

# Musicality in Childhood: Assessing Musical Communication Skills in 3- to 6-year-olds

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## Introduction | Background

- Musical communication is a key component of children's musicality [1], but practical tools for its assessment in childhood are lacking.
- Musical communication includes the ability to perceive emotions in music, express oneself through sound and respond to it, and be creative.
- Aim of the current study:** develop/adapt and pilot tasks to assess musical communication in 3- to 6-year-olds

## Methods | Materials

**Sample:**  $N = 72$  children (48% male) aged  $M = 59$  mo. ( $SD = 14$  mo.)

**Procedure:** 2 x 20 min. individual testing at daycare center. Tasks were embedded in a child-friendly cover story featuring the virtual robot "MuTeC".

**Materials:** Mini-Keyboard, Djembe, 6 x colored pictures, Timer, Laptop, Mirror-Impro Software [4]

### 1) Musical Idea Fluency

- Task:** Find as many different drum sounds as possible (1 min)
- Analysis:** Count of solutions [3]

### 2) Musical Improvisation

- Warm-up:** explore musical parameters by musically imitating different animal images
- Task:** Invent a "frog/elephant/mouse song"



- Analysis:** Flexibility -> number and quality of musical variations [2]

### 3) Visual-Sound-Coupling (film)

- Task:** Play sounds that match the film



- Analysis:** max. 3 point per scene for musical change (tempo, pitch, volume)

### 4) Reflexive Interaction

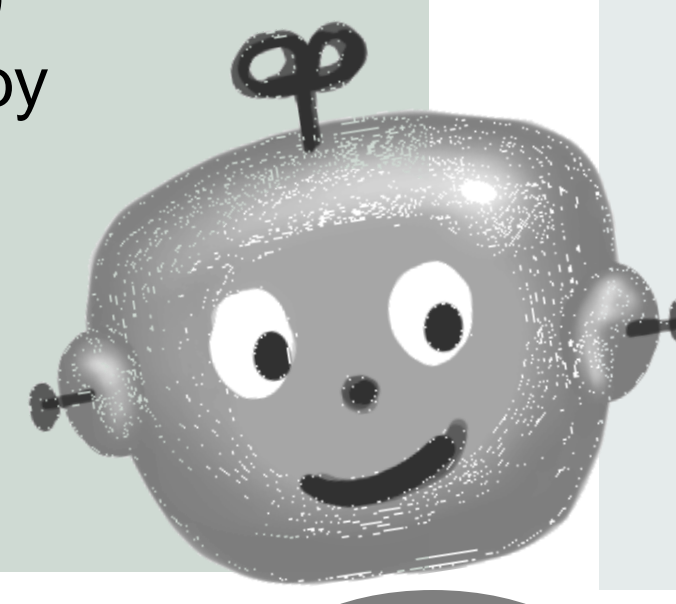
- Task:** Engage in musical communication with MuTeC (mirror impro software, which provides matching but varied response)
- Analysis:** Similarity between the child's response and the previous system melody [4]

### 5) Emotion Discrimination [5]

- Task:** Decide whether the second melody is happier or sadder
- Analysis:** Sumscore

### 6) Emotion Production

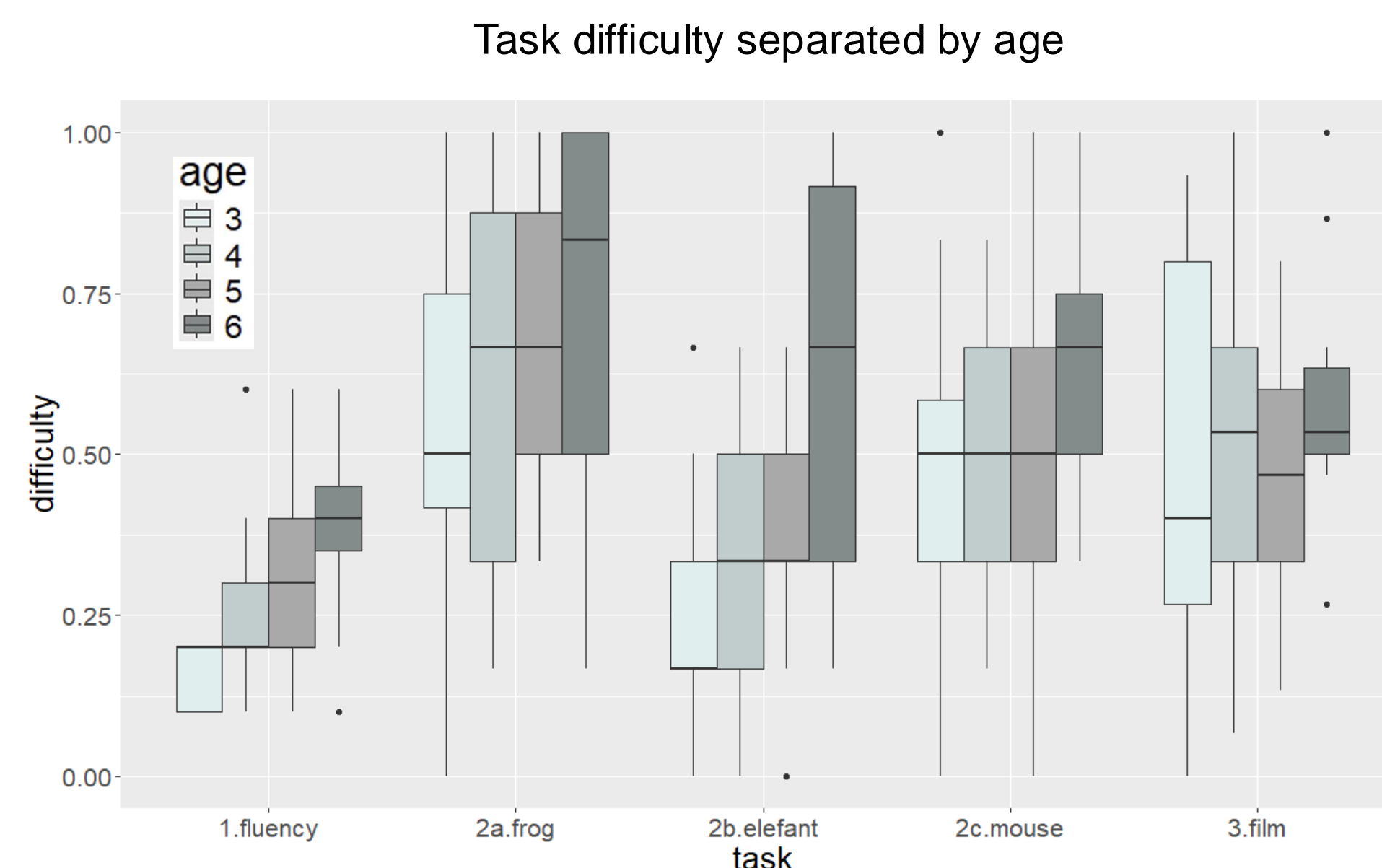
- Task:** Try to play the displayed emotion on the drum (card drawn out of four emotions)
- Analysis:** Sumscore of right guesses by investigator



Hi, it's MuTeC.  
Do you want to  
play a music  
game?

## Results

### Fluency, Improvisation & Film



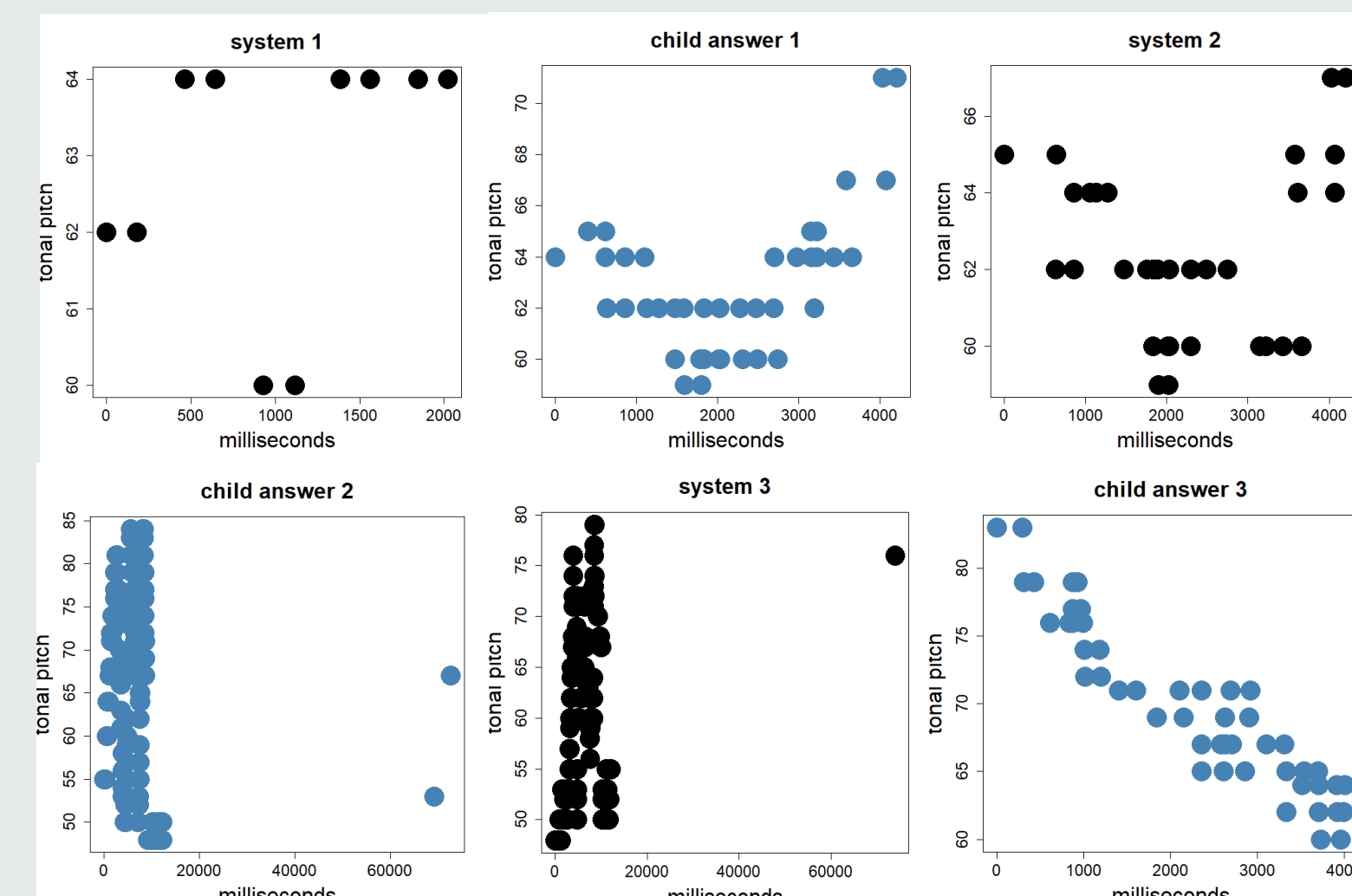
- Improvisation and film are feasible for the entire age range and show appropriate variance
- Musical fluency shows a floor effect for children under 4 years of age

### Reflexive Interaction

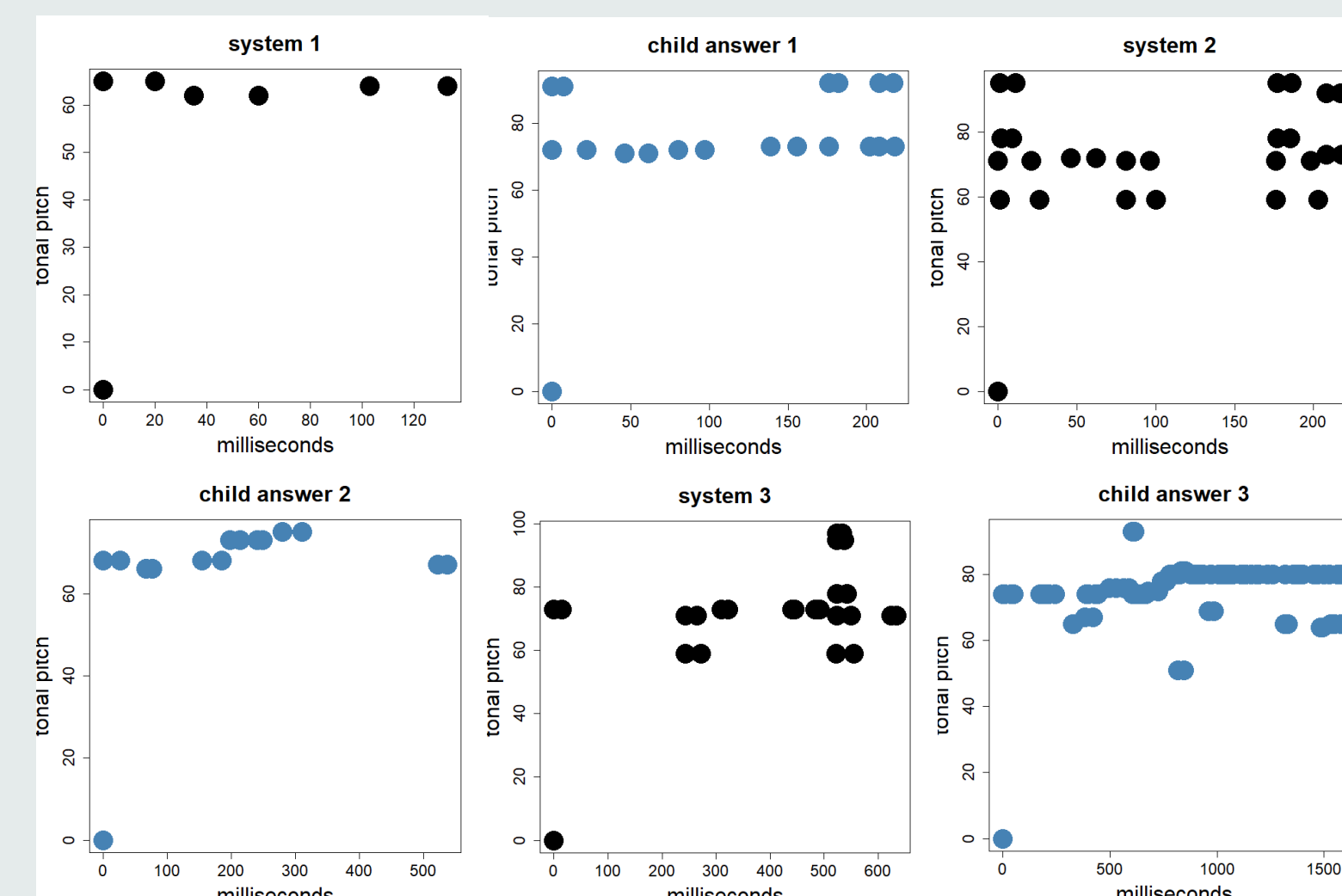
The task is still being analyzed, with various response modes being suspected. The children's verbal reactions indicate that they consciously interact with the system.

- "Oh, a staircase... I'll play a lot of stairs now"
- "Hey, he's copying me!"
- "I'll try something else and see if he can do it, too"
- "Let's see what he says when I do this..."

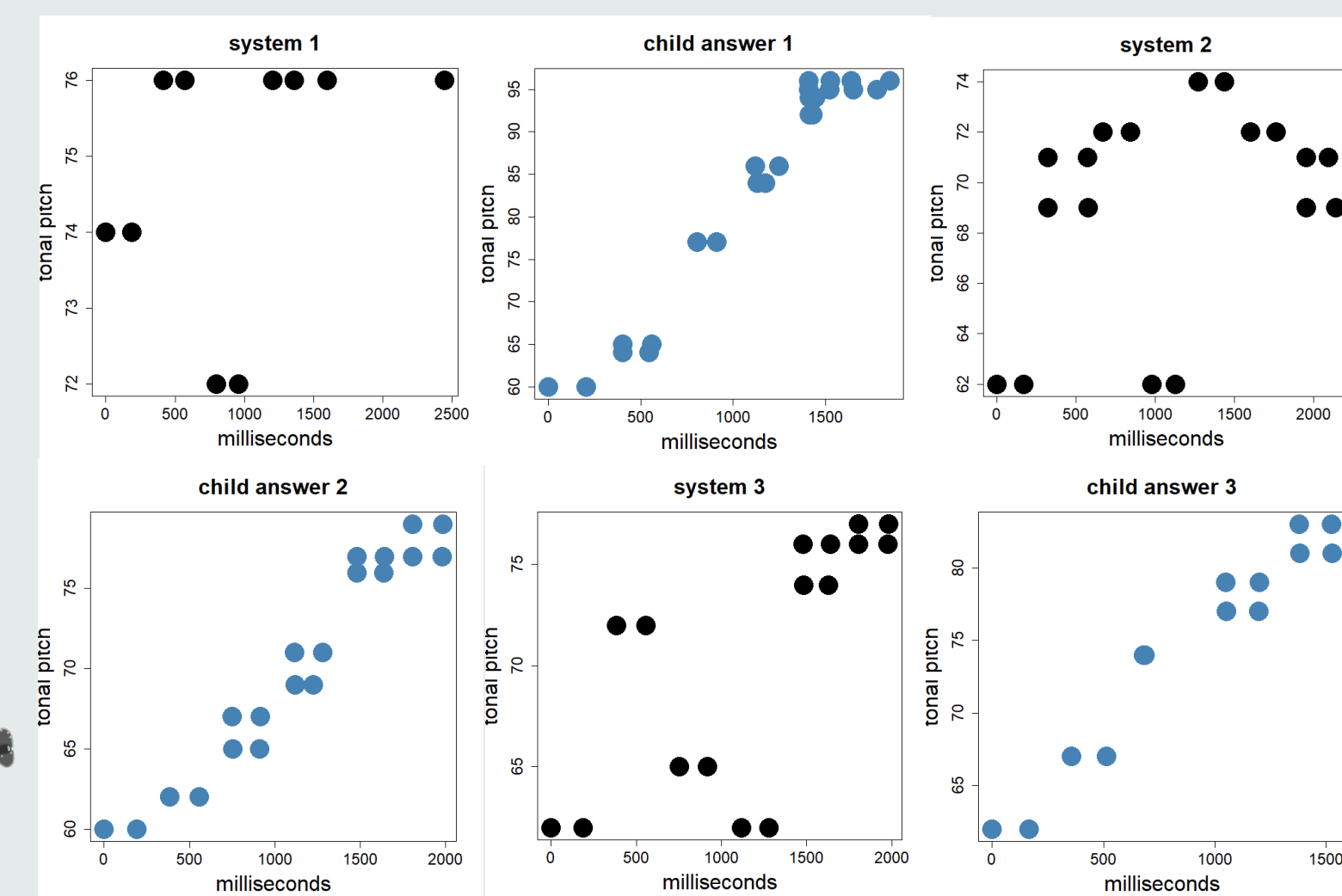
#### 1) Constantly different answers (exploring)



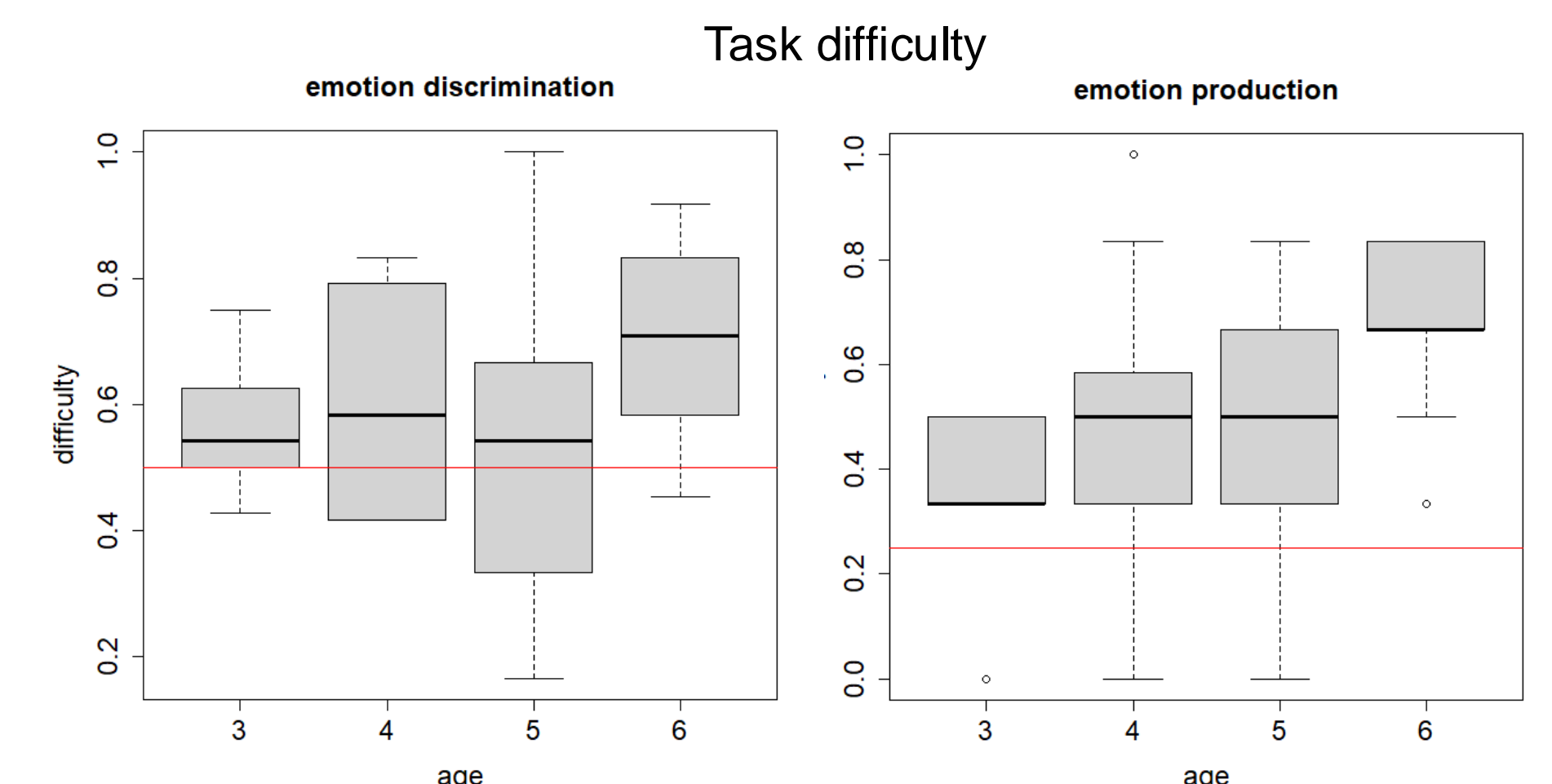
#### 2) Similarity to previous melody (adapting)



#### 3) Constantly same answers (system ignorance)



### Emotion Discrimination and Production



- Emotion discrimination proved difficult for children under 6 years of age
- Signs of misunderstanding the instruction:
  - "I think that sounds good"
  - "they are both nice"
- Emotion production proved too difficult for 3-year-olds, yet easier than discrimination

### Difficulty & Interrater Reliability

Task	Difficulty	Standard deviation	I. reliability (kendall's tau <sup>*</sup> )
1) Musical idea fluency	.31	.17	-
2a) Frog song (keyboard)	.63	.30	.77
2b) Elephant song (drum)	.40	.24	.75
2c) Mouse song (keyboard)	.52	.24	.76
3) Film	.47	.23	.65 - .75
4) Emotion discrimination	.59	.18	-
5) Emotion production	.55	.24	.41

Note: Results for whole age group. \*Cohens Kappa for emotion production.

- Broad range of difficulty covered (0.31 – 0.63)
- Flexibility in elephant improvisation (drum) appeared more difficult, than keyboard improvisations (e.g frog)
- Moderate to good interrater agreement

### Discriminant Validity

Task	Intelligence [6]	Non-musical fluency [3]	Inhibition [7]
1) Musical idea fluency	.37*	.50**	.20
2) Improvisation	.20	.40**	.03
3) Film	.21	.09	-.06
4) Emotion discrimination	.17	.32*	-.16
5) Emotion production	.33	.50**	.27

Note: Spearman correlation for tasks and intelligence (pitva [6]), general fluency (movement types [3]), inhibition (freeze task [7]). \* $p < .05$ , \*\* $p < .01$

- Musical fluency but no other task is significantly associated with intelligence
- Non-musical fluency shows moderate to strong positive correlations with all tasks except film
- Inhibition shows no significant correlation with tasks

## Discussion | Conclusion

- Tasks were well accepted and enjoyable
- Planned adjustments:
  - Improvement of coding manual to increase interrater agreement
  - Simplification of tasks for younger children
  - Improved analysis for reflexive interaction task
  - Selection of most promising tasks
- Our findings provide valuable initial insights into assessing musical communication in early childhood and offer a foundation for further research.