

## Evaluating children's perceptions of melodic violations of expectation through an emoji scale

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### Introduction

- Adults have expectations for note and chord sequences that reflect the structure of the music they grew up with (e.g., Kragness & Trainor, 2016; Halpern et al., 2017)
  - Typical adults can identify a “wrong note”, even in the absence of musical training
- Children’s ability to detect musical violations begins around 4 to 5 years old (e.g., Trainor & Trehub, 1994)
- Previous studies with children asked them to identify whether melodic violations are “bad” compared to non-violations (e.g., Corrigan & Trainor, 2009, 2010) as proxies
  - However, violations of expectations can be either pleasant or unpleasant (Cheung et al., 2019)
  - Can we investigate children's expectations with a more direct scale of surprise?

**We predict that children will rate phrase-final notes that violate Western musical structure as more surprising than those that do not**

### Methods

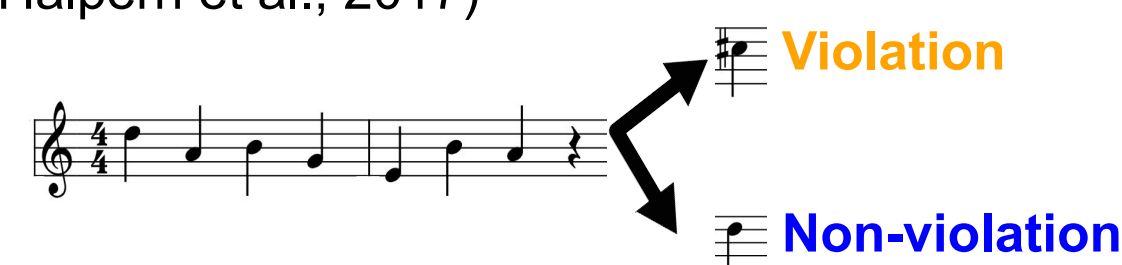
#### Participants

- 6- to 7- year old children ( $N = 71$ )
- Recruited through Children Helping Science (childrenhelpingscience.com)

#### Materials

##### Stimuli

- Monophonic piano melodies
- Composed with a phrase-final note that is a violation or non-violation of Western musical structure
- Previously used to evaluate melodic expectations in older adults (Halpern et al., 2017)



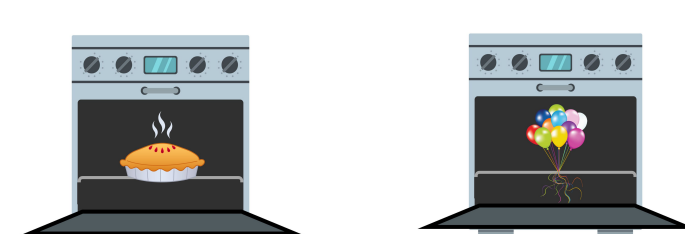
##### Surprise Rating Scale



#### Procedure

- Children are tested over Zoom in the comfort of their home
- Stimuli are presented by an experimenter using PsychoPy (Peirce et al., 2019)

##### Training (with corrective feedback)



Children are presented with and asked to rate unsurprising images (a pie in an oven) and relatively surprising images (balloons in the oven). Corrective feedback is given.

##### Experimental Trials: Melodic Violations and Non-Violations



Children are asked to rate how surprising the last note of a melody is. Across two blocks, they are tested on both the Violation and Non-Violation version of a melody.

##### Control Trials: Timbral Violations and Non-Violations



Children are asked to rate how surprising the last note of a melody is. Children are tested on Non-Violation melodies (not heard in the experimental trials) that have a timbre change on the last note to make sure that they are sensitive to acoustic changes.

### Results

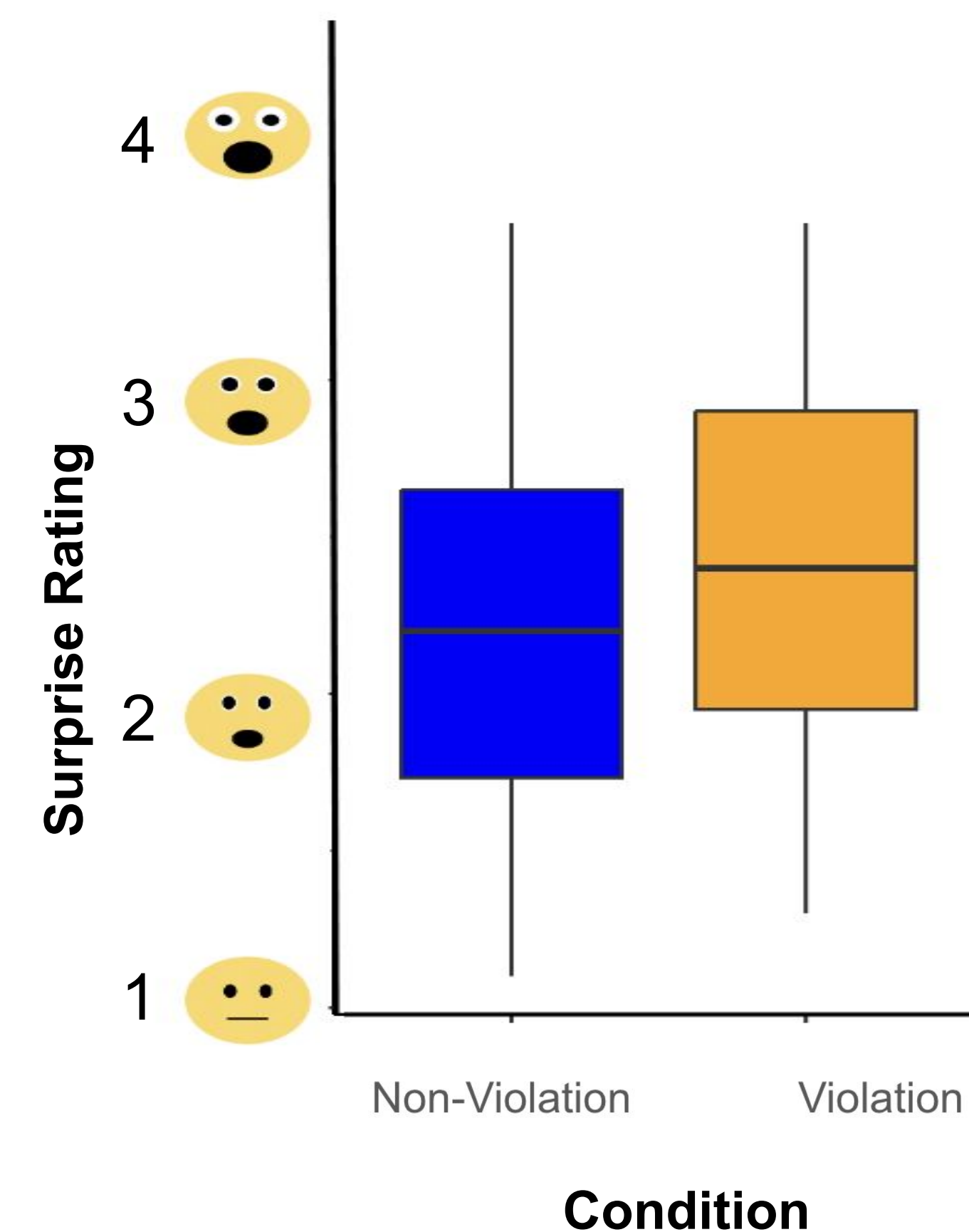


Fig 1. Distribution of participants' Surprise Ratings on the Experimental Trials (melodic violations).

#### Control Trials (Timbre Violations)

- 55% (39/71) of the participants rated the timbre violations as more surprising than non-violations
- Only participants who rated timbre violations as more surprising were included in the main analysis of melodic violations
  - This was done to account for task comprehensibility

#### Experimental Trials (Melodic Violations)

- Participants rated melodic Non-Violations as less surprising ( $M = 2.27$ ,  $SD = .68$ ) than melodic Violations ( $M = 2.48$ ,  $SD = .61$ ),  $t(38) = 2.41$ ,  $p = .021$

### Discussion

- Results support the hypothesis
  - 6- and 7-year old children rated melodic non-violations as less surprising than violations, consistent with adults
  - Children’s melodic expectations can be probed directly using a surprise scale (*not surprising* → *super surprising*), in addition to indirectly with a pleasantness scale (*good* → *bad*)

#### Future Directions

- At what age are children able to detect melodic violations?
- Are there differences between the included and excluded participants?
  - The groups did not differ on any of the variables measured here
- Potential influences of
  - Passive home musical environment
  - Active musical engagement