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Earables
Wearable Computing on the Ears

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INFORMATICS EUROPE

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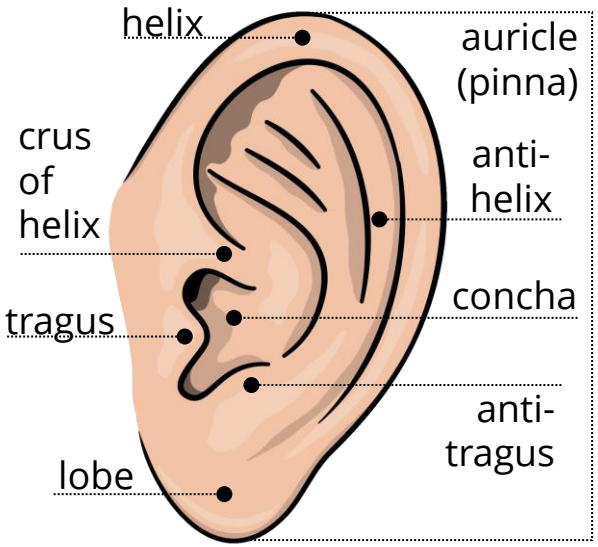
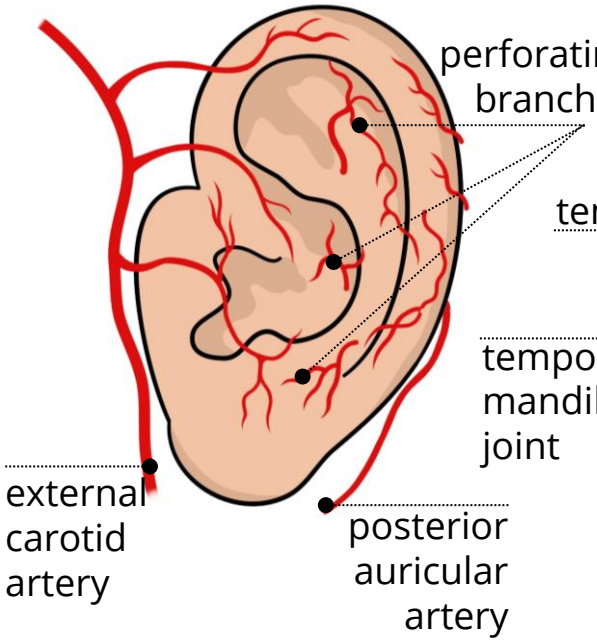
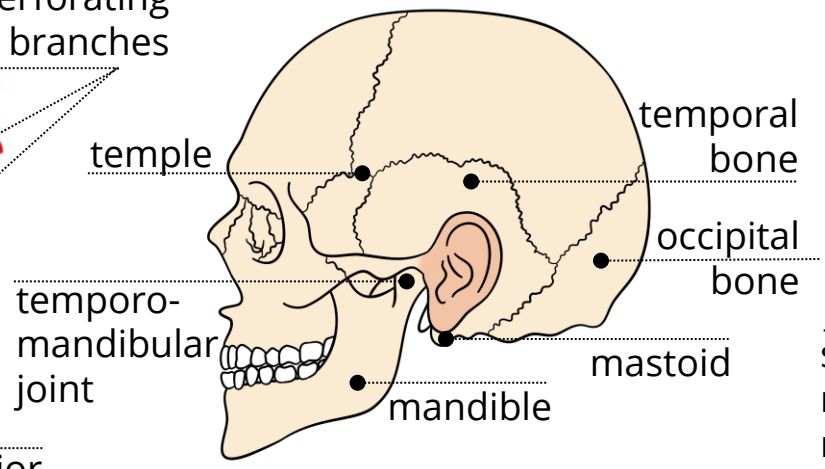
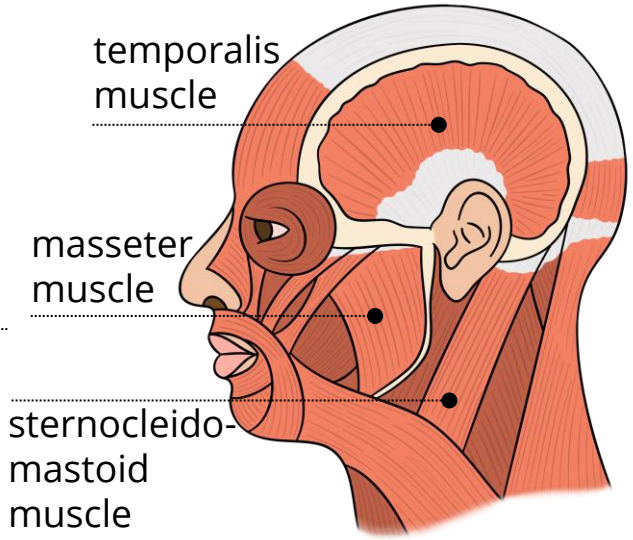
Motivation









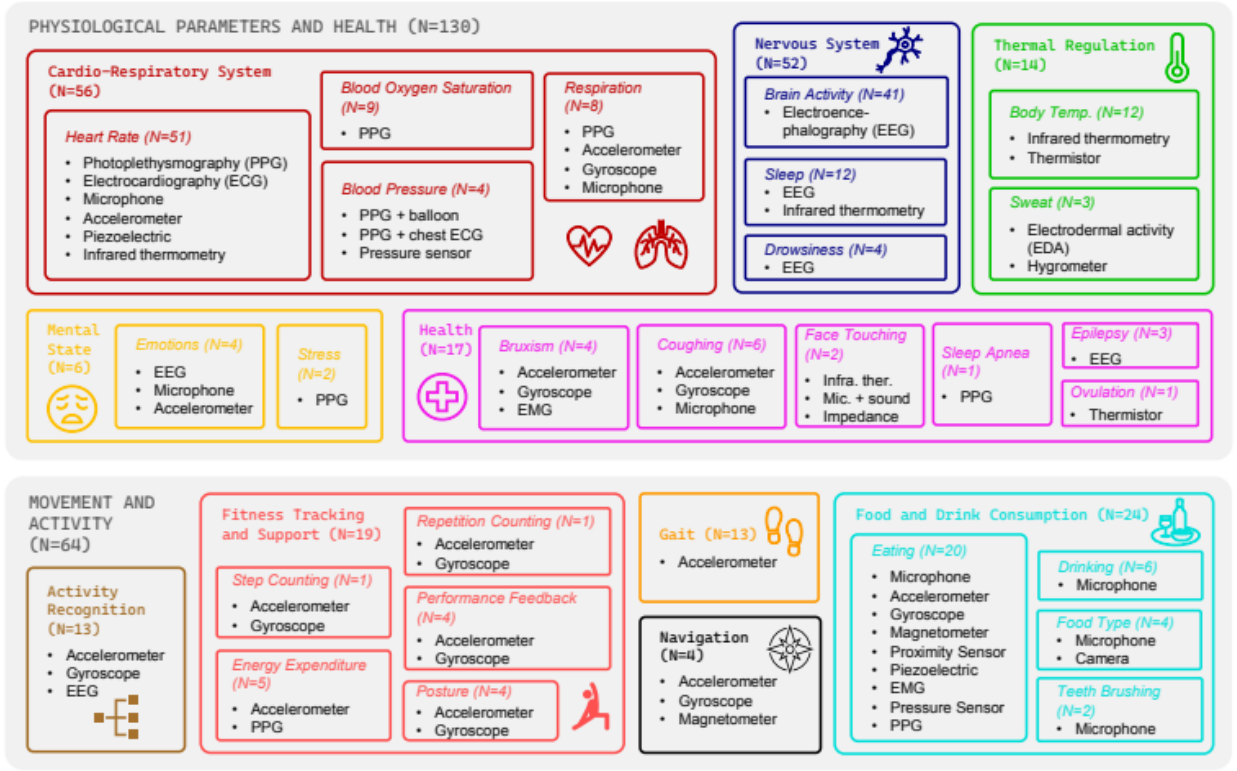
Sensing with Earables: A Systematic Literature Review and Taxonomy of Phenomena
T. Röddiger, C. Clarke, P. Breitling, T. Schneegans, H. Zhao, H. Gellersen, M. Beigl
Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies

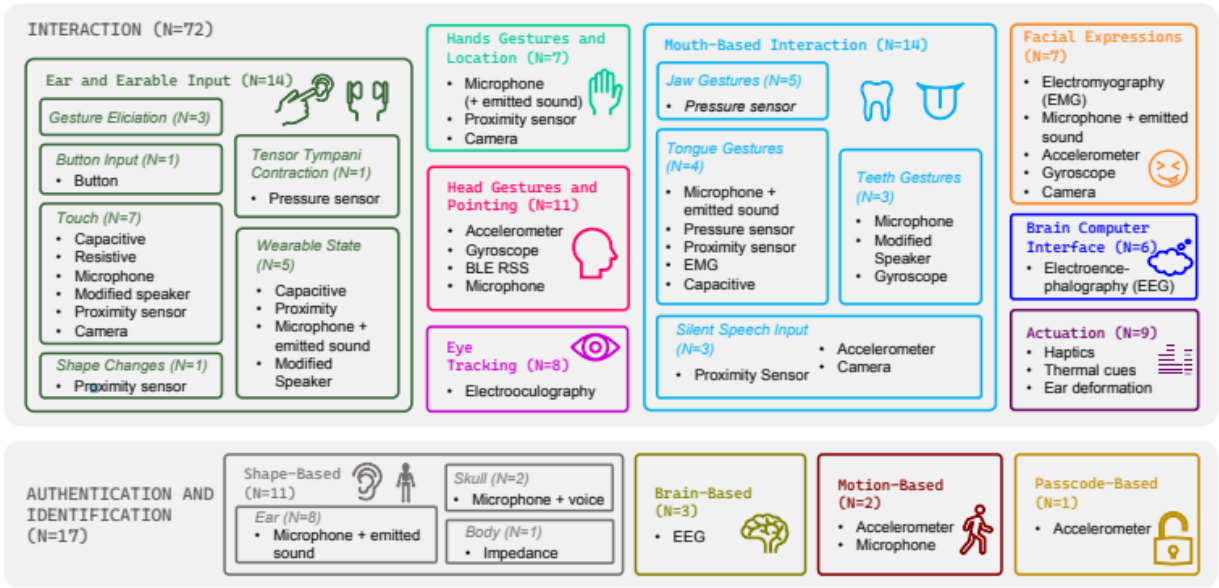
The ears are in close vicinity to many important anatomical structures.

Research Question

How can earphones offer capabilities beyond audio in- and output?

Taxonomy





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Analyzing 905 publications revealed four key earable research areas:
(i) physiological parameters and health, (ii) movement and activity, (iii) interaction, (iv) authentication and identification.

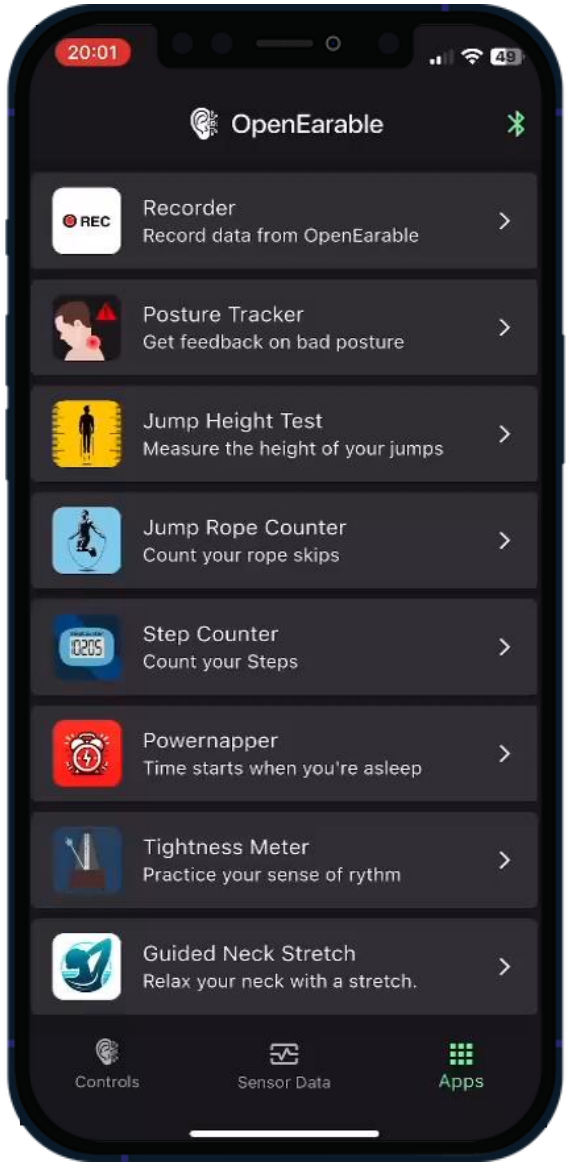
OpenEarable

SUPPORTERS AND USERS

Röddiger, Tobias, et al. "OpenEarable: Open Hardware Earable Sensing Platform." Earcomp 2022.

The world's first open-source reference architecture for ear-based sensing.

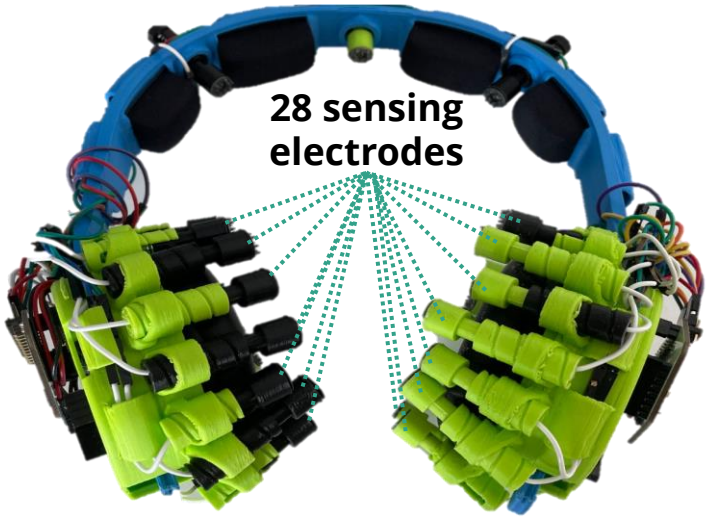
Appification



OpenEarable can sense 30+ phenomena and introduces the first “app store” for earables.

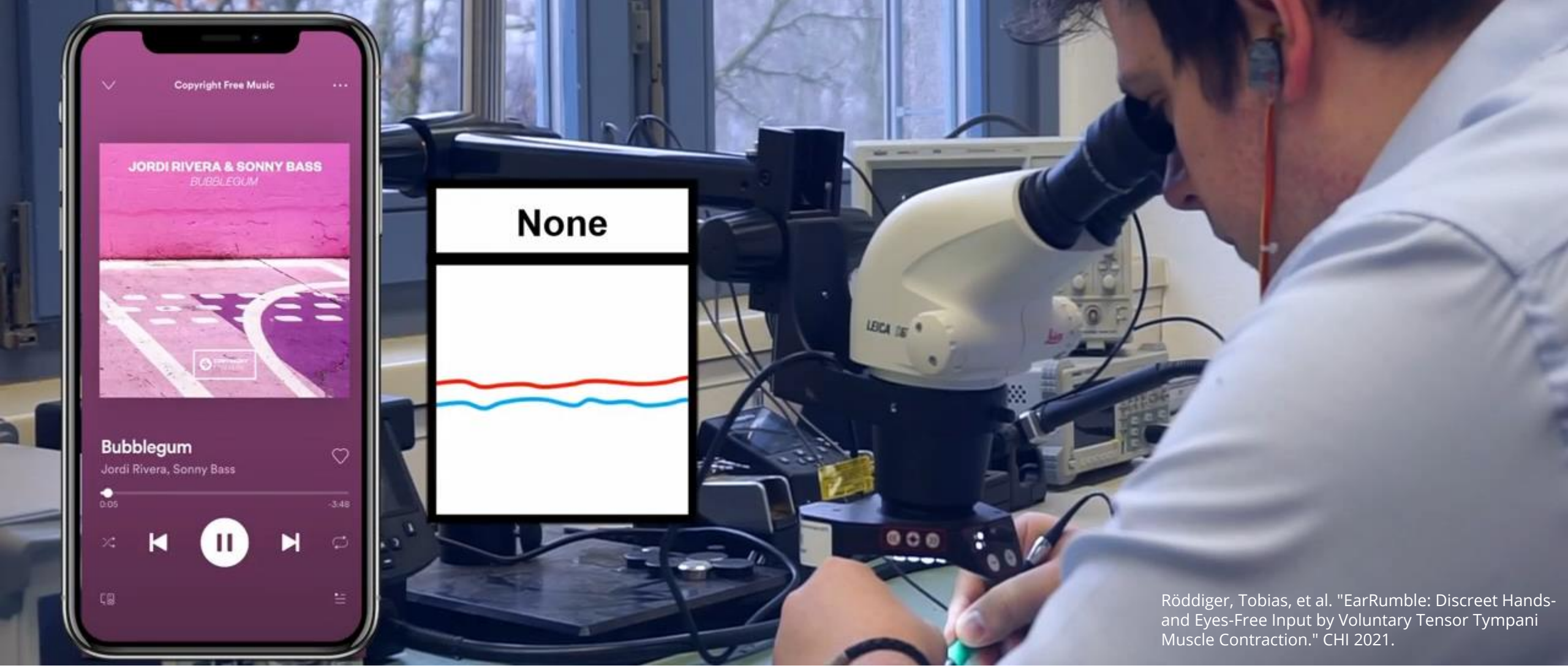
Applications

Hardware



Phenomena	cough detection	eye movement tracking	tensor tympani contraction
Applications	e.g., COVID-19 isolation	e.g., drowsiness detection	e.g., neurosurgery control
	Röddiger, Tobias, et al. "Towards Respiration Rate Monitoring Using an In-Ear Headphone Inertial Measurement Unit." Earcomp 2019.	Röddiger, Tobias, et al. “Periauricular Electrodes Facilitate Eye Tracking in a Natural Headphone Form Factor." Under Submission.	Röddiger, Tobias, et al. "EarRumble: Discreet Hands- and Eyes-Free Input by Voluntary Tensor Tympani Muscle Contraction." CHI 2021.

Different AI pipelines to detect novel phenomena in and around the ears.



Röddiger, Tobias, et al. "EarRumble: Discreet Hands- and Eyes-Free Input by Voluntary Tensor Tympani Muscle Contraction." CHI 2021.

Hands and eyes are occupied on the microscope. Using the tensor tympani muscle in the ear, users control their music which they describe as ”magical and almost telepathic”.

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Thank you!

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