# Neural tracking of acoustic onsets: Towards understanding the brain beyond the lab

**T. Haupt[1*], M. Bleichner[1,2]**

[1]Neurophysiology of Everyday Life group, Department of Psychology, University of Oldenburg, Germany;
[2]Research Center for Neurosensory Science, University of Oldenburg, Germany

[*]**E-Mail:** thorge.lars.haupt@uni-oldenburg.de

*Introduction:* We are interested in the neural dynamics of sound processing in everyday life. One challenge in the interpretation of EEG in response to everyday sounds is the extraction of optimal auditory features that are 1) easily obtainable from the environment in everyday situations and 2) provide sufficient information to gain insights into the brain response. In this study, we compare different sound features and evaluate them in their potential for beyond the lab recordings.

*Method:* We re-analyzed an existing dataset where participants performed an audio-visual-motor 3D Tetris task while listening to a realistic soundscape of a surgery room [1]. We extracted a multitude of low-level acoustic features (i.e. envelope, acoustic onsets) and used temporal response functions (TRF) to predict the EEG response. The performance of the derived neural model was compared to a held-out testing set. Using variance partitioning, model prediction was compared by determining the shared and unique variance of each feature of interest. Additionally, we compared experimentally relevant sound markers to unlabeled acoustic onsets, as this additional marker information is not readily available for beyond the lab recordings. At last, we use event density estimation of the soundscape to derive neural models representing periods of high and low acoustic event density, investigating real-world acoustic dynamics.

*Results:* The results show that automatically detected onsets from continuous sound streams can be used to derive plausible neural models, that in terms of model, predictions are comparable to validated features, such as the envelope. We find that model prediction with reduced data availability improves when more information about the acoustic stimulus is present (i.e. experimental marked sound type vs. onset only). At last, we show that during periods of high acoustic event density compared to low event density, a reduction in the neural response can be observed.

*Discussion:* We demonstrate that detected onsets based on acoustic transients are sufficient to monitor sound processing in daily life when using EEG beyond the lab. Our results will help to understand neural changes in response to changes in the environment.

*References*

[1] Rosenkranz M., Cetin T., Uslar V., Bleichner M. G. Investigating the attentional focus to workplace-related soundscapes in a complex audio-visual-motor task using EEG. In
bioRxiv 2022.10.06.511066; doi: https://doi.org/10.1101/2022.10.06.511066