

Variations on a theme:

How much is too much?

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Introduction

Motivations and a brief overview of theme and variation form.

1

Experiment

Method and results.

2

Computational Results

How do humans and computers compare?

3

Conclusions

Summary and future directions.

4

Motivation

Main research questions

- ▶ **Music similarity can be influenced by a variety of musical features (harmony, melody, texture)**
 - What is the impact on melodic and textural variation on similarity judgements?
- ▶ **Classical-era sectional theme and variations sets offer the opportunity to explore this in an ecologically valid context**
 - Is there a notable difference in performance on score-versus audio-based matching tasks?
 - Is there a notable difference in performance between human participants and by a computer algorithm?

Theme and Variations

TAVERN (Theme and Variation Encodings with Roman Numerals)

► In sectional theme and variations

- harmonic progressions remain (essentially) stable
- melodic characteristics and textures are varied

► TAVERN (getTAVERN.org)

- 27 complete sets of section theme and variations for piano by Mozart and Beethoven composed 1765–810
- harmonically analyzed in duplicate by music theory PhD students
- thanks to my RAs (Clair Arthur, Nathaniel Condit-Schultz, Kirsten Nisula, and Derek Richardson) and a Google Faculty Research Award for funding

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Beethoven Themes

Op 34



wo064



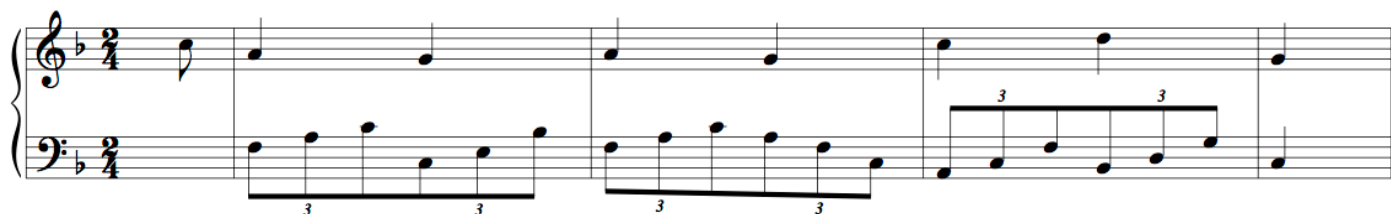
wo066



wo068



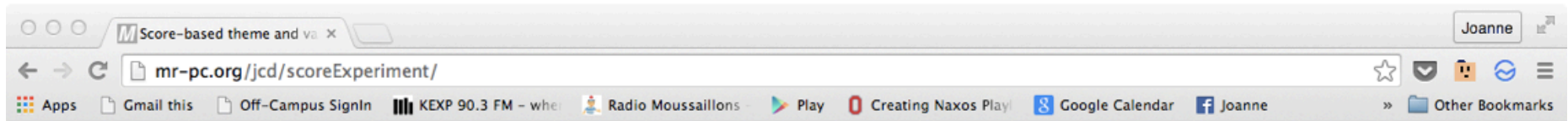
wo070



wo077



Score-based Experiment

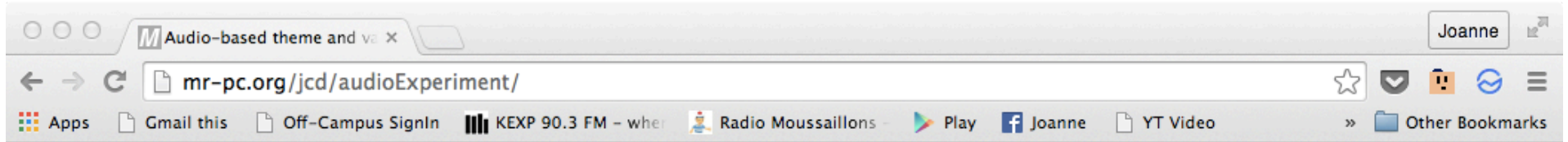


Press the appropriate number (1-6) to indicate which theme you think goes with this variation.

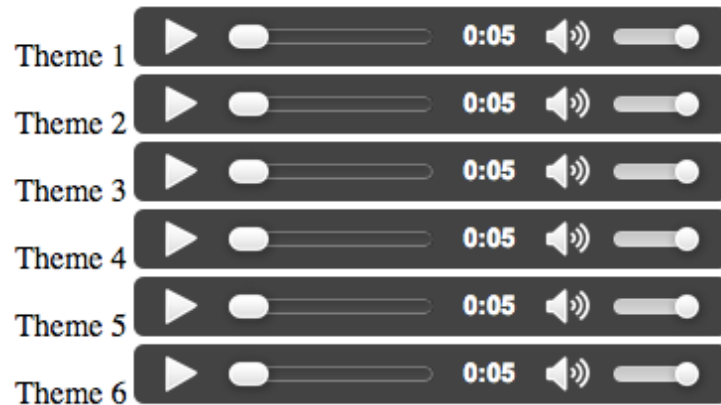
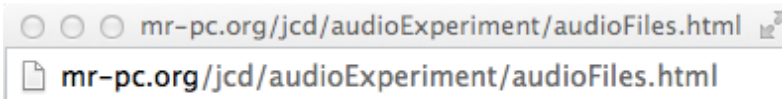
Themes



Audio-based Experiment

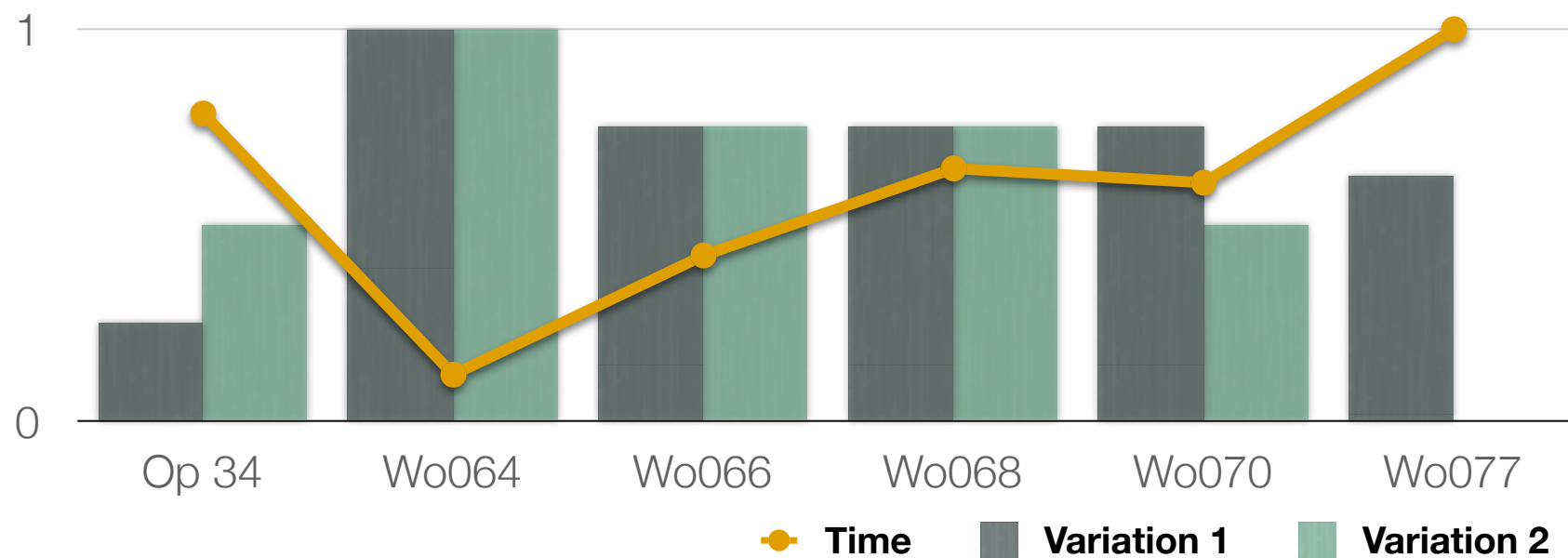


Press the appropriate number (1-6) to indicated which theme you think this variation belongs to. If you wish, you can re-listen to the themes in the pop-up. If you have closed the pop-up window, you can reopen it by clicking [here](#).

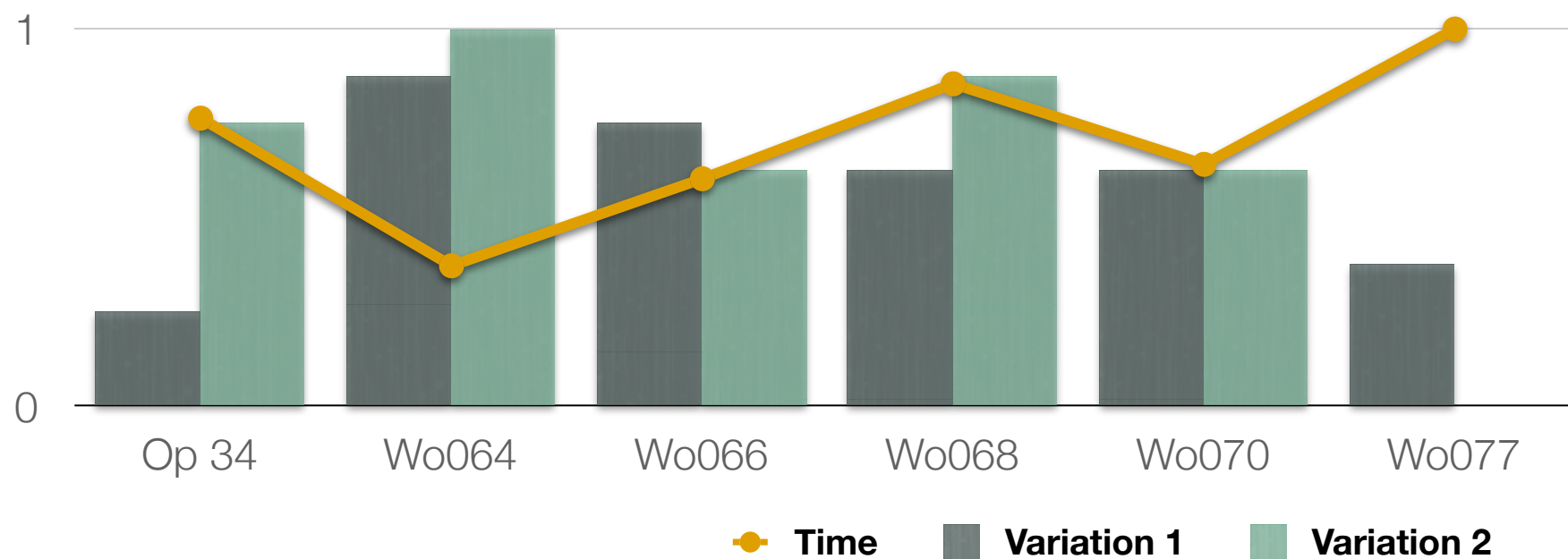


Experiments designed using *jspsych*, a JavaScript library for online experiments (<http://www.jspsych.org>)

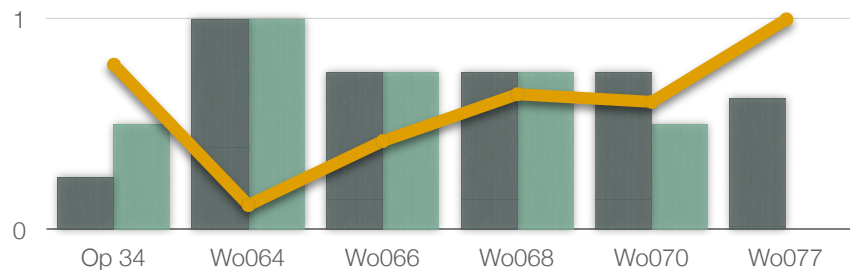
Symbolic



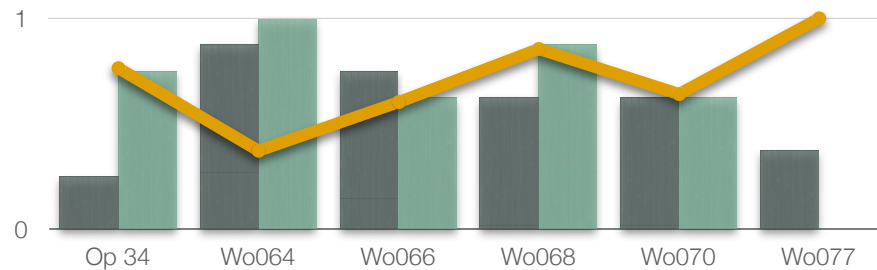
Audio



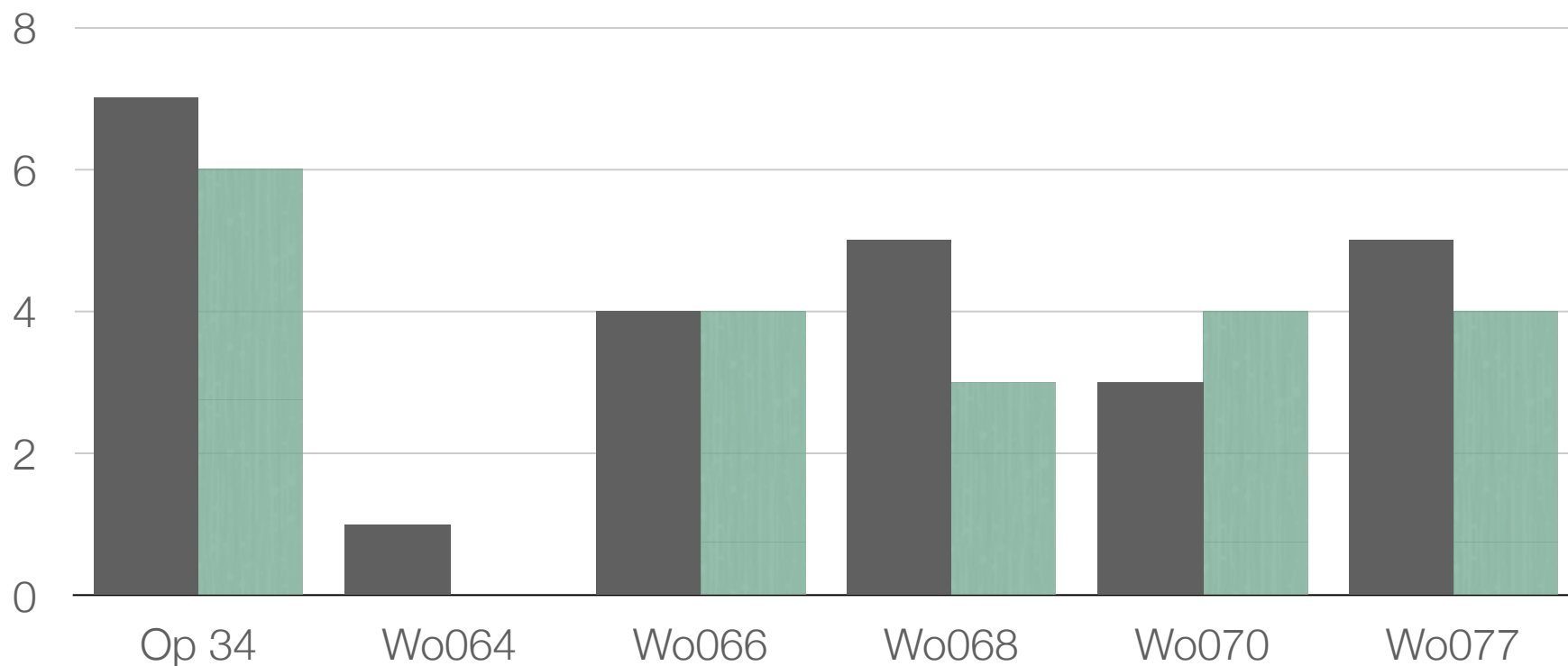
Symbolic



Audio

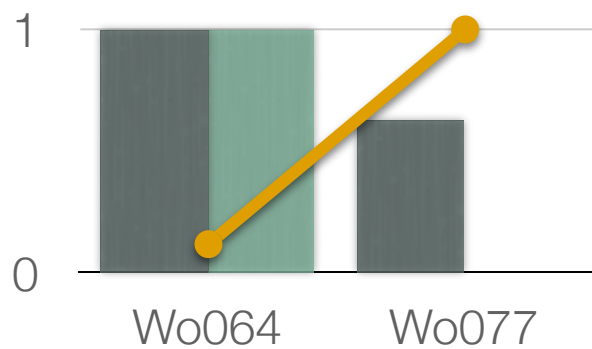


Disagreement between score and audio trials

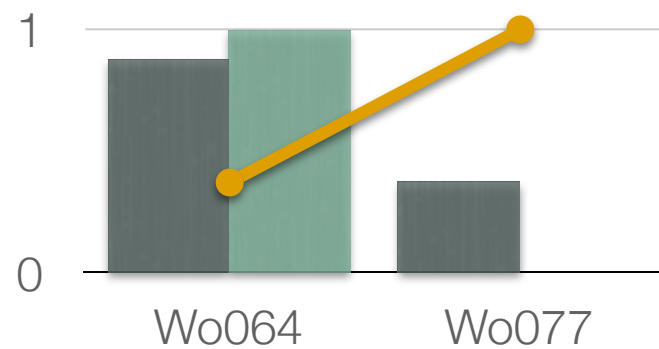


Time Variation 1 Variation 2

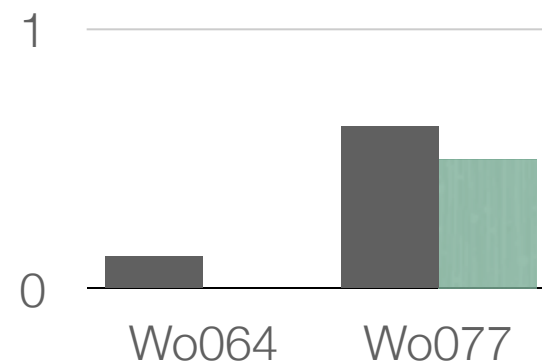
Symbolic



Audio



Disagreement



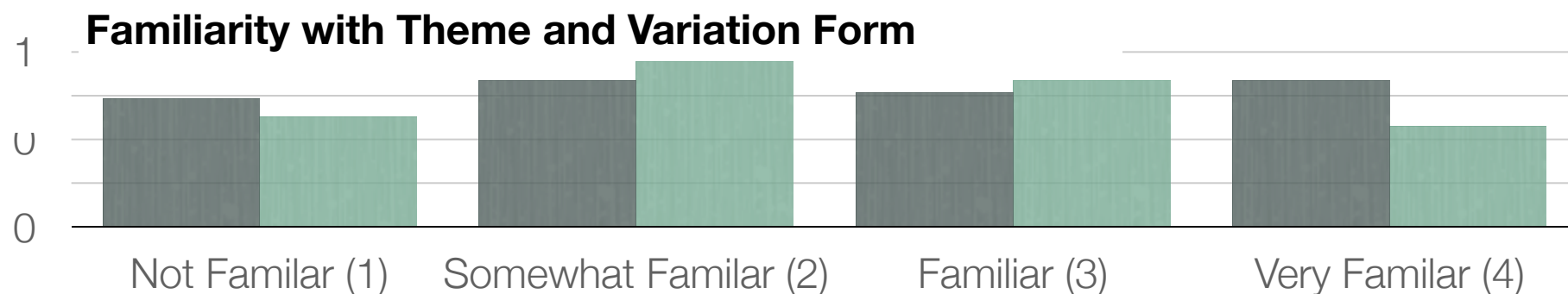
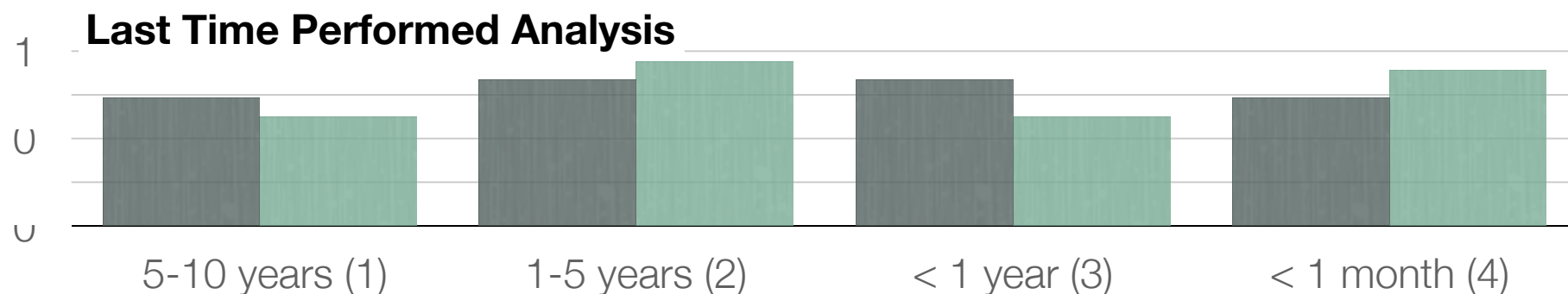
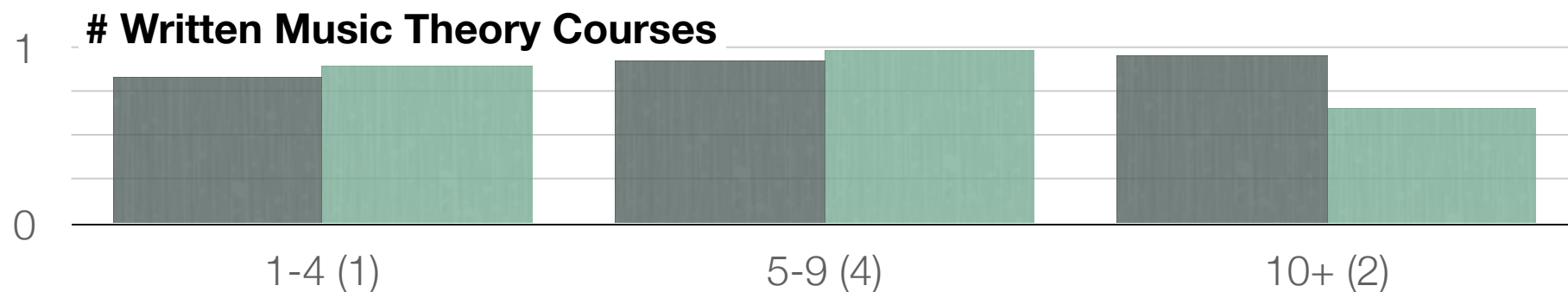
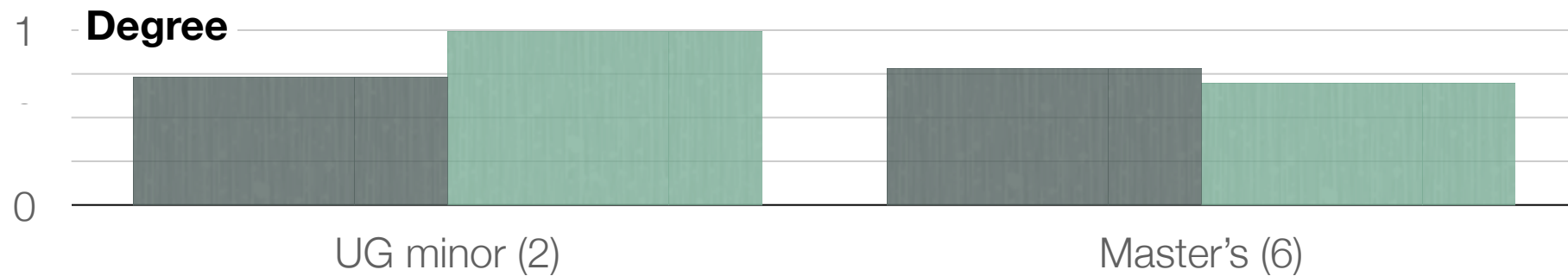
● Time
 Variation 1
 Variation 2

Wo066



Wo077





■ Score ■ Audio

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Computational Method

Symbolic- and audio-based experiments

▶ **Symbolic**

- notes versus chord tones

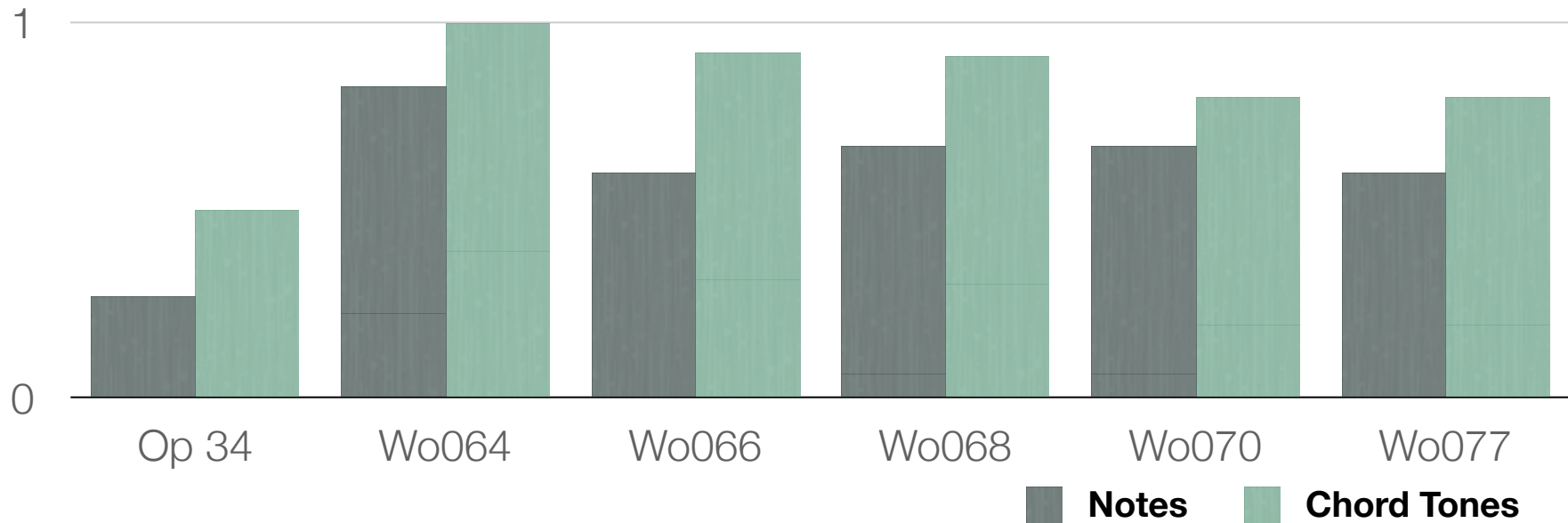
▶ **Audio (using same Finale-generated audio as for the human experiment)**

- chroma versus chord-tone chroma

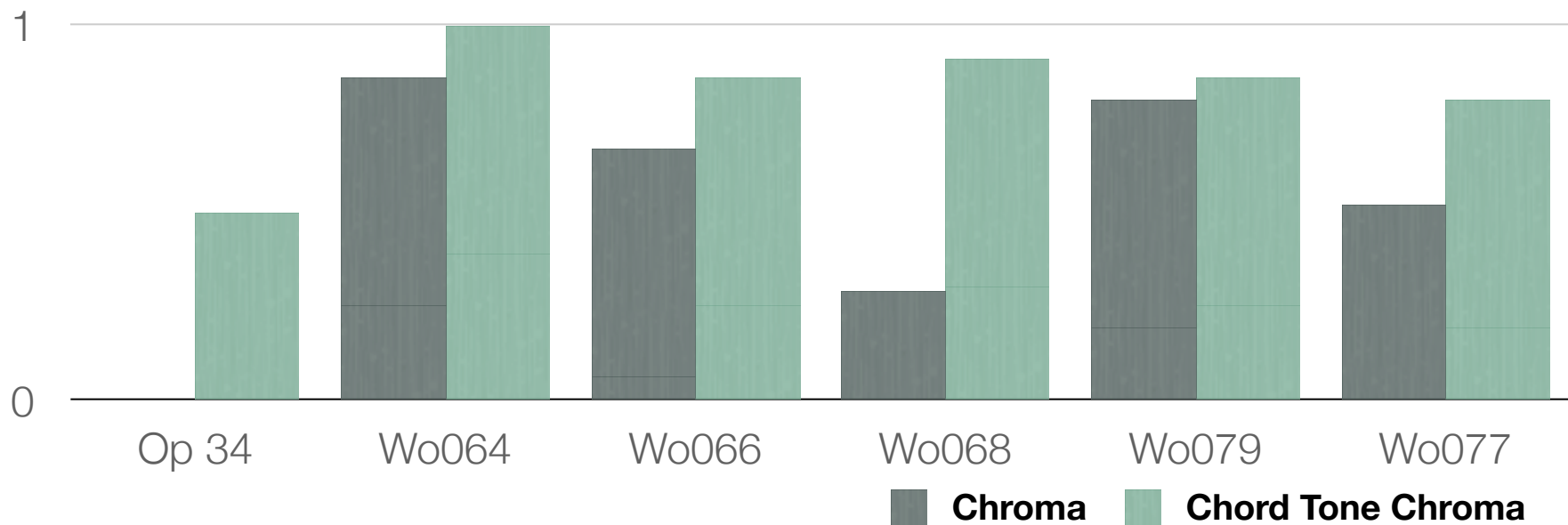
▶ **Chord tones used as a proxy for harmonic analysis training**

- if one agrees that the goal of harmonic analysis is to ascertain which notes are structurally “significant”

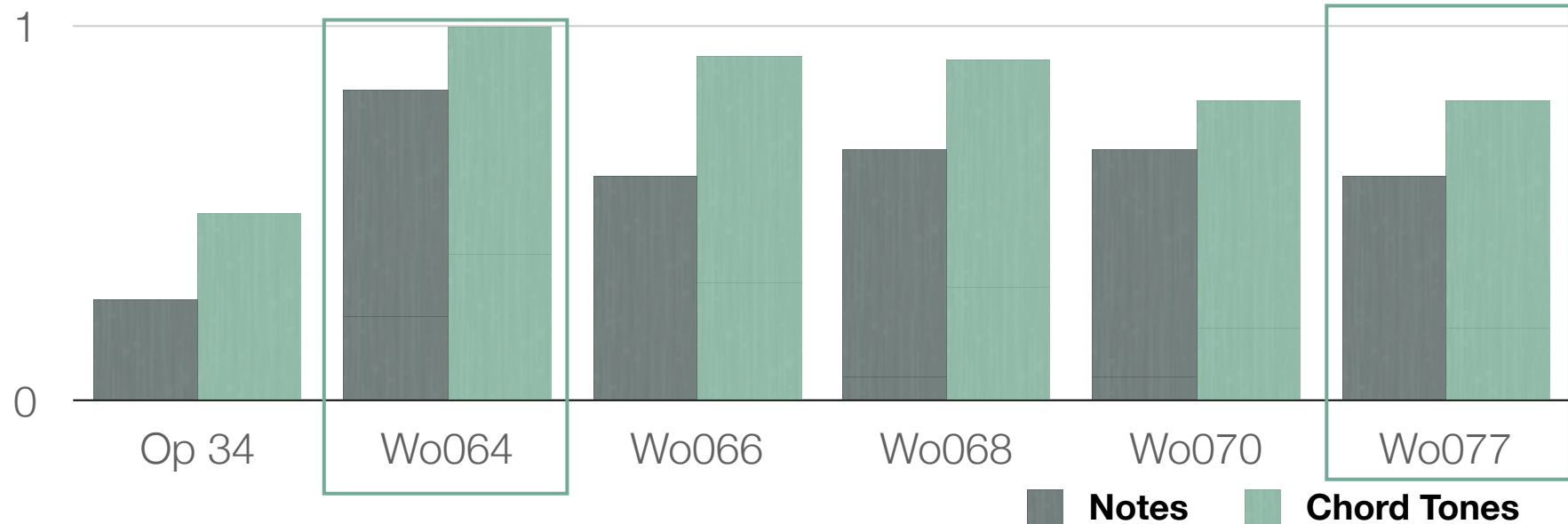
Symbolic



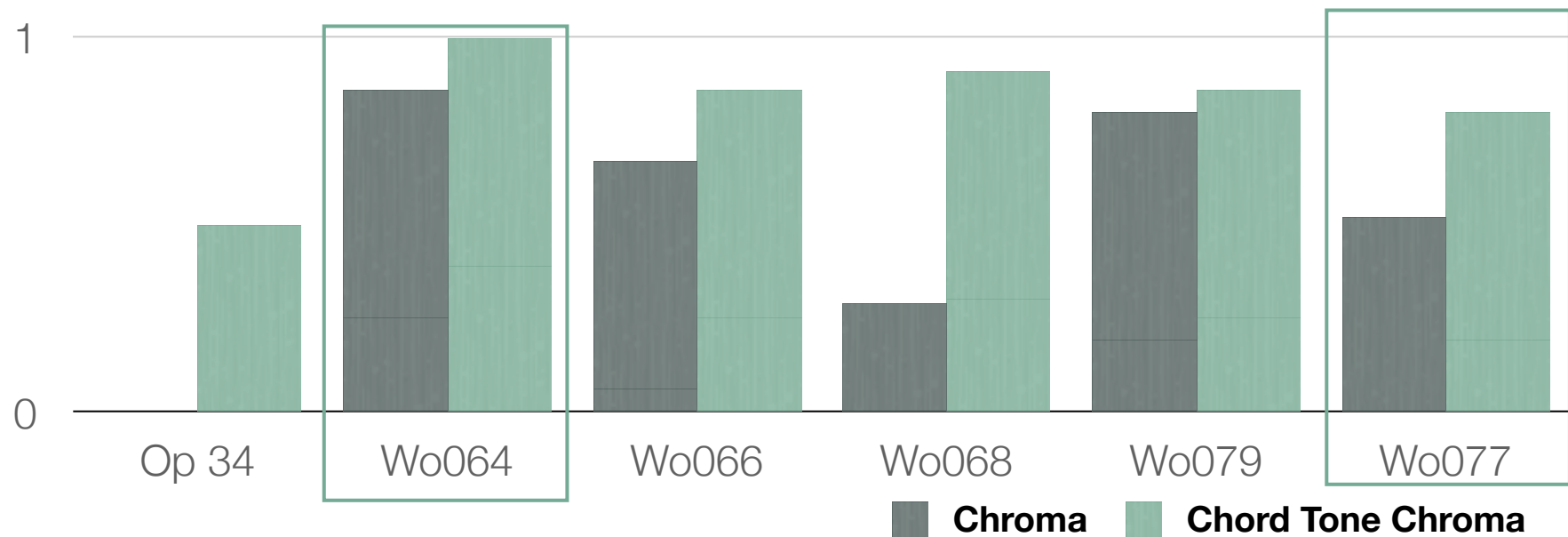
Audio



Symbolic



Audio



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Summary

Where we have been

- ▶ **This talk has presented some results from a 6-AFC experiment on theme and variations in order to address**
 - *What is the impact on melodic and textural variation on similarity judgements?* The human results are (so far) lower when a theme's melody and texture is more complex
 - *Is there a notable difference when performing score- or audio-based matching task?* Only for those with the lowest results
 - *Is there a notable difference between human participants and by a computer algorithm?* Computer had higher performance overall but showed more variability both between the score and audio tasks as well as in overall performance across themes

Future Work

Where I am going

- ▶ **Run more subjects with a wider range of musical training**
 - current subject pool is dominated with people with advanced degrees in music
- ▶ **Run the experiment with Mozart variations and a combination of Mozart and Beethoven variations**

Future Work

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- ▶ **Run the experiment with Mozart variations and a combination of Mozart and Beethoven variations**

Thank you!