TOWARDS AN ACTION-ORIENTED APPROACH TO THE EVOLUTION OF LANGUAGE AND MUSIC

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Language and music considered as cognitive systems form a mosaic, consisting of multiple components as parts with different evolutionary origins (Boeckx, 2013; Fitch, 2006). From a comparative perspective, some of these components might be shared and based on the same evolutionary genesis, while others might be different and emerged independently in the course of evolution. Till now, theoretical as well as empirical research proposed several candidates for shared and distinct components (Jackendoff, 2009; Koelsch, 2012; Patel, 2008; Peretz, 2013). However, their evolutionary origins and the way how those several components work together remains still unclear. In the current paper, this issue is discussed within an action-oriented framework exploring language and music in terms of goal of action, action planning, motor control, and sensory-motor integration (Asano & Boeckx, 2015). This framework makes it possible to investigate similarities and differences of cognitive systems at the same time.

Current findings suggest that shared structural and processing aspects are not specific to language and music: Complex action—also organized in an asymmetrical hierarchy—comprises temporal integration processes and involves neural resources shared with language and music (Fitch & Martins, 2014; Jackendoff, 2009; Koelsch, 2012). Moreover, action-based research provides an opportunity to consider the issue of cognitive phylogenies (Boeckx & Fujita, 2014; Fitch & Martins, 2014). Action is namely a basic form of hierarchically structured temporal sequence processing involved in 'higher' cognitive systems and is shared with non-human primates. An action-based research strategy allows to avoid all-or-nothing contrastive approaches which are investigating only the pinnacles of mental evolution and have been thus criticized repeatedly (De Waal & Ferrari, 2010; Theofanopoulou & Boeckx, 2015). Furthermore, an action-

based research strategy permits to examine 'humaniqueness' (Hauser, 2009) and uniqueness of each cognitive system in a more fine-grained way.

In the current paper, I focus on domain-general, action-based neurocognitive mechanisms playing an important role in the evolution of musical rhythm and discuss their relationship to the evolution of speech and language in terms of temporal integration processes. Especially, the basal ganglia, the motor cortico-basal ganglia-thalamo-cortical circuit as well as the dorsal stream including Broca's area are discussed as a set of domain-general neural structures undergoing significant changes in the course of the evolution in our lineage (Merchant & Honing, 2014; Merchant et al., 2015; Patel & Iversen, 2014; Rauschecker & Scott, 2009). Based on those findings from cognitive and evolutionary neuroscience and within an action-oriented framework, I propose how the cognitive systems language and music emerged on the basis of shared basic neurocognitive mechanisms.

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