Perception of emotional valence in goats

Luigi Baciadonna[1], Elodie F. Briefer[2], Livio Favaro[3] and Alan G. Mcelligott[1]
[1]Queen Mary University of London, Mile End Rd, E1 4NS London, United Kingdom, [2]Institute of Agricultural Sciences, Universitätstrasse 2, 8092 Zürich, Switzerland, [3]University of Turin, Via Accademia Albertina 13, 10123 Turin, Italy; luigi.baciadonna@qmul.ac.uk

Animals can potentially transmit information about emotional states through their vocalisations. We investigated whether goats can discriminate conspecific calls with different emotional valence (positive or negative). We used a habituation-dishabituation-rehabituation paradigm. Subjects were initially habituated to a stimulus by repeated exposures to 9 calls from the same animal, which was previously recorded either positive or negative situations. After the habituation to the stimulus, a stimulus of opposite valence was presented (n=3 calls from the same animal with different valence compared to the habituation phase). Finally, the stimulus that the subject was habituated to was presented again (n=1 call from the same animal) to check whether the animal showed a new shift in attention. Twenty-four goats (12 females, 12 males) were tested. The time spent looking at the speaker and the physiological reactions to the calls were measured. During the habituation phase, goats reduced the rate of looking towards the speaker (linear mixed-effect model (LMM); $\chi^2_{(1)}$=30.01, P<0.001), indicating the expected habituation effect. The rate of looking towards the speaker increased when the second call of dishabituation was played (LMM; $\chi^2_{(1)=}$5.58, P=0.01). During rehabituation, the rate of looking towards the speaker was higher when a negative call was played compared to a positive call (LMM; $\chi^2_{(1)}$=5.57, P=0.01). Heart rate decreased during habituation (LMM; $\chi^2_{(1)}$=30.01, P<0.001, mean first call: 123.85±3.71 BPM, mean last call: 108.59±3.48 BPM), regardless of the valence, and did not change in either the dishabituation or rehabituation phases. Heart-rate variability (RMSSD) during the habituation was affected by the valence (LMM; $\chi^2_{(1)}$=4.66, P=0.030); it was generally lower when a positive call was played (mean: 53.55±2.39 ms) compared to a negative call (mean: 57.21±2.01 ms). When the first call of dishabituation was played, heart-rate variability was affected by the valence (LMM; $\chi^2_{(1)}$=4.50, P=0.033); it was higher when a positive call was played (mean: 60.71±4.04 ms) compared to a negative call (mean: 49.64±4.09 ms). When the rehabituation call was played, an effect of valence was found (LMM; $\chi^2_{(1)}$=6.52, P=0.010); heart-rate variability was higher when a positive call was played (mean: 71.30±3.61 ms) compared to a negative call (51.14±7.33 ms). Our results indicate that goats discriminate between calls of different valence. Investigating the perception of emotion-linked calls in livestock is important for evaluating their potential role in emotional contagion.