

Press Release

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Ten years of vocal research at the Freiburg Institute for Musicians' Medicine

Current study analyzes the voices of high-performance singers / publication in PLOS ONE

Vocal research has now been conducted for ten years at the Freiburg Institute for Musicians' Medicine (FIM). The institute is a joint facility of the Medical Faculty of the University of Freiburg, the Medical Center - University of Freiburg and the Freiburg Conservatory, which today celebrates its 70th anniversary. The FIM is headed by Prof. Dr. **Claudia Spahn** and Prof. Dr. **Bernhard Richter**. It is the joint goal of Prof. **Matthias Echternach**, consultant at the Institute for Musicians' Medicine, and Prof. Richter to clarify through scientific research the question of how the voice is produced in high-performance singers.

In the course of the studies, which were funded by the German Research Foundation (DFG), almost 50 singers were analyzed, including many who regularly perform at leading international opera houses such as La Scala Milan, the Metropolitan Opera, the Bayreuth Festival or the Unter den Linden State Opera in Berlin.

The studies were conducted primarily using dynamic magnetic resonance imaging (MRI). The implementation and optimization of imaging was the result of close cooperation with the Division of Medical Physics at the Department of Radiology at the Medical Center - University of Freiburg (Prof. Dr. **Jürgen Hennig**) and the Department of Neuroradiology at the Medical Center - University of Freiburg (Prof. **Horst Urbach**).

"The fact that magnetic resonance imaging does not have any X-rays means that, according to current scientific knowledge, the studies are harmless for the subjects. The insight that the singers grant us here is unique and helps us to better understand humans' most important means of communication, their voice", explains Prof. Echternach.

In an interview conducted by the Münchner Merkur with world-renowned baritone **Michael Voalle**, who also participated in the studies, the singer said: "First of all, you are totally baffled. I had absolutely no clue ... Many subtleties and details about the head and neck area as a whole were completely new to me." The attached video of a sample MR image (<https://www.youtube.com/watch?v=1pCF-05VEKk>) had more than 200,000 views on YouTube in only four days after it was first posted.

In addition to vocal research, the work group headed by the Freiburg performing musicians' physicians Spahn, judges, Pöppe and Echternach has put together an instructional DVD in which this technology is applied to the understanding of physiological processes in brass musicians

(<https://www.youtube.com/watch?v=4Xo63XrlxQ>). In addition to the analysis by means of MRI, the working group also studied oscillations of the vocal folds with high-speed imaging of 20,000 frames per second. This meant that, for the first time, it was possible to analyze even very high human voice ranges, such as in the "Queen of the Night" in Mozart's "Magic Flute".

The working group headed by Echternach and Richter has now authored over 50 publications for evaluation in peer review journals, mostly in English. Most recently they published a freely accessible article in the scientific journal *PLOS ONE* (<http://dx.doi.org/10.1371/journal.pone.0153792>), examining volume is investigated in high-performance singers.

Original title of study: Morphometric Differences of Vocal Tract articulators in Different Loudness Conditions in Singing

Link to study: <http://dx.doi.org/10.1371/journal.pone.0153792>

Homepage: www.uniklinik-freiburg.de/musikermmedizin

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