

Metro-rhythmical experience in dance and music as the participatory cross-modal syntactic processing

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Disciplinary background A. Biomusicology: Music is an example of the Humboldt system (Merker, 2002) which consists of a restricted number of units organized according to particular rules. The arrangement of these units is often called 'syntax' and it necessitates a special form of neural processing (Patel, 1998). The neural processing of musical syntax is based on two types of analysis (i.e. spectral and temporal analyses) (Zatorre, Belin, & Penhune, 2002) which result in the experience of musical pitch and rhythm hierarchies. As a rhythm hierarchy is experienced as a periodical scheme of accents (meter) that occurs when we listen to a succession of rhythm measures (rhythm) the hierarchical patterns in this domain can be called 'metro-rhythmical patterns.' However, while the hierarchical schemes of discrete pitch patterns seem to be unique to music, the metro-rhythmical patterns can be produced both in the auditory and motor domains by the means of vocalizations and body movements respectively. As the result, the metro-rhythmical part of musical structure can be interpreted by the means of body movements in dance (Sievers, Polansky, Casey, & Wheatley, 2013).

Disciplinary background B. Psychology of Music: The experience of rhythm hierarchies, being pre-conceptual and motor in nature, became the cross-modal mental reference of syntactic relations as the result of the evolution of cortical and subcortical interactions. This view is supported by the facts that the experience and recognition of metro-rhythmical patterns does not necessitate any awareness of conceptual properties, and that the auditory-motor synchronization – the ability that is crucial for the production of rhythm syntax, is based on cortico-subcortical loops (Li et al., 2015).

Abstract

Music and dance are vital components of human togetherness. The main aim of this presentation is to show that our sense of participation in dance and music is based on the syntactic processing of metro-rhythmical and pitch hierarchies. In the case of a metro-rhythmical hierarchy this sense is related to cross-modal processing which is a functionally different mental tool in comparison to the syntactical processing of musical pitch.

In contrast to the standard view that musical syntax is a relatively uniform entity (Lerdahl, 2013; Lerdahl & Jackendoff, 1983) it is suggested that the metro-rhythmical experience in dance and music relies on a qualitatively distinct ability that is separated from the ability to process pitch hierarchy in music. As a result, both pitch syntax and metro-rhythmical syntax should be treated as separate phenomena. Moreover, the participatory cross-modal character of metro-rhythmical syntax allows us to 'translate' musical patterns into dance movements and vice versa. This view is supported by neuroimaging studies which reveal activity within the basal ganglia and the motor cortex during the recognition of metro-rhythmical patterns in music and dance (Li et al., 2015). These results also suggest the possible different roles of different cortico-subcortical loops in the processing of various musical features. The different involvement of three cortico-subcortical loops (i.e. motor, associative, and limbic loops) in the processing of music and dance syntax will be discussed. In addition, the possible evolutionary origin of these two abilities will be presented. Although some scholars have proposed that musical rhythm is evolutionarily older than musical pitch (Mithen, 2006) the question of their functions remains open. The possible solution of this issue is that both metro-rhythmical and pitch syntaxes are related to a consolidatory function. However, the difference between these

syntaxes can be based on the level of sublimation. While metro-rhythmical syntax is simpler and cross-domain, pitch syntax is more elaborate and solely auditory.

Interdisciplinary implications. Understanding of the participatory character of metro-rhythmical hierarchy in dance and music may be helpful in musical didactics by indicating which performance element our attention should be focused on in order to obtain a desirable effect in the listener. It can also be helpful in analysis and interpretation of music, which currently lacks objective tools for evaluation of metro-rhythmical content of music.

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