Music Visualisation and its Short-term Effect on Appraisal Skills

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Abstract

Music psychologists have long been concerned with phenomena such as repetition and tonality – both the nature of internal representations formed by exposure to these phenomena, and how the representations vary with expertise. A question arises of whether less expert listeners can gain proficiency in perceiving a particular phenomenon by being exposed to representations that are known to be employed by more expert listeners [1, 2]. The current paper addresses this question within the domain of music appraisal. Participants with varying levels of musical expertise interacted with visualizations of two excerpts from Beethoven's symphonies. One visualization (ScoreViewer) showed the staff notation of the music, synchronized automatically to an orchestral recording. The other visualization (PatternViewer) also depicted the notes synchronized to the recording, as well as representations of the music's repetitive and tonal structure. These representations were based on models from prominent music cognition papers, and the models themselves were derived from experimental observations of trained music listeners. Music appraisal skills of our participants were assessed via multiple-choice questions covering the topics of instrumentation, dynamics, repetition, and tonality. Results indicated that interacting with the PatternViewer visualization led to a significant improvement in listeners' appraisal of the repetitive and tonal structure of a piece of music, compared to interacting with the ScoreViewer. The size of this effect was well predicted by amount of formal musical training, such that less expert listeners exhibited larger improvements than more expert listeners. While further work is required to determine whether the observed effects transfer beyond the pieces studied or into long-term learning, these findings for appraisal skills indicate that carefully chosen representations from models of expert behavior can, in turn, help less expert individuals to improve their understanding of musical phenomena.

1   Method

Eighteen students from JKU Linz participated in the experiment (8 identified as women, 10 as men, mean age = 26.3 years, SD = 3.8 years). Mean years of formal musical training (instrumental or vocal) was 6.0 (SD = 4.7). Twenty multiple-choice questions for each of two pieces of music (one visualised in ScoreViewer; the other in PatternViewer) were answered, with question order randomised and presentation counterbalanced to mitigate training effects.

2   Results

A two-way within-subject ANOVA on accuracy, with factors for Topic and Visualization, reveals a significant main effect of Topic ($F_{1,17} = 22.64$, $p < .001$, see also Fig. 1a), and a significant
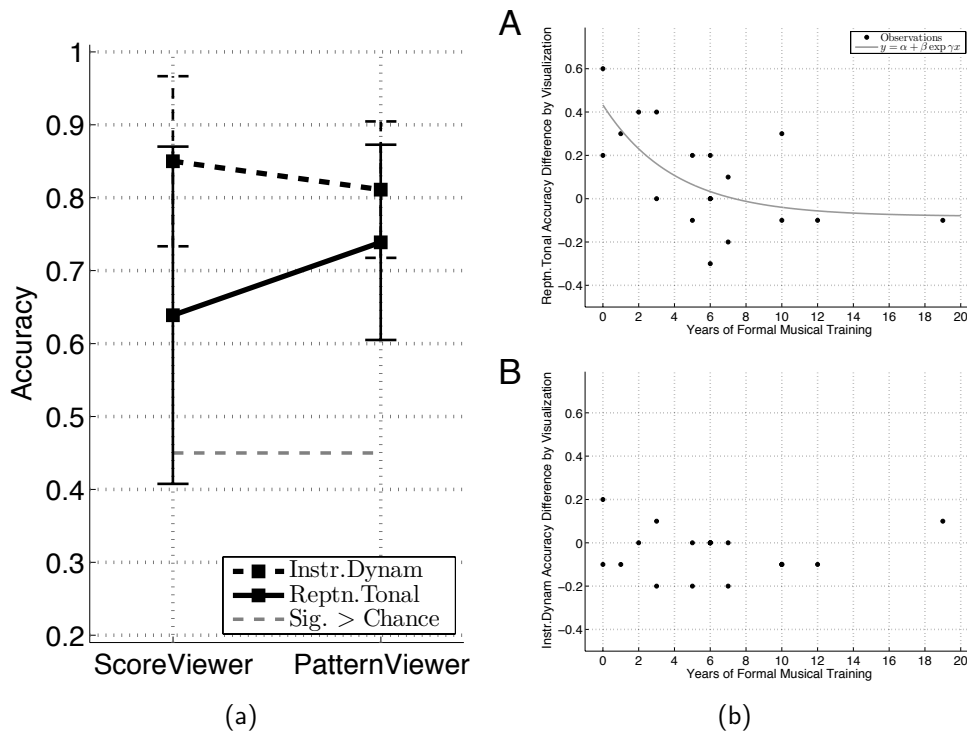
Figure 1: Left: participant accuracy as a function of Visualisation (ScoreViewer and PatternViewer) and Topic type (instrumentation/dynamics and repetition/tonality). Top-right: Plot of Reptn.Tonal accuracy in the PatternViewer minus Reptn.Tonal accuracy in the ScoreViewer against years of formal musical training. The regression of accuracy difference on years of training was significant, $F(1, 16) = 12.31, p < .01, s = .19, R^2 = .43$, and gave parameter values $\alpha = -0.08$, $\beta = 0.51$, $\gamma = -0.25$. Bottom-right: Plot of Instr.Dynam accuracy in the PatternViewer minus Instr.Dynam accuracy in the ScoreViewer against years of formal musical training. A corresponding regression analysis did not identify any significant linear or exponential trends.

interaction effect of Topic and Visualization ($F_{1,17} = 6.84$, $p < .05$, indicated by the lines having different gradients in Fig. 1a). The effect of Topic on accuracy varies as a function of Visualisation, with Reptn.Tonal questions being answered more accurately in the PatternViewer and Instr.Dynam questions being answered more accurately in the ScoreViewer.

Our contribution is to determine how appreciation or appraisal of a piece of music varies with question topic (instrumentation, dynamics, repetition, tonality) and visualization (ScoreViewer and PatternViewer). The results of our experiment demonstrated that listeners' appraisal of repetitive and tonal structure was improved when using the PatternViewer, compared to using the ScoreViewer. While this overall observation holds, it was nuanced by further analysis (Figure 1b) suggesting that participants with five years or less of formal musical training showed the greatest appraisal improvements for repetitive and tonal structure questions, when using the PatternViewer compared to ScoreViewer.

References

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