

Greater music dynamics in shoebox-shaped concert halls

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Berlin Philharmonie.

Aalto University researchers have found that music is perceived to have greater dynamic range in rectangular, shoebox shaped concert halls than in other types of halls.

From a shoebox hall's sidewalls, strong reflected [sound](#) arrives to listeners' ears from directions where human directional hearing

sensitivity is the highest. Sound reflected from the sidewalls strengthens the especially strong higher overtones that players produce during a whole orchestra fortissimo, but not during pianissimo passages. Therefore, such a [concert hall](#) shape affects perceived dynamic range even though rooms itself amplify all passages the same amount.

"Dynamic expression is an inseparable part of music. For this reason, a concert hall's ability to transmit the orchestra's played dynamics is one of the most important criteria of good acoustics. Our research is the first that explains how halls influence perception of dynamic expression," Dr. Jukka Pätynen says.

The importance of early lateral reflections to good concert hall acoustics has been known for decades. Earlier, they were believed to widen the perceived overall sound image and increase the perceived closeness of the sound. Now, *Proceedings of The National Academy of Sciences* of The United States of America has published an article that expands our understanding of how perception of dynamic musical content depends on concert hall acoustics. The findings will lead to better concert hall designs than ever before.



Musikverein Vienna.

Dr. Jukka Pätynen works as a post-doctoral researcher in Tapio Lokki's Virtual Acoustics research group. The group aims to understand how room [acoustics](#) affect sound signals, and how people perceive room acoustic properties. Research focuses on improved prediction and understanding of concert halls and other acoustically demanding spaces. Notably, the concert hall acoustic research group has developed methods, unique in the world, that are described in a second article that was just featured on the cover of *Physics Today*.



Stadthalle Wuppertal.

More information: Jukka Pätynen, Sakari Tervo, Philip W. Robinson, and Tapio Lokki. "Concert halls with strong lateral reflections enhance musical dynamics." *PNAS* 2014 ; published ahead of print March 3, 2014, [DOI: 10.1073/pnas.1319976111](https://doi.org/10.1073/pnas.1319976111)

Provided by Aalto University

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