



Section

Fields (of activity)

Toward a tool for farmers to evaluate welfare states of pigs: measuring vocal indicators of emotions

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Key words

Emotion, indicators, pigs, recognition system, vocalisations

Aim of the study

Emotions play a central role in modern definitions of farm animal welfare. Therefore, it is of special interest to reliably detect them in practice. One promising approach to this is the analysis of vocalisation, which often accompanies emotional responses as part of the behavioural component of affect. Our project aimed at the development of a software tool to detect and quantify such bioacoustics indicators of emotion in pig vocalisation. This required the identification of reliable indicators across different breeds and ages (both factors known to significantly affect vocal quality), and their implementation in a software-environment for real-time monitoring in practice based on artificial neural networks.

Material and methods

To achieve this, we formed a consortium of six EU partnering institutes with a strong background in pig vocalization and emotion (ANIHWA-funded project 'SOUNDWEL'). The partners contributed to a database comprising over 38,000 calls produced in 19 different context categories by pigs housed in five different facilities. Data originated mostly from previous published research studies, and were supplemented with new recordings from contexts (and therefore affective states) that were still lacking but relevant on-farm. Statistical analyses were run across this database, aiming to find both indicators of context and of valence and arousal.

Results and significance

Call duration and amplitude modulation turned out to be good indicators of emotional valence (i.e., how pleasant of unpleasant/positive or negative a situation is perceived by the animal). Calls produced in positive contexts were shorter and less modulated. Using discriminant function analyses, we could show that calls could be reliably assigned (with up to 97% accuracy) to the valence of production. This indicates that they could most likely be correctly classified using artificial neural networks as intended in our software tool. A separate analysis for high-pitched (squeals, screams) and low-pitched (grunts) calls appears to improve classification and would therefore need to be implemented in the software. First results on artificial network training with a data-subset were promising. Unfortunately, we failed to reach our final goal (building a tool) due to significant shortfall of personnel because of illness and parental leaves of key members of the involved working groups. Yet, we consider the database we gathered a significant accomplishment. Artificial neural networks and machine learning approaches in general require enormous datasets, which in this specific context could not be generated by a single group alone. Amongst others, one needs to record the same context in different facilities and different breeds in order to avoid the algorithm learning to identify these instead of the affective state in focus. Within SOUNDWEL, we were able to do this, and the database is therefore an exceptional basis for future developments.

Publications, posters and presentations *(only those including Swiss partners)*

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- Briefer EF**, Tallet C, Villain AS 2019. Vocal expression of emotions. *XXVII International Bioacoustics Council meeting*, Brighton, UK. (Conference symposium)
- Tallet C, Leliveld LMC, **Briefer EF** 2019. Indicators of emotions: vocalisations. *ISAE course on animal emotions*, Wageningen University, Netherland. (Talk at PhD course)
- Padilla de la Torre M, **Briefer EF**, Nordgreen J, Andrew AJ 2017. SOUNDWEL: Toward a tool for farmers to evaluate welfare states of pigs: measuring vocal indicators of emotions. *Ås Kulturhus, Ås, Norway*. (Public talk)
- Briefer, EF 2019. Stand at 'Culture Night', Copenhagen. *'Does it sound positive or negative? From horses to pigs, how good are you at recognising animal emotions from their sounds?'* (Outreach)

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