Researchers publish first empirical study on evolution of musical aptitude

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Geneticists at the University of Helsinki and the National University of Singapore have teamed up to explore the evolution of musical aptitude in the first-ever empirical study of the evolution of music. The Finnish scientists in the project were supported by funding from the Academy of Finland. The study was published in *Scientific Reports*, a peer-reviewed scientific journal of the Nature Publishing Group.

In the study, the researchers applied genomic methods to identify candidate regions in the human genome showing positive selection regions with musical aptitude. They found that the associated regions contained numerous candidate genes, among them genes known to affect ear function, language development, memory, bird song and the brain's reward mechanism.

"We started out from the hypothesis that genetic variants associated with musical aptitude have a pivotal role in musical practices. This assumption is based on the idea that the evolution of the human genome progresses much more slowly than cultural evolution. The structure and function of the auditory system is very similar in modern humans and the first primates, suggesting high evolutionary conservation of auditory perception among species," says Docent Irma Järvelä, the principal investigator of the study.

FOXP1, one of the candidate genes discovered, has been previously found to affect both human language development and songbirds' singing. The researchers also identified RGS9 as another gene that is

implicated in song learning and singing in songbirds. RGS9 is expressed in the corpus striatum together with dopamine receptors. The striatum is activated by expectations in music. When those expectations are met, dopamine is released in the striatum giving the mind a sense of satisfaction. Another member of the RGS gene family, RGS2, is known to become activated when musicians play music. "Based on their functions, these genes are suitable candidate genes for further studies into the evolution of music," says Järvelä.

The results of the study suggest that music and language have common roots in human evolution. An improved understanding of the biological background of musical aptitude can contribute new insights into, for instance, genes that affect normal brain functions, the interactions between genes and the environment and the significance of music as a form of therapy.

"The study opens new avenues to study the evolution of music. However, more studies are needed to dissect the role of the candidate regions and genes identified in selection regions," says Järvelä.

More information: Xuanyao Liu et al. Detecting signatures of positive selection associated with musical aptitude in the human genome, *Scientific Reports* (2016). DOI: 10.1038/srep21198

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