

The role of attention in the perception of music structure

Jordan B. L. Smith,
Marcus T. Pearce,
and Elaine Chew

Queen Mary
University of London

Background

Listeners perceive structure in music. There are two important processes:

- Segmentation (perception of boundaries between sections)
- Grouping (categorization of sections)

Models of grouping structure mostly base predictions on musical content, but how then to explain listener disagreements?

Human factors affect perception: musical knowledge, familiarity with the piece, attention, listening goals, etc.

Attention largely unstudied, and causal relationship unclear: does attention direct the perception of structure, or do salient patterns direct attention?

Questions

- How skilled are listeners at attending to different features within a piece of music?
- Does the salience of a change in music increase when one is focusing on the feature that changes?
- Does focusing on a feature make a listener more likely to group sections in accordance with how that feature changes?

Stimuli

Our need: music with controlled changes and specific pattern combinations.

We composed three environments varying four features: harmony, melody, rhythm and timbre.

In each environment, some features are “convolved” since they are varied within the same voice.

Each environment has two patterns for each feature, and any combination is possible: e.g., excerpt in Experiment 3 has harmonic structure AAB and melodic structure ABB, with rhythm and timbre constant.

Part 4: Musical training

Level of music theory and instrument training was assessed using Goldsmiths Musical Sophistication Index.

Greater musical training correlated with more accurate change identification (Exp. 1), increased salience contrast (Exp. 2) and more accurate pattern detection (Exp. 3).

However, training had no effect on how often participants preferred the grouping implied by the focal feature in Exp. 3.

Conclusion:

Musical training improves one’s ability to articulate what kinds of changes occur in music, but does not alter the importance of attention. This supports the view that attention is a fundamental generator of grouping perceptions.

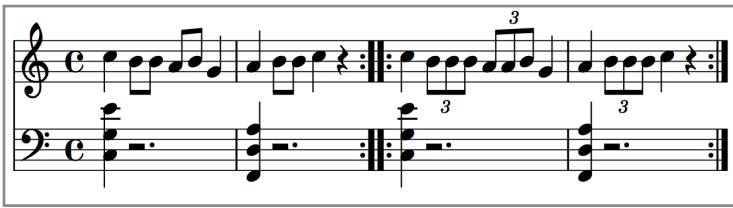
Experiment 1: Change identification

Procedure:

Participants heard AB-pattern stimuli with a single feature changing in the middle, like the one at right, and were then asked: was this a change in chord progression, melody, rhythm or timbre? (The answer in this case is *rhythm*.)

Results:

Participants identified the correct changing feature with **86%** accuracy, far above chance level of **25%**.



Conclusion:

Listening can be multi-dimensional (as opposed to holistic), and our participants are skilled at locating changes.

Experiment 2: Salience judgement

Procedure:

Participants told to focus on a single feature while listening to an AB-pattern clip (like above), and to rate the salience of the change. Match between focal and changing feature varies: in clip above, focal feature could be rhythm (*match*), melody (*convolved*), or chord progression or timbre (*wrong*).

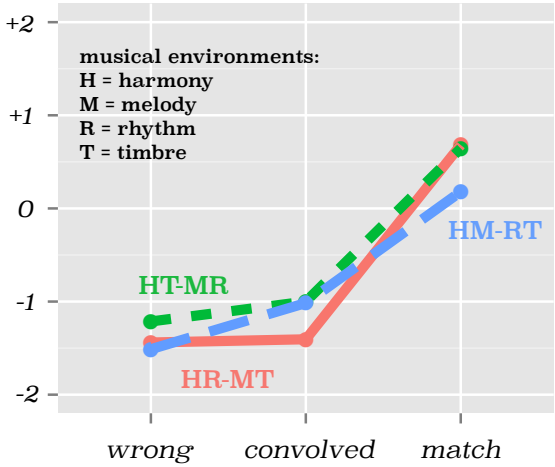
Results:

Identical changes were not equally salient: changes in the *wrong* condition were far less salient than those in the *match* condition, and slightly less than those in *convolved* condition.

Conclusion:

Attention affects the salience of structural boundaries.

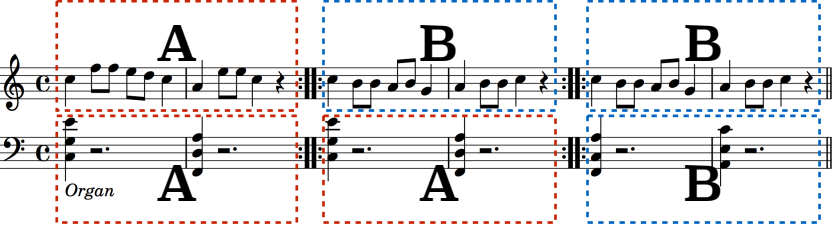
Mean rated salience as a function of condition for 3 environments



Experiment 3: Grouping preference

Procedure:

Participants listened to a probe pattern, which could be either a melody, rhythm, timbre or chord progression. They were then asked whether it occurs in a longer excerpt, like this:



Finally, they were asked which grouping they prefer: AAB or ABB.

Identifying the pattern is a distractor task that guides their focus implicitly to a single feature. A *relevant* probe implies a grouping: the melodic probes below imply grouping ABB, whereas the rhythms below imply nothing. Whether *relevant* or *irrelevant*, a probe may also be *present* or *absent*.

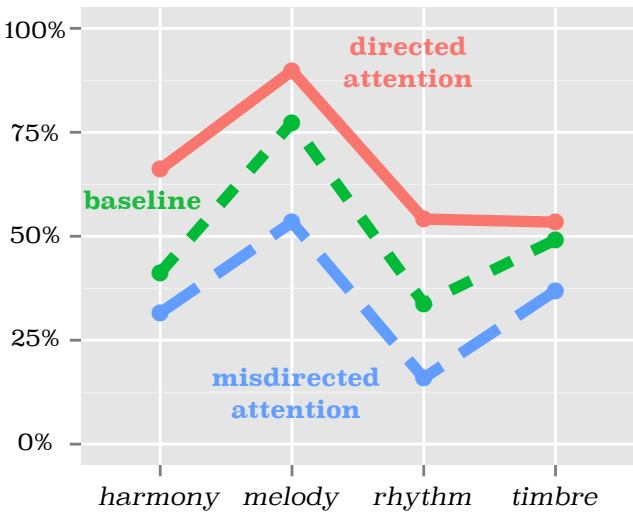


Results:

Participants preferred the implied grouping **65%** of the time, compared to chance level of **50%**.

But baseline choices varied by feature: in a pre-test where focus was not manipulated, listeners tended to group according to melody. Increase over baseline was significant for each feature, but only barely so for timbre. When attention was direction away from a feature, the opposite effect was found.

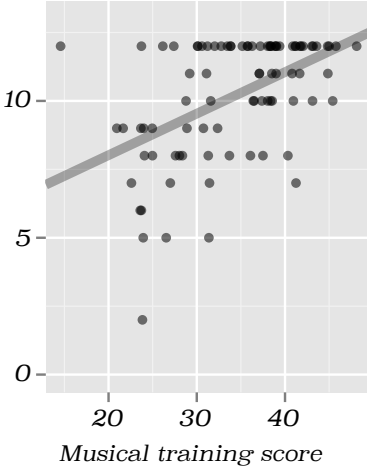
Average grouping preference in different attentional conditions



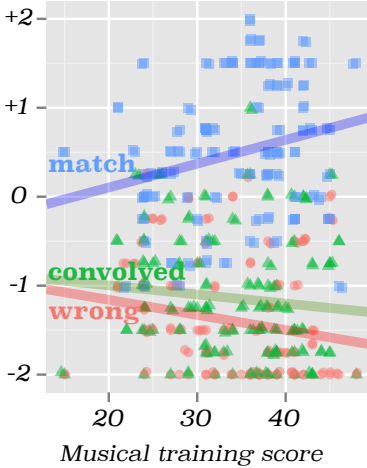
Conclusion:

Focus affects the grouping analyses of listeners. Disagreements between listeners could be the result of people paying attention to different aspects of music.

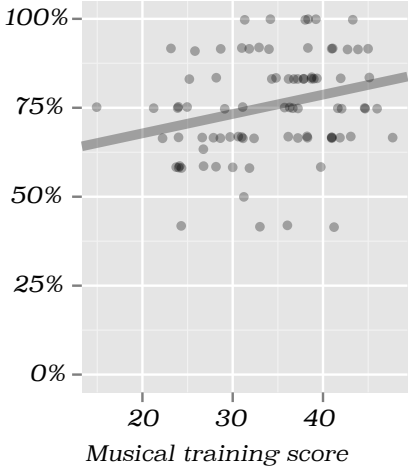
Number of correct answers in Experiment no. 1



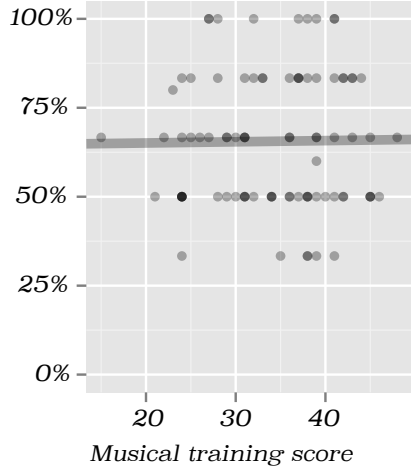
Mean rated salience in Experiment no. 2



Mean pattern-identification accuracy in Experiment no. 3



Rate of agreement with probe in Experiment no. 3



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Queen Mary
University of London

centre for digital music