[C9] Do loudness capability and pitch height influence the choice of solo instruments in concertos?

Song Hui Chon (1)*, David Huron (1)

(1) Ohio State University. Columbus, OH, USA
* =chon.21@osu.edu

Among musical instruments, some are more popular than others for playing a solo role. Of many possible factors, two acoustical factors might be expected to influence the choice of a solo instrument. Louder instruments might be expected to be favored over quieter instruments; and in light of the high-voice superiority effect (Marie & Trainor, 2012), higher-pitched instruments might also expect to be favored.

Musical solos can occur in various contexts. In this study, we considered only concertos in Western classical music because, in this genre, titles bear an explicit designation of the solo instrument(s). 6,559 concertos were obtained from allmusic.com, featuring 138 unique solo instruments. The number of concertos featuring each solo instrument was tallied. Not surprisingly, the most popular are violin, piano and flute, although there are some uncommon instruments such as sitar and didgeridoo. Loudness capability data were obtained by a survey of 11 musicians who judged the 24 most popular solo instruments. Each instrument's highest pitch was determined from standard orchestration textbooks. These pitches were converted to midi numbers for numerical analysis. Multiple regression on the number of concertos of the 24 most popular solo instruments was significant, $F(2, 21) = 4.274$, $p = 0.028$. Upon close examination, the highest pitch was the only significant factor, $\beta = .532$, $p = .010$; the loudness capability failed to achieve significance, $\beta = .268$, $p = .171$ (a result that may be attributable to a ceiling effect where most instruments exhibit rather similar loudness capacities). In summary, an instrument capable of playing high pitch was popular for a solo role in concertos, regardless of its loudness capacity. This popularity of high-pitch instruments for solo use suggests the importance of the high-voice superiority effect.

[C10] Variation in probe tone pitch impacts secondary task reaction time

Joshua Sites (1)*, Edgar Jamison-Koenig (1)

(1) Indiana University. Bloomington, IN, USA
* =sitesj@indiana.edu

This study explores the relationship between pitch onset and response times (RT). It is widely understood that humans' auditory response to loudness over the range of audible frequencies is nonlinear. Stemming from evolutionary psychology, this study employs a theory of processing positing that stimuli activate motivational systems in service of the organism (Lang, 2006). Thus, a possible explanation for the response curve is that the human auditory system is most sensitive to frequencies that are evolutionarily relevant. Response time is associated with cognitive load. If different pitches result in different RT, then it would suggest that some pitches take cognitive priority. This could drastically impact music composition and production by introducing a new means to grab listeners' attention.

Typically, RT procedures present auditory stimulus at 500Hz or 1kHz, but little research has been done to ascertain if the pitch of the auditory stimulus impacts RT results. RT requires participants to attend to a primary task and react to a secondary task. In this study, participants are asked to attend to visual-only stimuli as the primary task, and react by pressing a button on a computer keyboard upon hearing the onset of the pitch. There are 3 groups of visual stimuli, organized by emotional valence: positive, neutral, and negative. The auditory stimulus is varied by pitch, with participants receiving 12 possible different sine tones spread across several octaves, that have been normalized by perceived loudness. The data will be analyzed for differences between RTs based on pitch and primary task emotional valence.

Regardless of outcome, the results of this study will be beneficial in implementing RT. If there is no difference between conditions, researchers can confidently select whatever pitch best suits their primary task stimulus. However, if there is a difference, existing RT results may need to be reinterpreted.