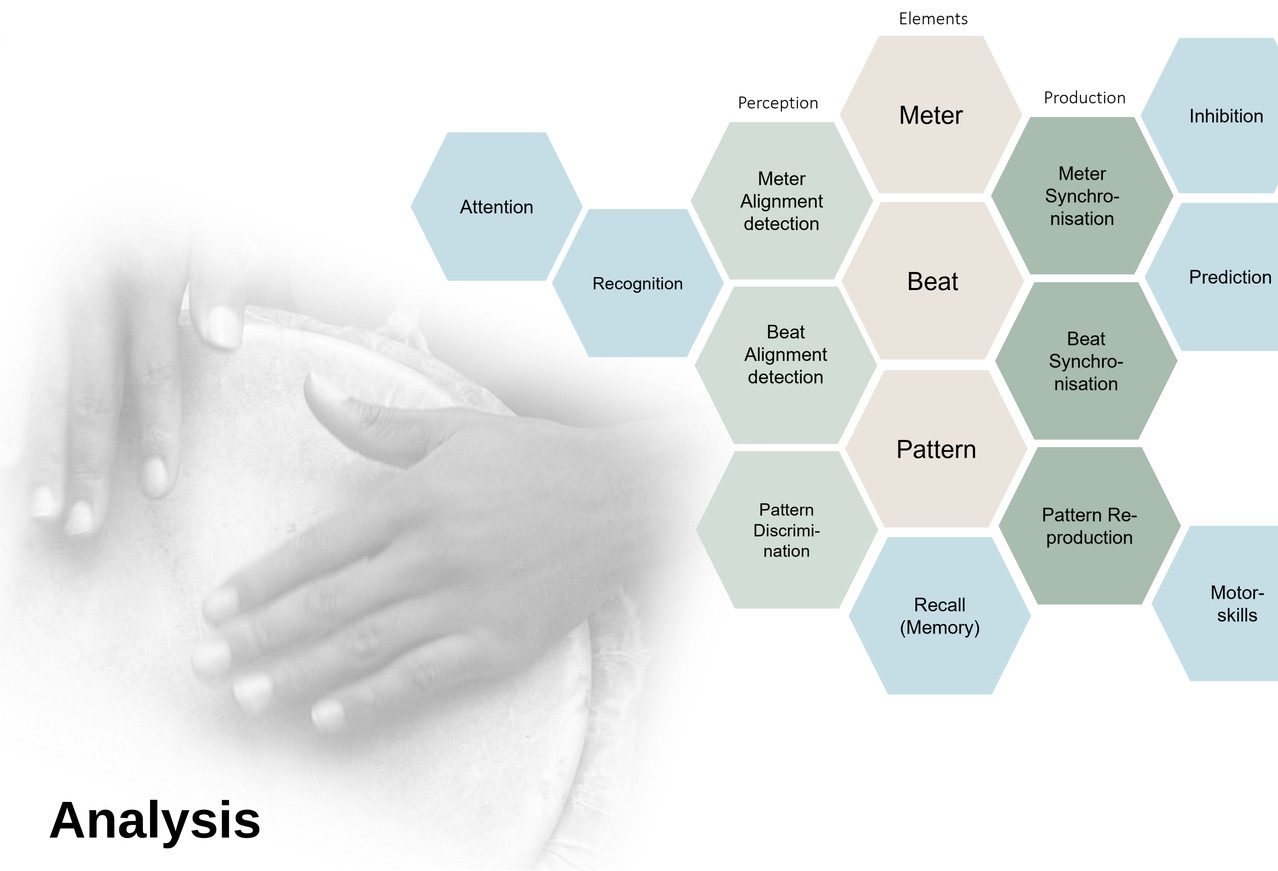
Structure, Development and Interrelation

MAX PLANCK INSTITUTE FOR EMPIRICAL AESTHETICS

Katharina Schaaf, Franziska Degé - Max Planck Institute for Empirical Aesthetics

Introduction | Background

- Rhythmic ability is an overarching construct, including rhythm production and perception across dimensions such as beat, meter, and pattern. [1]
- Rhythmic subskills show large individual differences in childhood and remain unevenly studied.
- Current evidence links rhythm to motor skills, executive functions, and social domains, yet most studies focus on isolated subskills. [2][3]
- Need for groundwork toward taxonomy of rhythmic abilities



Methods | Materials

Figure 1. Recruitment plan for longitudinal study

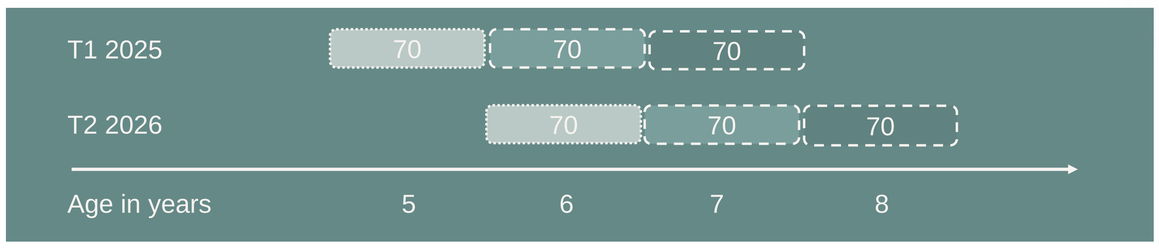


Figure 2. Setting

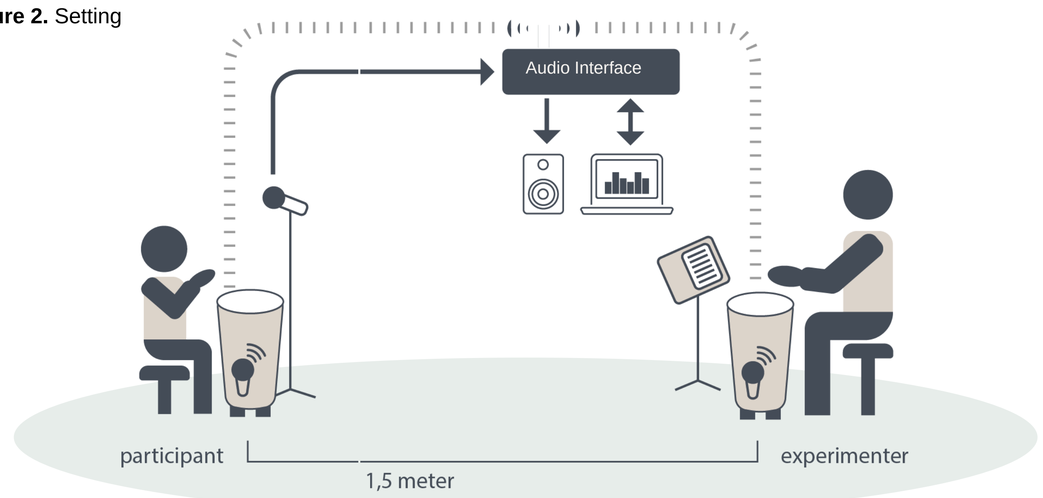
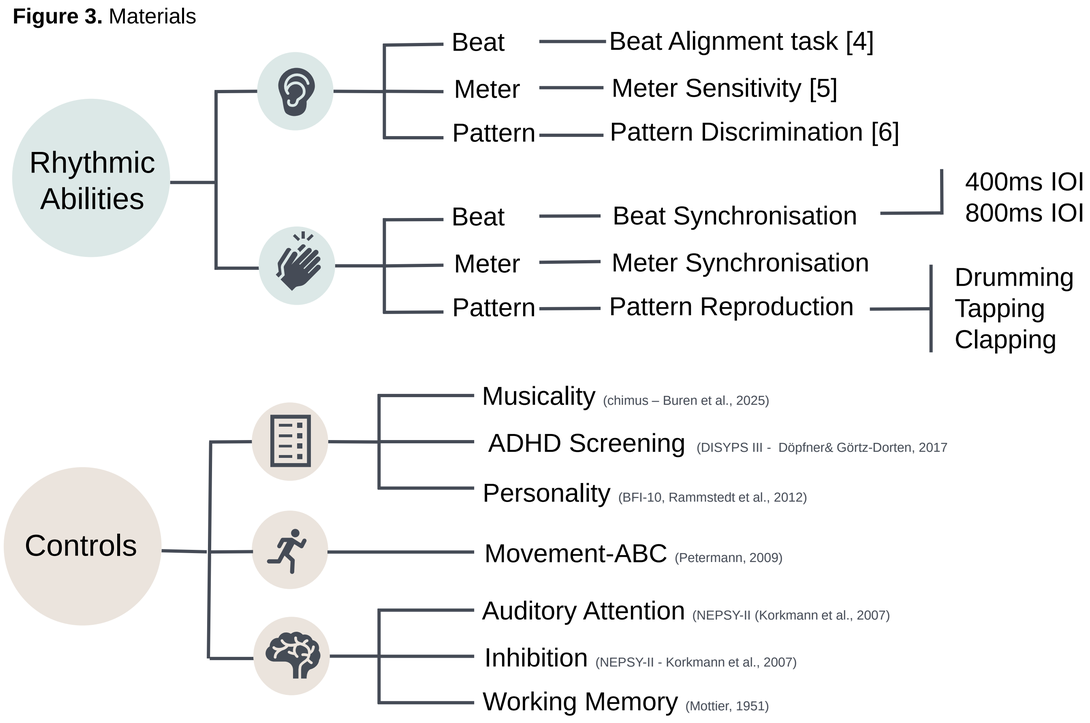


Figure 3. Materials



Procedure: Three sessions of 30-minute individual testing conducted in a familiar environment within the childcare facility.

Setting: Audio presentation via loudspeakers. Real-time recording of drumming performance using an internal drum pickup.

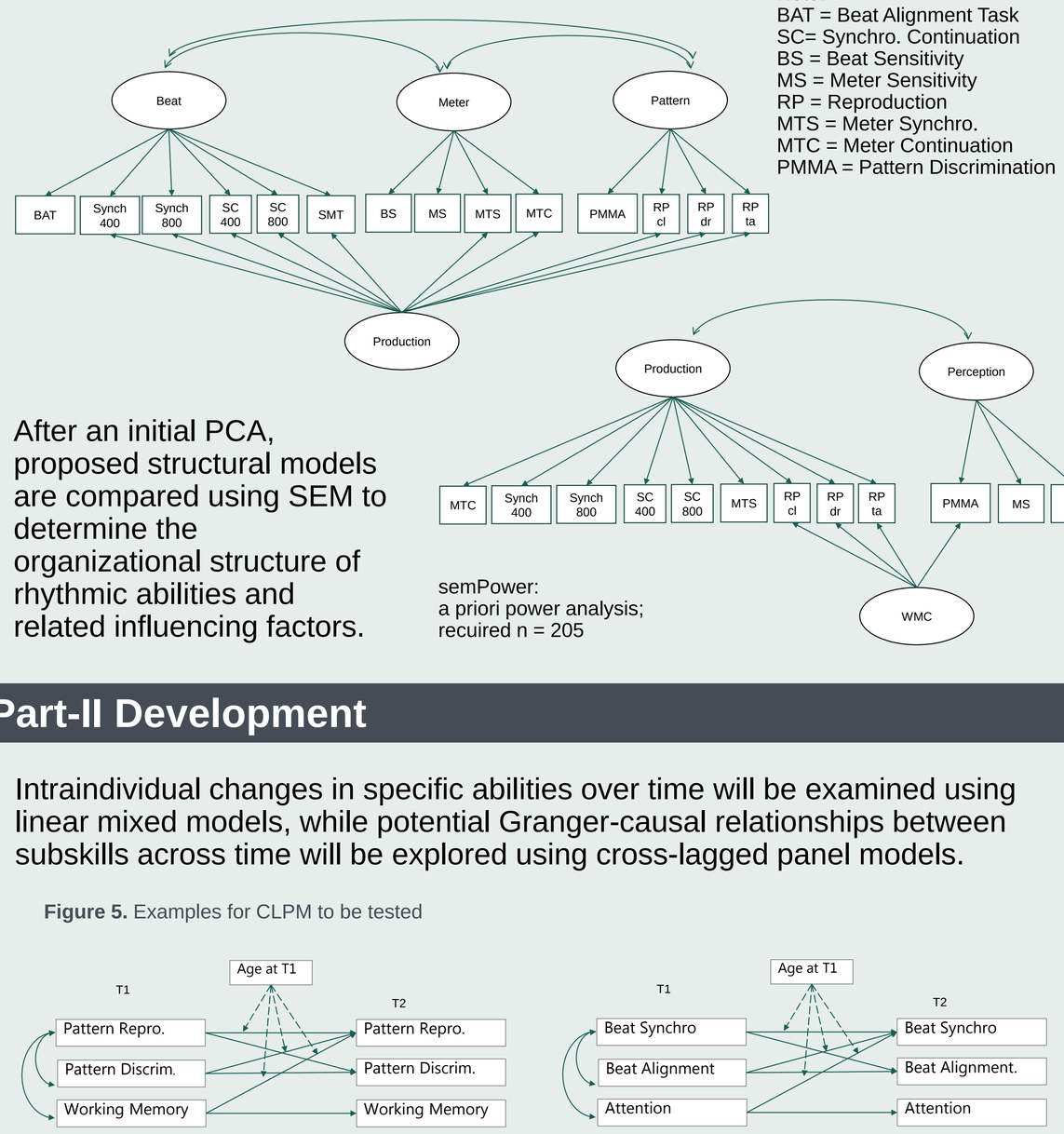
Research Questions

- How are rhythmic abilities organized in childhood?
- How do specific rhythmic subskills develop between ages 5 and 8?
- How are rhythmic subskills embedded in other developmental domains? E.g. What associations exist between rhythmic abilities, motor skills, and cognition?

Analysis

Part-I Structure

Figure 4. Potential models to be tested



Note:
BAT = Beat Alignment Task
SC= Synchro. Continuation
BS = Beat Sensitivity
MS = Meter Sensitivity
RP = Reproduction
MTS = Meter Synchro.
MTC = Meter Continuation
PMMA = Pattern Discrimination

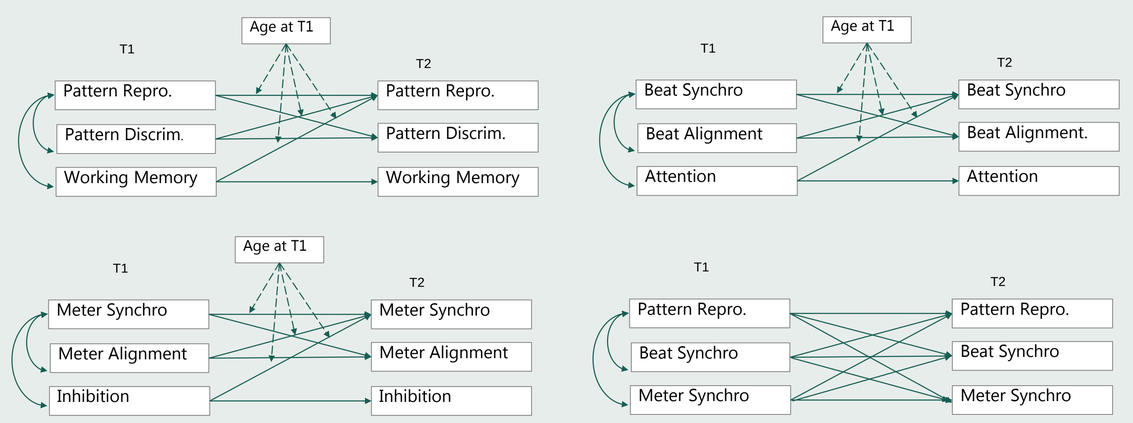
After an initial PCA, proposed structural models are compared using SEM to determine the organizational structure of rhythmic abilities and related influencing factors.

semPower:
a priori power analysis;
recuired n = 205

Part-II Development

Intraindividual changes in specific abilities over time will be examined using linear mixed models, while potential Granger-causal relationships between subskills across time will be explored using cross-lagged panel models.

Figure 5. Examples for CLPM to be tested



Discussion

- With this study, we aim to establish a foundation for further research on the development and promotion of rhythmic subskills.
- Our goal is to build a comprehensive understanding of the organizational structure of rhythmic abilities.
- This work is ongoing — discussion, feedback, and suggestions for alternative models or analyses are very welcome.

Contact:

Katharina.schaaf@ae.mpg.de

References:
[1] Snyder, J. S., Gordon, R. L., & Hannon, E. E. (2024). Theoretical and empirical advances in understanding musical rhythm, beat and metre. Nature Reviews Psychology, 3(7), 449-462. ;
[2] Nitin, R., Gustavson, D. E., Aaron, A. S., Boorom, O. A., Bush, C. T., Wiens, N., ... & Gordon, R. L. (2023). Exploring individual differences in musical rhythm and grammar skills in school-aged children with typically developing language. *Scientific Reports*, *13*(1), 2201.
[3] Bentley, L. A., Eager, R., Savage, S., Nielson, C., White, S. L., & Williams, K. E. (2023). A translational application of music for preschool cognitive development: RCT evidence for improved executive function, self-regulation, and school readiness. Developmental Science, 26(5), e13358.
[4] Harrison, P. M., & Müllensiefen, D. (2018). Development and validation of the computerised adaptive beat alignment test (CA-BAT). Scientific Reports, 8(1), 12395.
[5] Nave-Blodgett, J. E., Snyder, J. S., & Hannon, E. E. (2021). Hierarchical beat perception develops throughout childhood and adolescence and is enhanced in those with musical training. Journal of Experimental Psychology: General, 150(2), 314.
[6] Gordon, E. E. (1979). Primary Measures of Music Audiation (PMMA). GIA Publications.