Introduction

Through ritualized behavior, among others, close ties are formed between participating members. This is demonstrated by studies in which collective rituals are shown to enhance cooperative behavior (e.g. Ruffle & Sosis, 2007; Xygalatas et al., 2011). This experiment is aimed to identify one of the possible aspects of ritualized behavior which have these effects, i.e. a rhythmic beat.

Brain

Interestingly, the human Mirror Neuron System (MNS) has been implicated in listening to music (Molnar-Szakacz & Overy, 2006). A similar network is active during passive listening to drumming and in actual performance (Molnar-Szakacz & Overy, 2006). Moreover, Chen et al. (2009) identified specific brain parts (PMC, SMA and cerebellum) employed by passive listening to rhythmic music. Given the fact that these neural systems are necessary for timing of movements and coordinated action, it's reasonable to assume an effect of rhythm on a subsequent joint task.

Dependent variables

<u>Inter-subjective motor coordination:</u>
Time needed for participants to navigate a steel ball through a wooden labyrinth (performed in dyads, three trials). This method is inspired by Valdesolo, Ouyang & DeSteno (2010).

<u>Arousal:</u>
Heart rate monitors – non-invasive plastic strip fastened to participants' chest.

<u>Motor synchrony:</u>
Actigraph activity monitors fastened to participants' wrists.

<u>Prosociality</u>:
Questionnaire focused on self-reported feelings about connectedness to the other participant, cooperation etc.

Aims of the Study

- Elucidate a possible explanation for using rhythmic drumming during rituals
- Look for aftereffects of exposure to rhythmic beats on human motor coordination, synchrony and prosociality
- Explore a role of arousal on motor coordination and prosociality

Rhythm

Rhythmic beat is known to promote synchronous and coordinated behavior (dancing, rowing etc.), and is a widespread feature of many rituals (Fitch, 2006; Kirschner & Tomasello, 2012). However, very little is yet known about after effects of rhythm exposure, especially on human cooperation. Through investigations into the role of music in rituals, this study hopes to identify how rhythm facilitates these overlapping self-other representations.

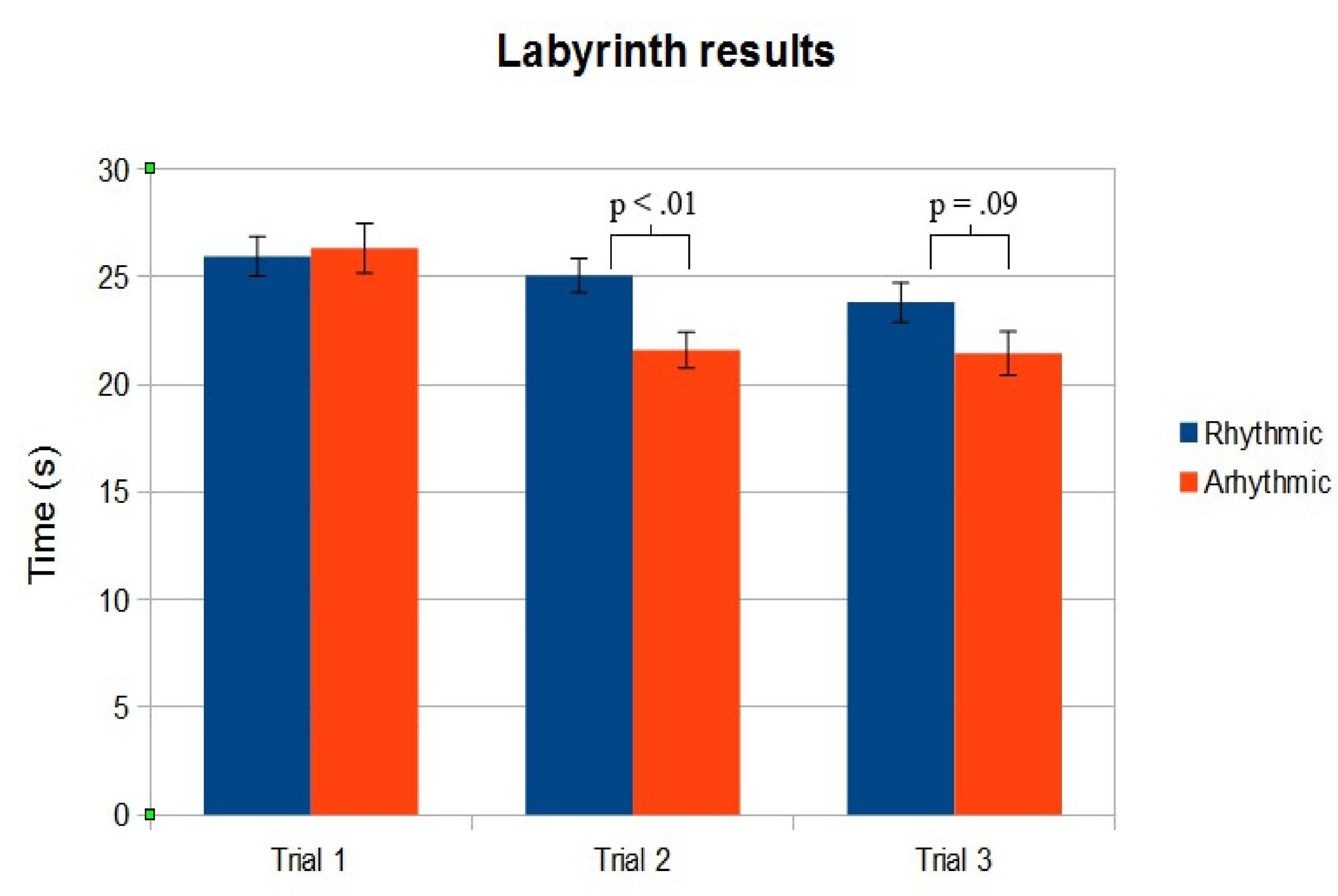
Design

The experiment is a between-subject (dyads) design – two participants are seated next to each other, they listen to rhythmic or arhythmic beats and are forbidden to move or talk. After the music stimuli, the two participants play together a wooden labyrinth game for 3 times and finally fill out a questionnaire.

<u>Rhythmic condition:</u>
4-minute listening to 4/4 drum pattern at 120 BPM played from a computer;no movement;

<u>Arhythmic condtion:</u>
4-minute listening to chaotic drumming at 120 BPM with a random distance between beats (no pattern) played from a computer; no movement; a number of beats is the same for both stimuli;

Preliminary results



A 3x2 mixed method ANOVA was performed (Within subject IV: trial; between subject IV: condition; DV: time on labyrinth task). There was a significant interaction between trial and condition, $F(2, 48) = 3.25$, $p = .048$. There was also a significant main effect of trial, $F(2, 48) = 11.54$, $p < .001$. Follow up t-tests found a significantly faster mean time for the arrhythmic condition ($M = 21.61$, $SD = 2.87$) than the rhythmic condition ($M = 25.07$, $SD = 2.95$), $t(24) = 3.02$, $p = .006$, $d = 1.24$.

Discussion

Preliminary results (so far N = 52) suggest a significant trend for participants in the arhythmic condition to be faster in the labyrinth task. Although there is virtually no difference between condtions in the first trial, the second trial highly favors participants from the arhythmic condtion (mean difference 3,46 s). This trend is visible also in the third trial, it doesn't reach the level of significance, though.

This data suggest, that participants were getting to know the task and each other in the first trial, therefore they've reached similar times. In the second trial, however, there is significant influence of treatment on motor coordination abilities. Participants from arhythmic condition reached the ceiling effect of their time possibilities already in the second trial, meanwhile the rhythmic condition participants were getting better gradually.

These results go in a different direction than the original hypothesis. This might be due to several reasons, but the most probable explanation is the excitation transfer of arousal. Assuming that the arhythmic beat is more arousing than than the rhythmic one, the more aroused participants perform better in a simple motor coordination task. Before jumping to this conclusion, however, a careful analysis of heart rate monitor data should support this explanatory suggestion.

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