Evidence for Modularity in Musical Performance

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This poster explores the issue of modularity in musical performance. Two modules are hypothesized as sources of influence on musical performance: a "musical perception module" and a "motor module". The key property of modular systems is that they are relatively inaccessible to central cognitive systems (such as belief, desire and imagination) and operate more like a "dumb" reflex rather than an intelligent, thoughtful reflective process (Fodor, 1983). Evidence for modular processes can be found in such perceptual illusions as the "size-weight" illusion and the Muller-Lyer illusion, where no amount of knowledge can remove the illusion. Such reflexive processes are cognitive in nature because they are representational: they seem to involve computations on representations of various abstract properties of the domain, yet they are not the result of fully intelligent thought.

One source of influence on musical performance is the "musical perception module" where "musical reflexes" operate. Examples of musical reflexes can be found in Lerdahl & Jackendoff (1983): groupings follow Gestalt principles of proximity and similarity with weak and strong beats alternating at equal spacings, stresses tending to strong beats, rests to weak ones. The idea is that in the absence of strong cues, listeners will perceive musical patterns according to the expectations of these reflexes. An example of a persistent musical illusion is provided by an experiment done by Sternberg & Knoll (1984), who found that musicians tend to perceive short notes (less than 1/4 beat) to be shorter than they really are.

Another source of influence on musical performance comes from the "motor module" where representations specifically control the execution of motor commands, immune from background beliefs and desires. Thus we need to make a distinction between situations where motor control appears to be unmodular in nature - for example, when a piano teacher describes moonlight to affect her pupil's playing of the "Moonlight sonata" and the more purely motoric considerations of giving the correct duration and weight to each note in the music.

An example of a motoric problem is triplets, or three notes played in the time of two. Triplets are notoriously difficult for musicians to play even when the notes are easy to find. Perhaps this is because the motor module reflexes expect groupings to be binary, making groupings of twos, fours, eights and sixteens easy to play, whereas groupings of threes, fives, sevens and nines are not.

To illustrate how musical reflexes in the musical perception module could influence the execution of motor commands in the motor module, I propose an experiment where a subject plays a musical fragment designed to violate the expectations of the musical reflexes described above. The modularity hypothesis predicts that in the absence of any special cues, forcing a subject to play such a piece of music at a sufficiently fast tempo will put enough pressure on the resources of the cognitive system to cause the representations to re-organize to reflect the expectations of the cognitive reflexes. If the data are in accord with these predictions, we would have some evidence that errors in musical performance are governed by low-level musical reflexes in both the musical perceptual module and the motor module without input from central systems.

References

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