

# Rhythmic Development in 5- to 8-year-old Children and Adults: The Role of Motor Skills

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## Background

Research has shown that at age 7, children perform similarly well in rhythm production tasks as musically untrained adults (Drake, 1993). Considering that rhythm perception skills develop early in infancy (Phillips-Silver & Trainor, 2005), it seems surprising that rhythmic development takes so long to unfold. In order to gain a deeper understanding here, it might be helpful to consider the task chosen to measure rhythmic production, because rhythm reproduction might differ depending on the task (Gooding & Standley, 2011). Furthermore, the context (alone vs. social setting) in which rhythmic reproduction is assessed might have an influence on the outcome (Kirschner & Tomasello, 2009). Moreover, motor development, for example hand dexterity, might play a crucial role in the successful reproduction of rhythms in a drumming task. Finally, also the relation between rhythm perception skills and rhythm production skills should be considered.

Therefore, we examined the developmental trajectory of rhythmic skills and investigated whether development of these is related to applied task, to context, and to motor skill development.

## Research Questions

- Is there an influence of task?
- Is there an facilitating effect of context in all age groups?
- Do perception and production interact?
- Does motor skill development influence rhythm skill development?
- Do we underestimate rhythmic abilities due to applied tasks (motor development)?

## Methods

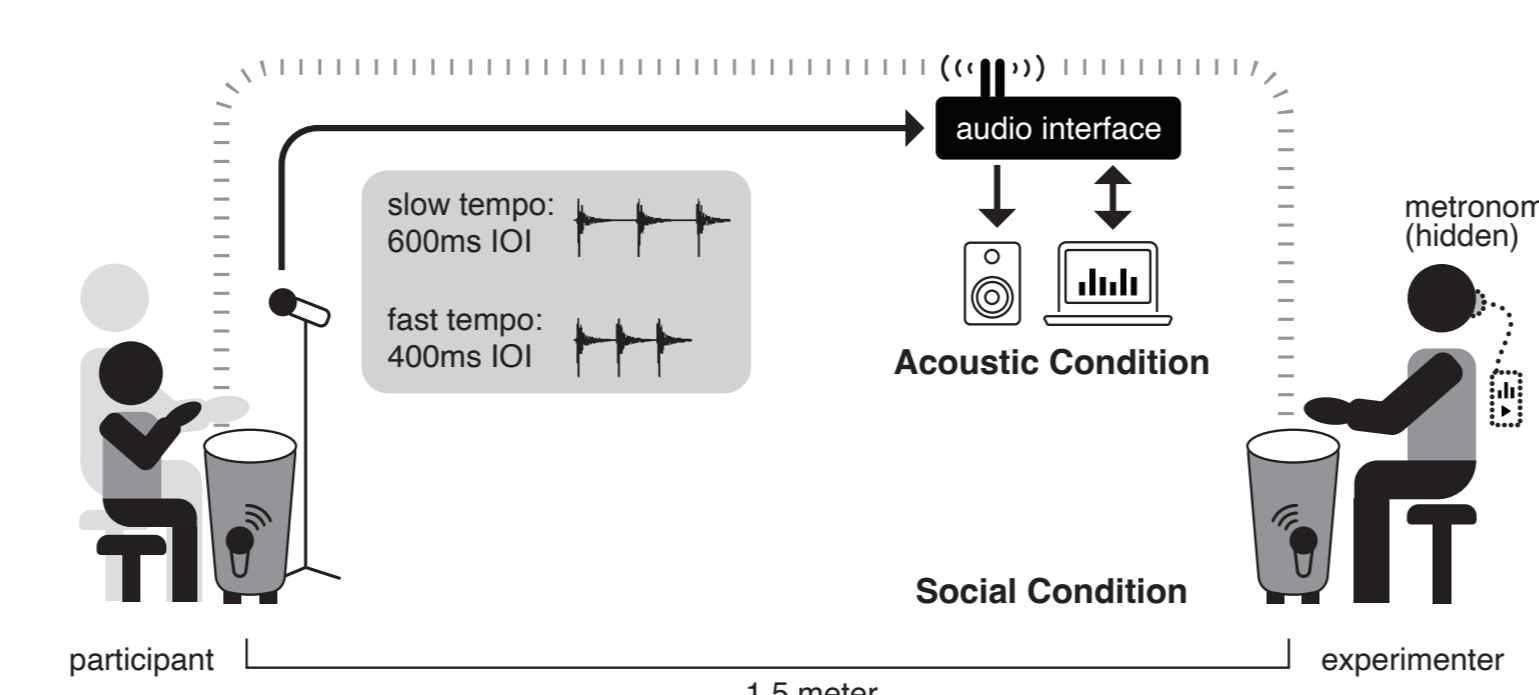
### Participants

5-year-old children	6-year-old children	7-year-old children	8-year-old children	Adults
22 f / 9 m / 0 d	18 f / 11 m / 0 d	27 f / 19 m / 0 d	20 f / 16 m / 0 d	25 f / 32 m / 1 d
M = 65.35 months (SD = 3.55 months)	M = 77.41 months (SD = 3.27 months)	M = 89.26 months (SD = 3.80 months)	M = 100.69 months (SD = 3.35 months)	M = 273.51 months (SD = 58.45 months)

## Material

### Rhythm Reproduction Task

Rhythms following Jungbluth & Hafen (2005)



5 different response formats x 10 rhythms

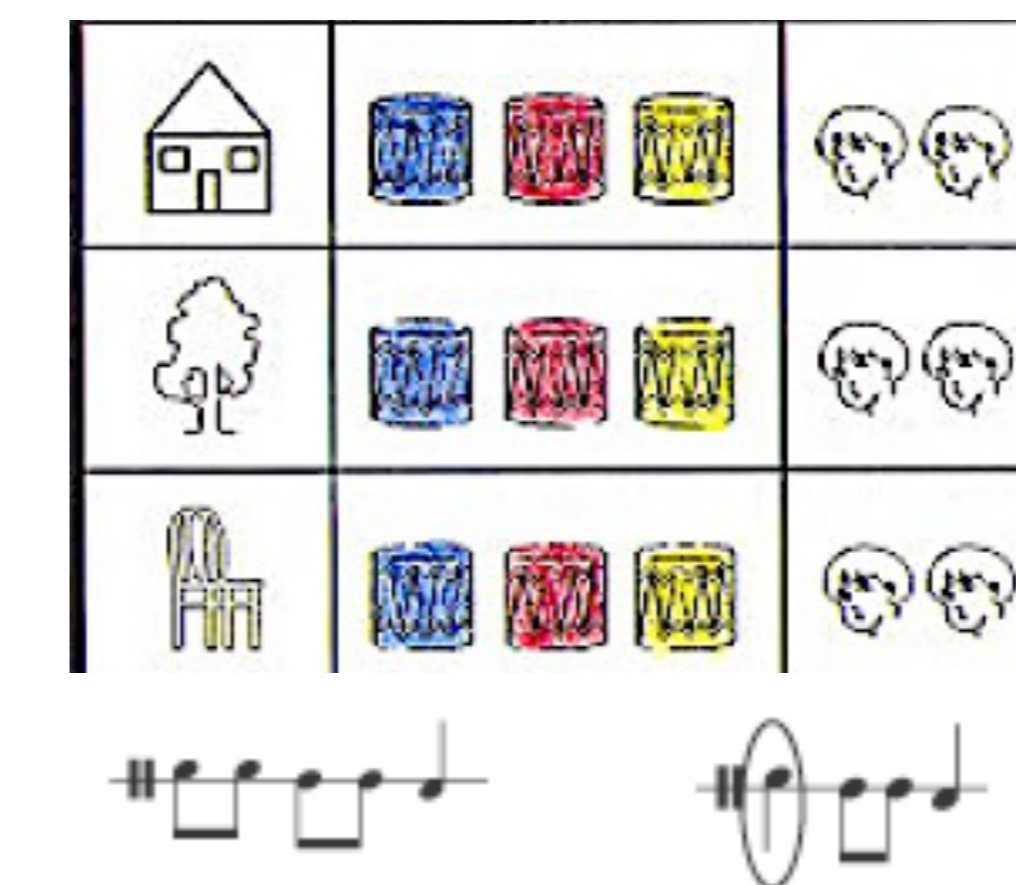
- Tapping
- Voice
- Clapping
- Drumming alone
- Drumming social

- 4 parallel versions
- counterbalanced repetitions of one version in 5<sup>th</sup> response format
- randomization across 30 participants

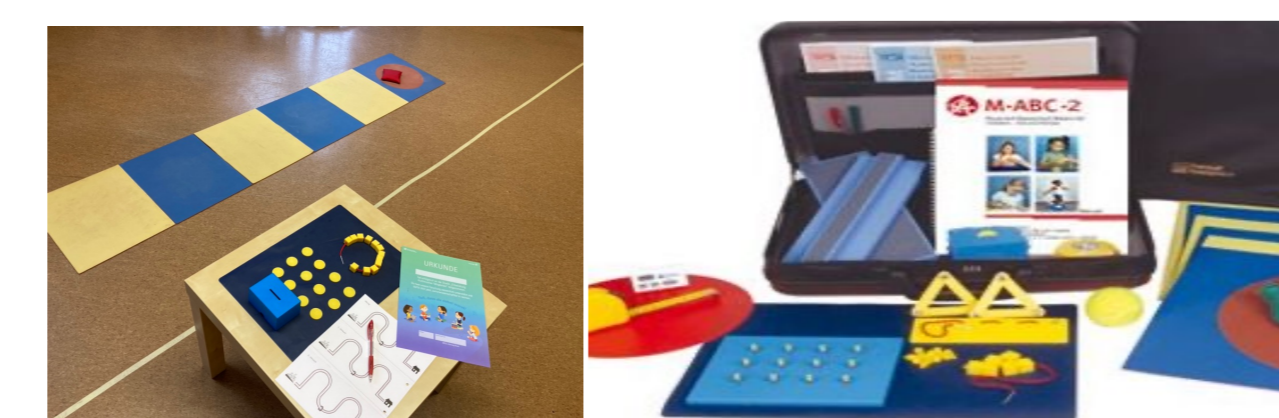
### Rhythm Perception Task

(Jungbluth & Hafen, 2005)

- 3 different sounding drums
- compare prelude and postlude
- Indicate any changes or the same



### Motor Task



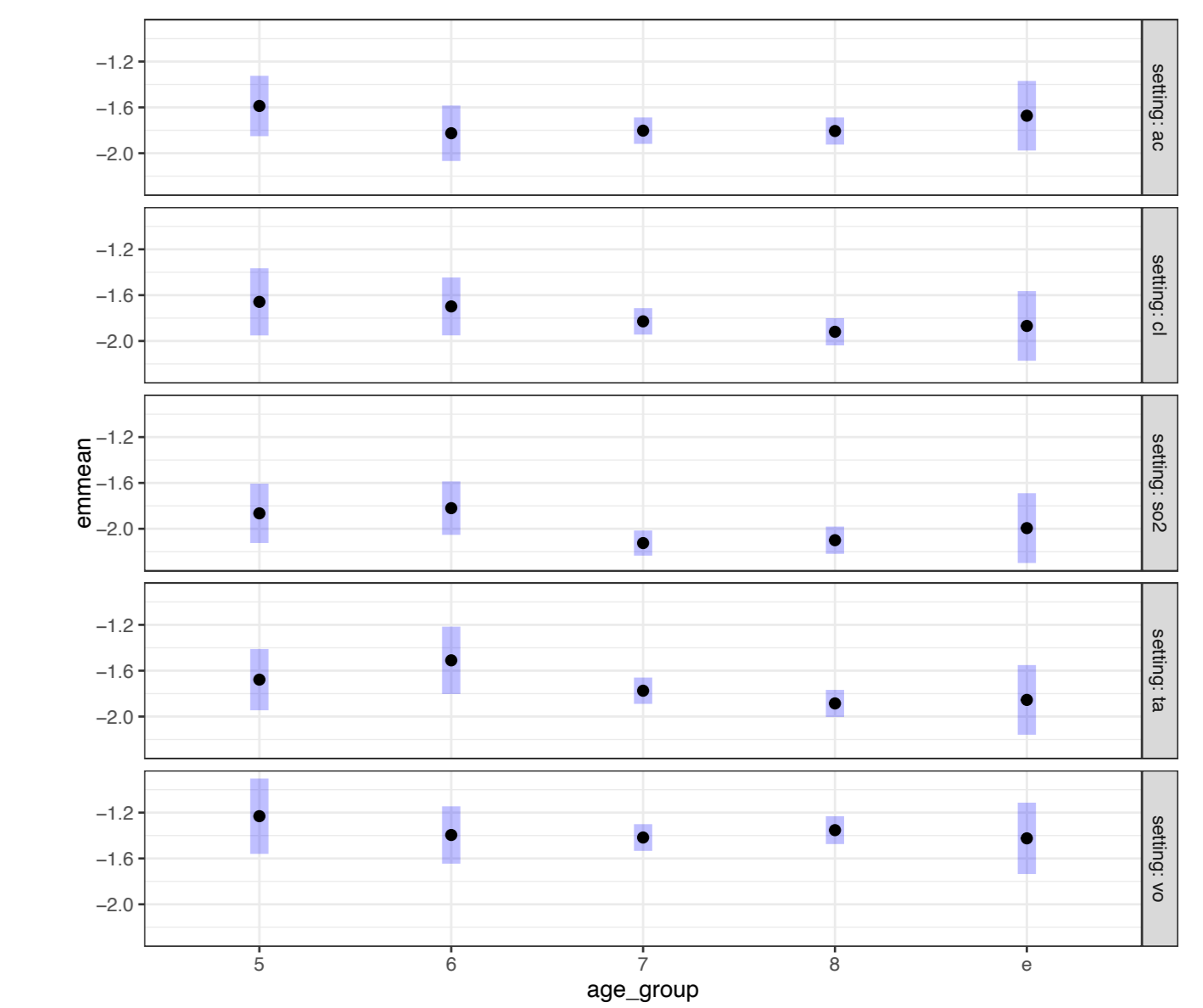
Movement ABC-2 (Petermann, 2009)

	5- to 6-year-old children	7- to 8-year-old children	Adults
Hand Dexterity	1.Posting Coins, 2.Threading Beads, 3.Drawing Trial	1.Placing Pegs 2.Threading Beads 3.Drawing Trial	1.Turning Pegs 2.Triangle with Nuts and Bolts 3.Drawing Trial
Ball Skills	1.Catching Beanbag 2.Throwing Beanbag onto Mat	1.Two-Hand Catch, 2.Throwing Beanbag onto Target Area	1.One-Hand-Catch 2.Throwing at a Wall Target
Balance Skills	1.One-Leg-Balance 2.Walking Heels Raised 3.Jumping on Mats	1.One-Board-Balance 2.Walking Toe-to-Heel Forwards 3.Hopping on Mats	1.Two-Board-Balance 2.Walking Toe-to-Heel Backwards 3.Zig-Zag Hopping

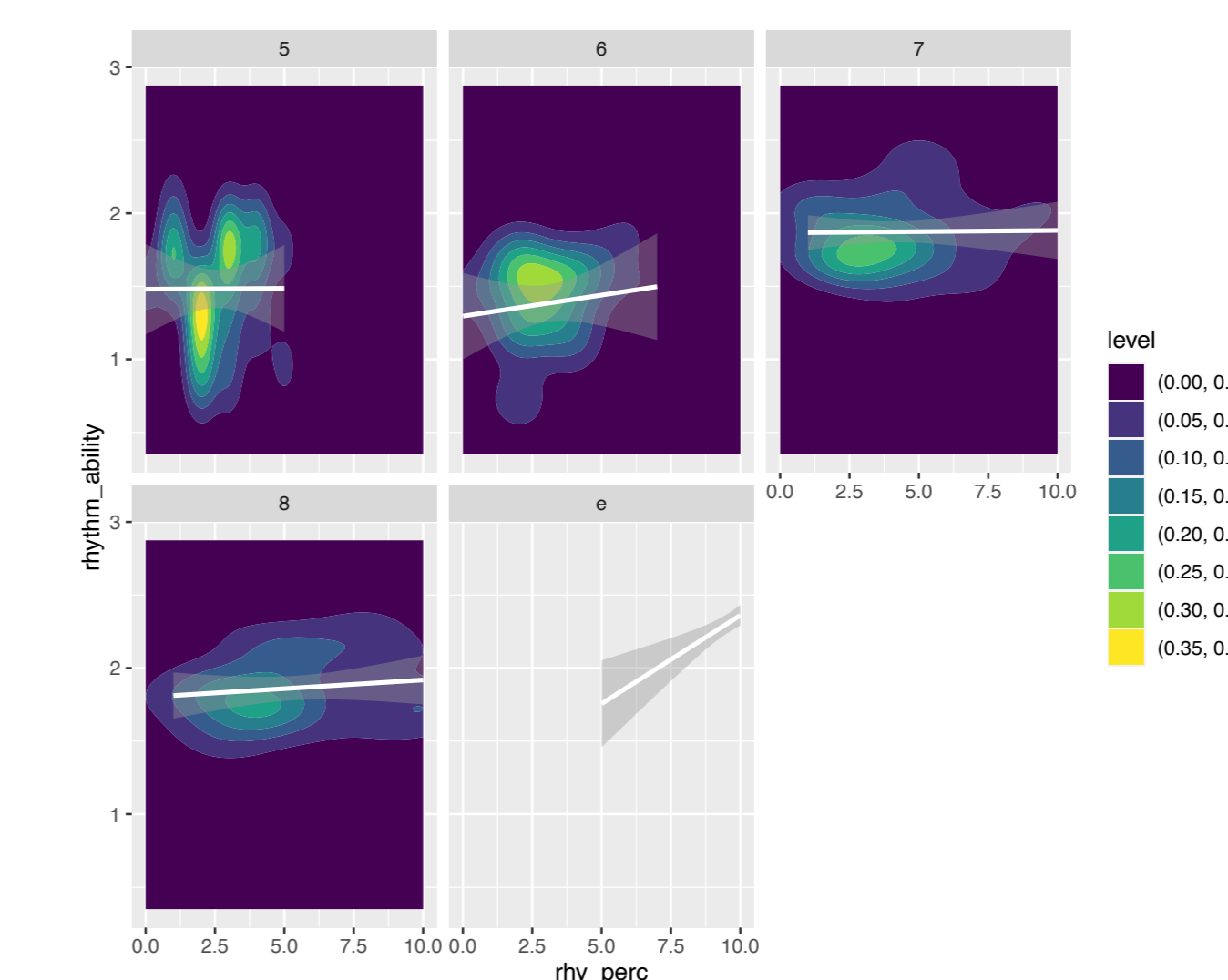
## Results

### Comparison of Tasks

- Best reproduction for drumming social
- Worst reproduction for voice



### Correlation between Perception and Production



Rhythm perception and rhythm production (total score) are significantly correlated,  $r = .638, p < .001$ . This correlation is mainly based on the correlation found in adults,  $r = .47, p < .001$ .

### Correlations between rhythm production and motor skills

	Rhythm Reproduction (total score)				
	5 years	6 years	7 years	8 years	adults
<b>Hand Dexterity</b>					
Posting coins	- 0.12	- 0.13	0.08	- 0.45**	- 0.11
Beads /Triangle	0.19	- 0.41*	0.32*	- 0.31	- 0.30*
Drawing	- 0.41*	- 0.32	- 0.24	- 0.16	- 0.19
<b>Ball Skills</b>					
Catching Beanbag	- 0.02	0.63**	- 0.05	- 0.00	- 0.06
Throwing Beanbag	0.10	- 0.19	0.08	0.09	0.22
<b>Balance Skills</b>					
One-Leg-Balance	0.11	0.34*	0.07	0.37*	0.07
Walking	0.07	0.21	0.11	0.05	0.22
Jumping	0.11	0.33	0.03	0.09	constant

## Discussion

Our results indicate an influence of task on rhythm reproduction as well as an facilitating effect of a social context. The correlation of rhythm perception and production was depending on the age group: Adults showed the strongest correlation. We could not reveal a systematic correlation between rhythm reproduction and motor skills. It is highly likely that the motoric test that we applied made it extremely difficult to find associations between rhythm reproduction and motor skills. We only have cross-sectional data. Future studies should realize a training or longitudinal approach.

## Contact

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## References

Drake, C. (1993). Reproduction of musical rhythms by children, adult musicians, and adult nonmusicians. *Perception & Psychophysics*, 53(1), 25–33. <https://doi.org/10.3758/BF03211712>. Gooding, L., & Standley, J. M. (2011). Musical Development and Learning Characteristics of Students. *Update: Applications of Research in Music Education*, 30(1), 32–45. <https://doi.org/10.1177/8755123311418481>. Jungbluth, A., & Hafen, R. (2005). *Musik-Screening für Kinder*. Vechta: unpublished test material. Kirschner, S., & Tomasello, M. (2009a). Joint drumming: Social context facilitates synchronization in preschool children. *Journal of Experimental Child Psychology*, 102(3), 299–314. <https://doi.org/10.1016/j.jecp.2008.07.005>. Phillips-Silver, J., & Trainor, L. J. (2005). Psychology: Feeling the beat: Movement influences infant rhythm perception. *Science*, 308(5727), 1430. <https://doi.org/10.1126/science.1110922>