

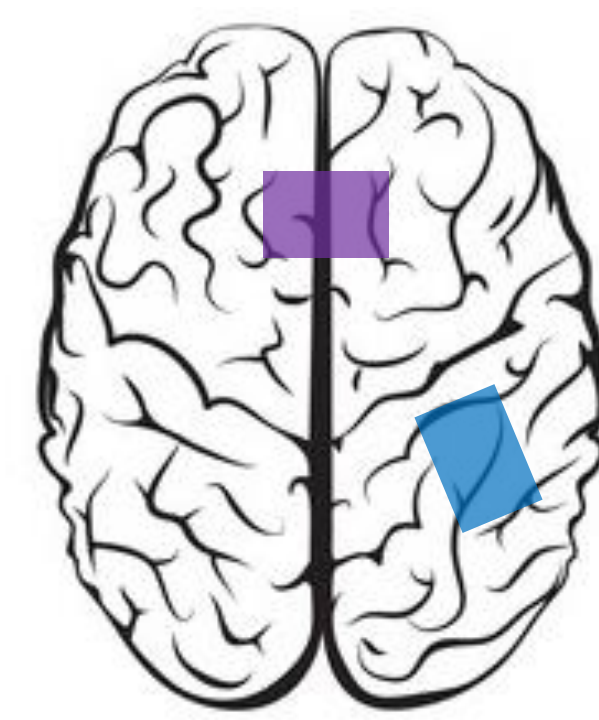


Introduction

- Rhythmic abilities are often measured as a single concept, by a *single* rhythm task.
- However, rhythmic abilities are likely *multidimensional*: complex in structure and involving different dimensions.
- Behavioural studies suggest beat-based tasks (e.g., **Beat Alignment Test**) are distinct from sequence-memory tasks (e.g., **Rhythm Reproduction**).¹
- Further causal evidence could be provided by applying transcranial direct current stimulation (tDCS) to selectively modulate rhythmic behaviour.
 - Supplementary Motor Area (SMA)**: involved in beat-based timing²
 - right Supramarginal Gyrus (rSMG)**: involved in rhythm memory³

Research Question:

To what extent do commonly used rhythmic tasks reflect **beat-based** rhythm perception or **sequence memory-based** rhythm perception as revealed by tDCS?

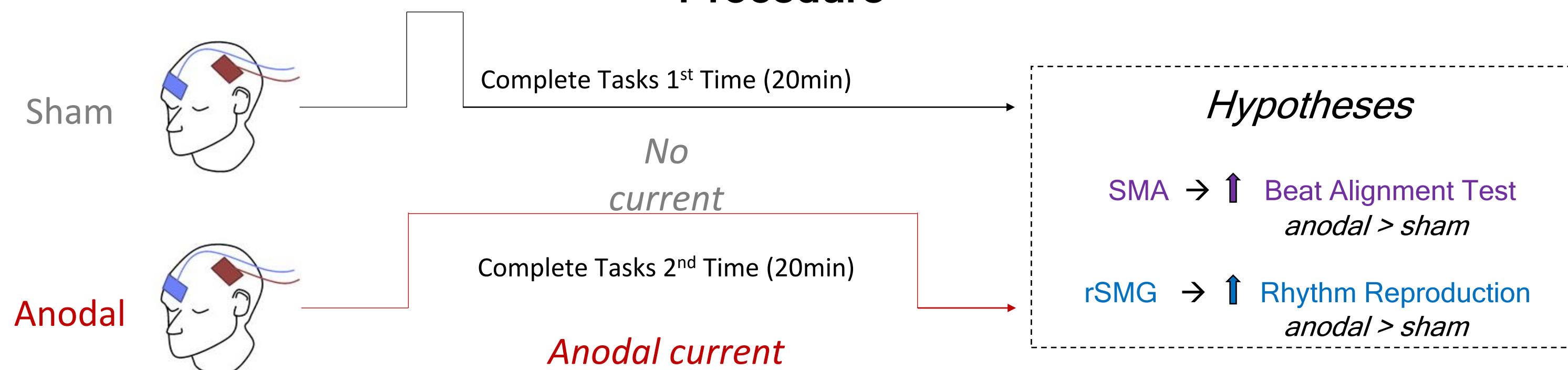


Method

Participants (N = 23)

SMA: n = 11, 5 female, Mean Age = 21.1 (6.8), Music Years = 5.75 (6.18)
rSMG: n = 12, 8 female, Mean Age = 18.8 (1.1), Music Years = 5.82 (5.27)

Procedure



Rhythm Reproduction Test

Listen to a rhythm three times then reproduce it

Metric Simple: 1 1 2 3 1 4 x3

Metric Complex: 1 2 4 1 1 3 x3

Non-Metric: 1 1.4 4.5 1 1 3.5 x3

BAT-Perception Test

Determine if the beat superimposed on the musical excerpt is "on" or "off" the beat

On-Beat

Tempo-Error

Phase-Shift

Confidence?
 1. Guessing
 2. Somewhat sure
 3. Completely Certain

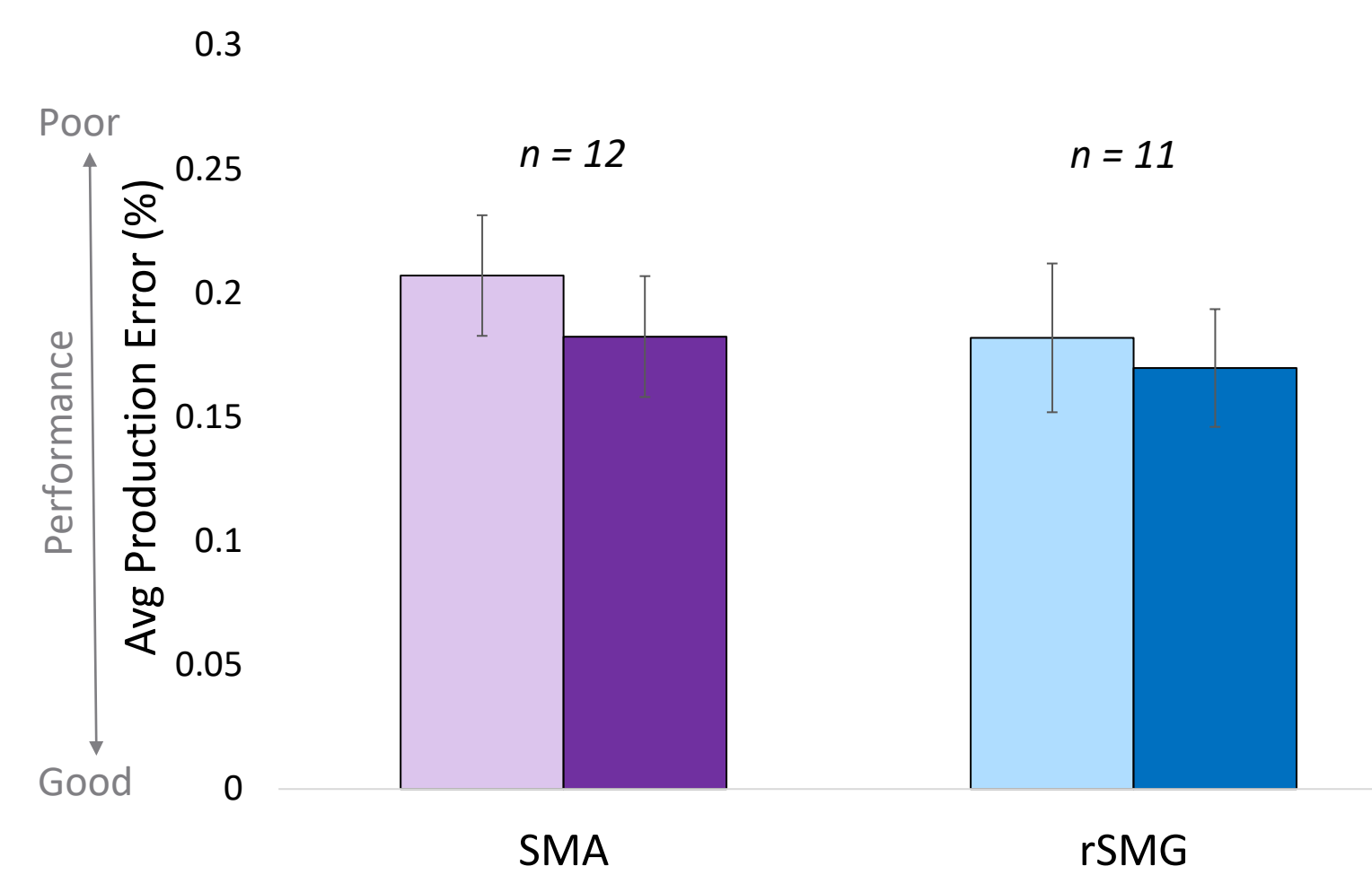
BAT-Production Test

Tap along to the beat of the music excerpt

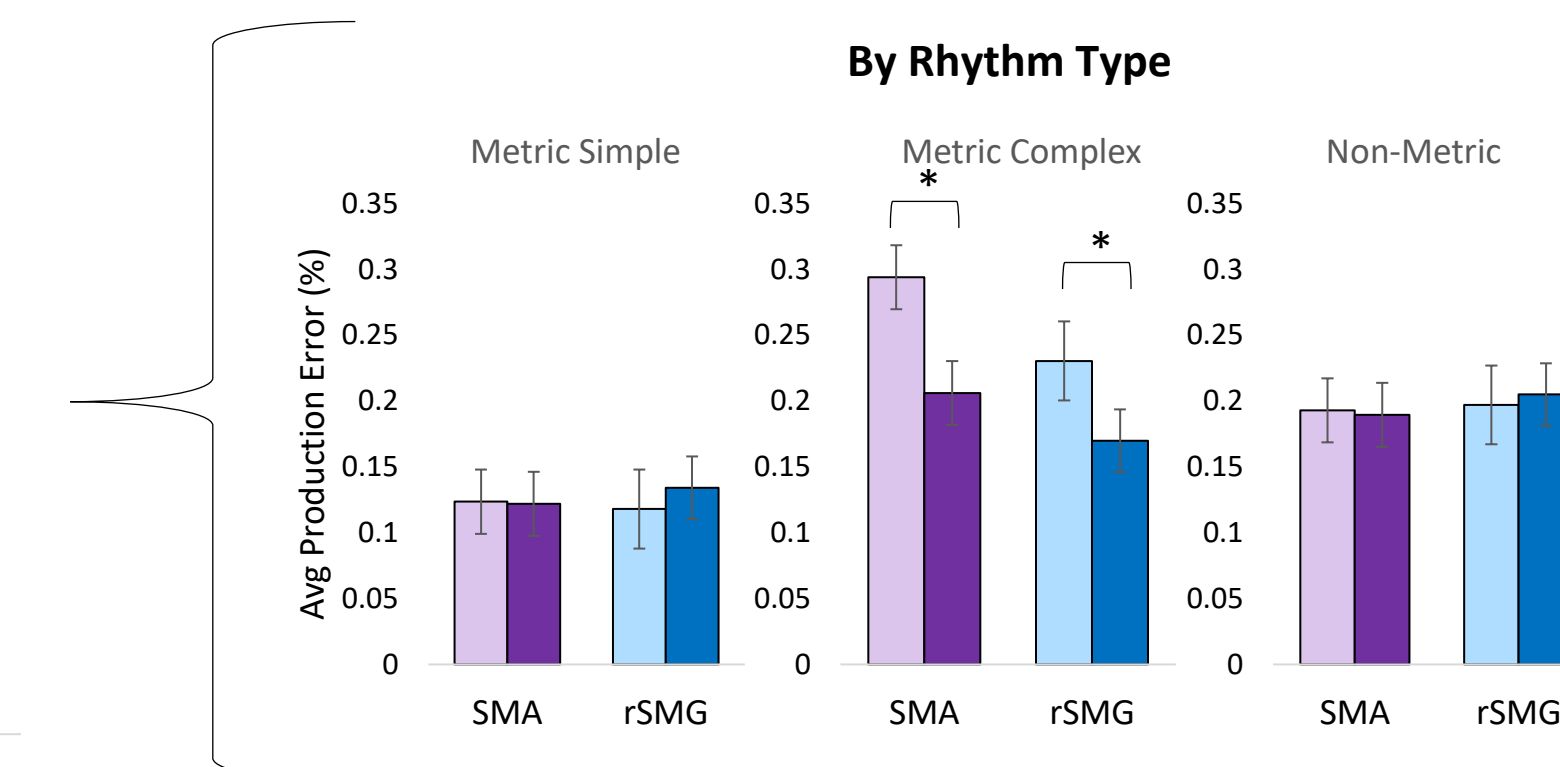
Familiarity?
 1. Never heard of it
 2. Somewhat familiar
 3. Very familiar

Results

* = $p < .05$, not corrected for multiple comparisons
 Error bars: SEM

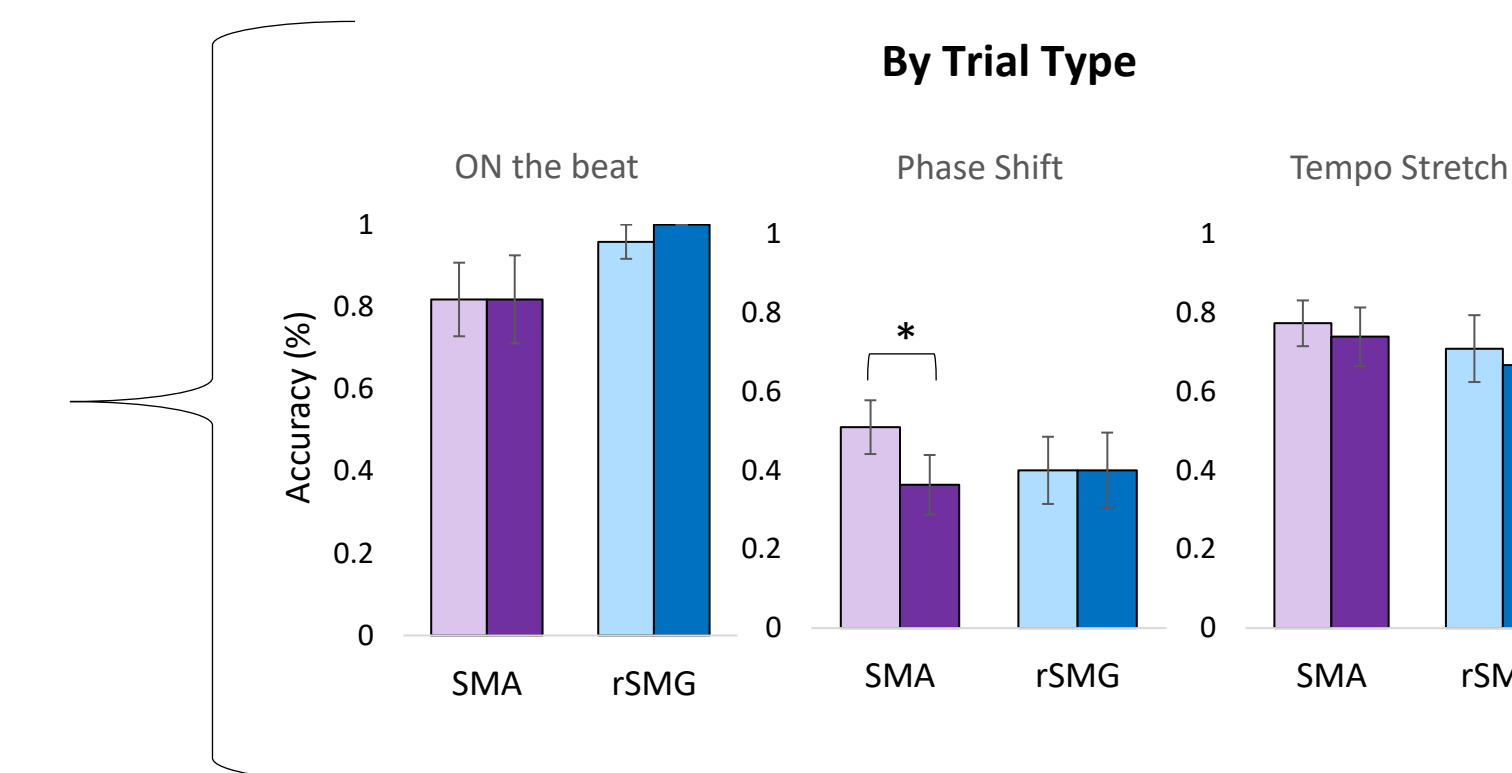
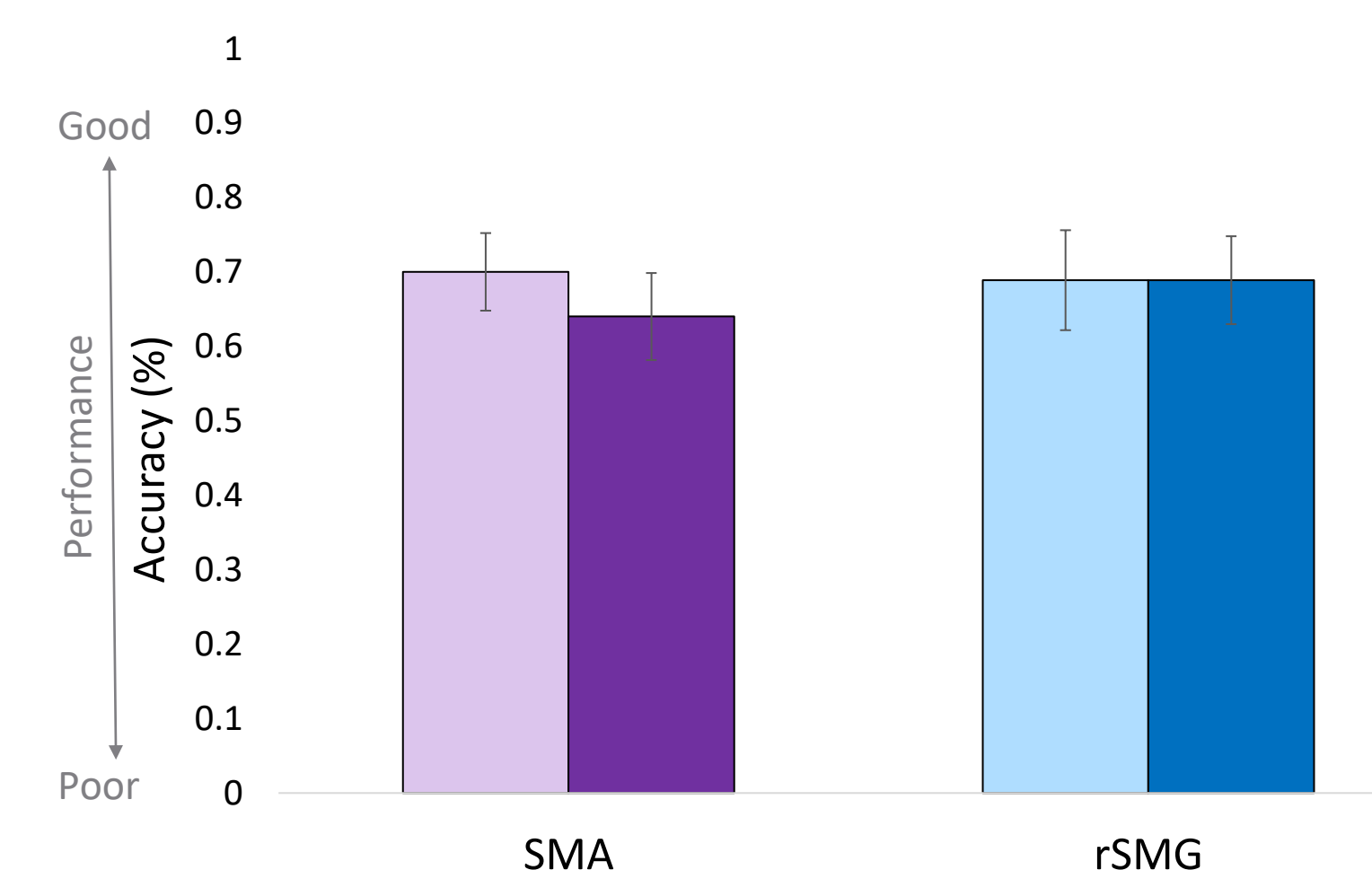


Rhythm Reproduction



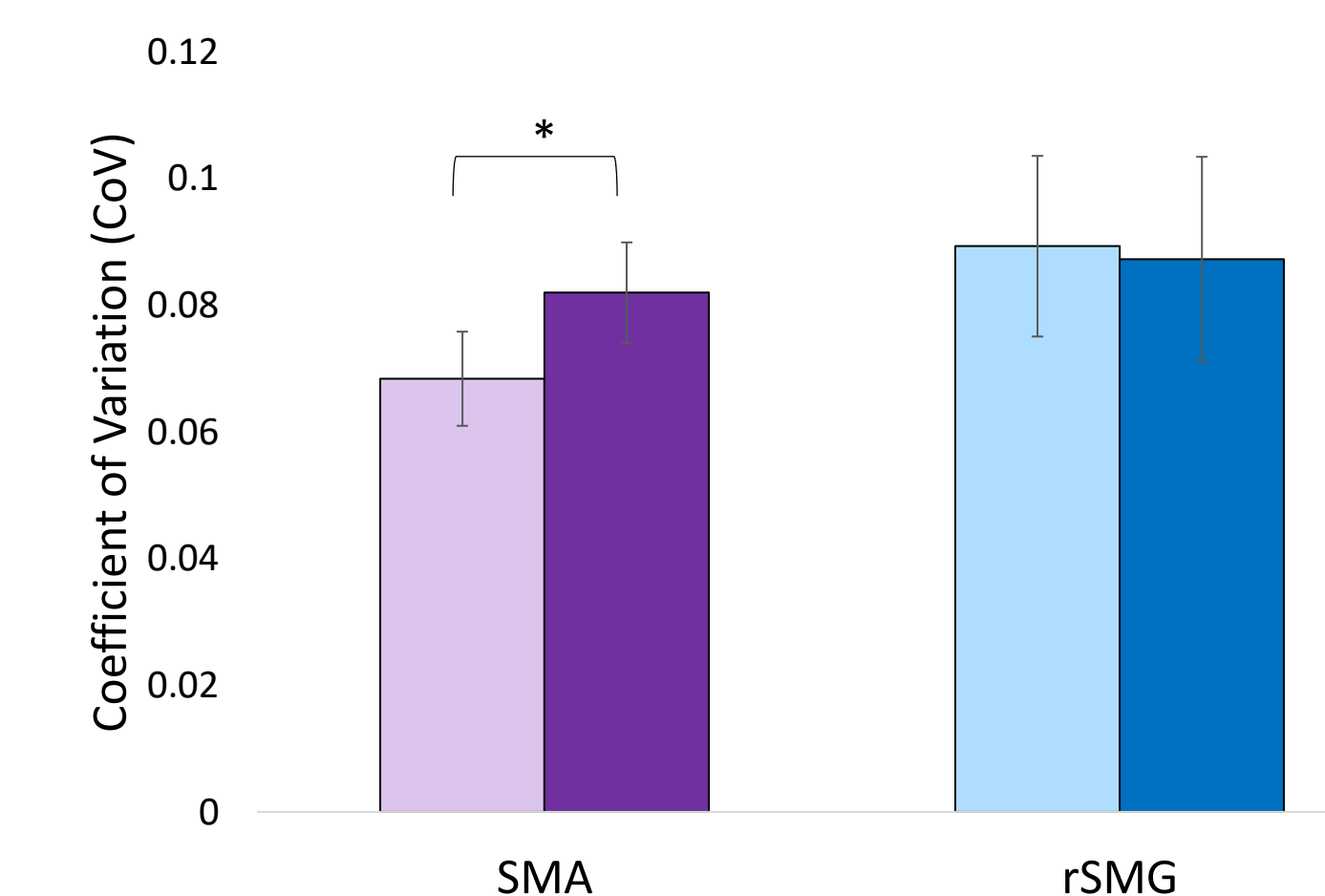
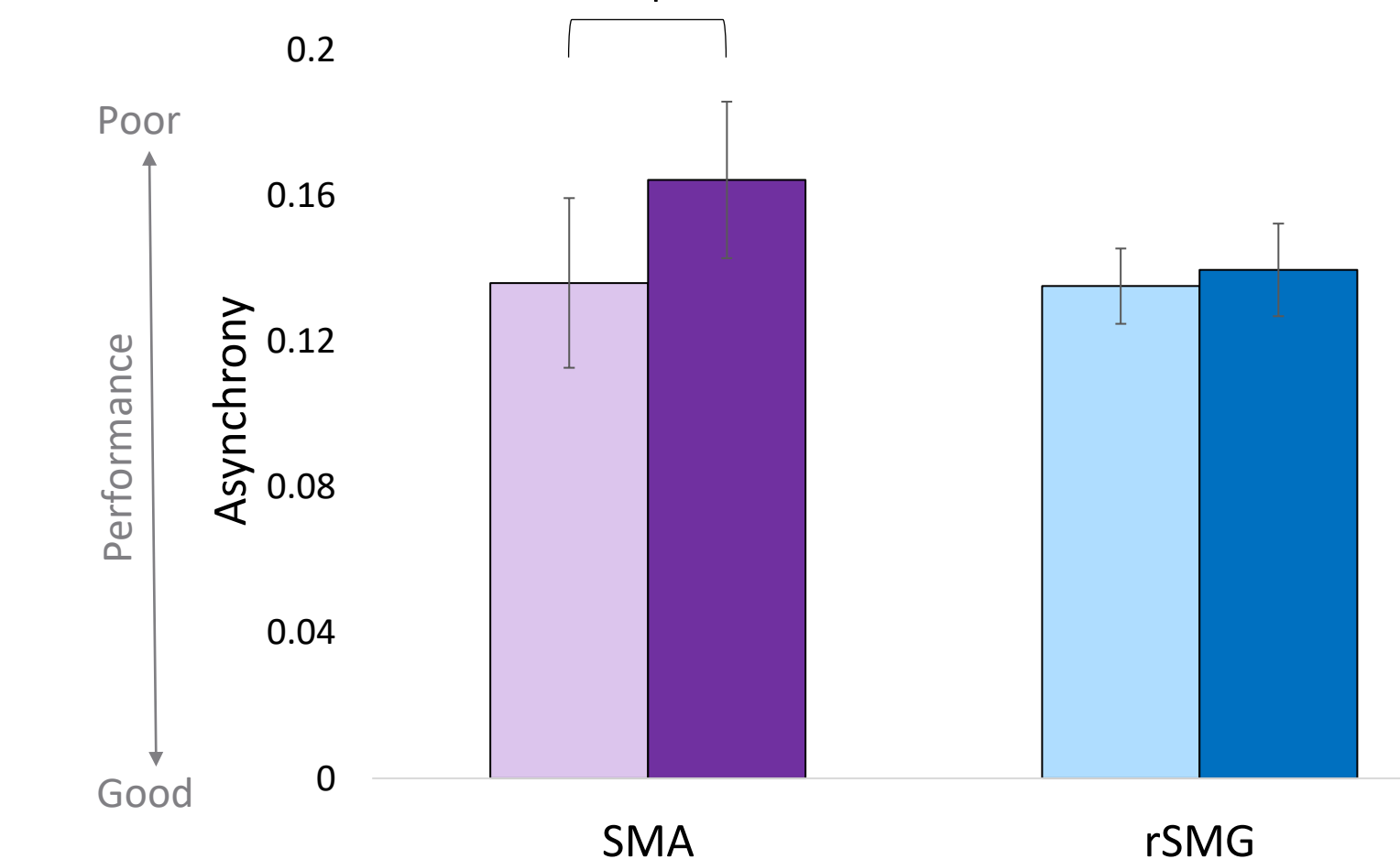
No effect of brain region, significant stim type x rhythm type interaction

BAT - Perception



No effect of brain region, main effect of trial type

BAT - Production



No effect of brain region, main effect of stim type, marginally sig stim x area interaction ($p = .082, .065$)

Discussion

Findings:

- No differences were observed on the basis of brain region stimulated.
- In a **beat-based** production task, listeners performed better during sham than anodal stimulation - opposite of our hypothesis.
- In the **sequence-memory** task (rhythm reproduction), anodal stimulation improved performance, but only for metric complex

Together, the current results cannot provide causal evidence for a clear distinction between beat-based and sequence-memory based rhythmic competencies.

Limitations & Future Directions:

- This pilot study was limited to one session, with a limited number of tasks and limited number of trials per task.
- We aim to re-design the study as a multi-session study where session order is counterbalanced, and include both anodal and cathodal stimulation.

References

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