

Behavioural Science

Call form and its link to signaling situations during fighting in the Pallid gerbil (*Gerbillus perpallidus*)

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The role of calling during agonistic interactions in mammals is poorly understood. Probably, animals either express their internal state or they influence the behaviour of their opponents using these calls. To answer these questions, it is necessary to conduct a study during which the relationship between call structures and behaviour of combatants is examined. Laboratory rodents, such as Pallid gerbils, are good subjects for such a study. Encounters of two opponents on neutral territory represent an appropriate situation of social conflict. During social conflicts, Pallid gerbils emit calls that fall into the audible range. After a few minutes of conflict, opponents establish winner-loser asymmetry, after which all sounds originate from the loser.

In this study, we describe defensive vocal repertoire in the Pallid gerbil (*Gerbillus perpallidus*). We designed 14 male-male 15-minute conflicts between males on a neutral arena. We selected from video and audio tapes of each of the conflicts two 60 s time intervals, corresponding to the third and thirteenth minute after the winner-loser asymmetry was established. Within these intervals we analysed the data in respect to winner actions (scan sampling method with 1-s scans, behaviours ranged from absence of aggression to threats or fights) and call structures of losers (all sounds throughout these two 60 s intervals, in total 1471 analysed sounds for 14 conflicts). We analysed how the call structure depends on the immediate actions of the winner and on exposition to aggressive pressing (by analysing of cumulative effect using comparison of data for the third and thirteenth minute).

We found that increases of social pressure (demonstration of more aggressive behavior by the winner) enhanced the noisiness of calls, the degree of frequency modulation, and evoked translocation of the dominant energy into higher frequency bands. In addition, the periods between calls decreased in duration. Only tonal sounds changed, whereas the structure of purely noisy calls (where the tonal component is absent) remained constant. Comparison of call structures for the third and thirteenth minute (cumulative effect) showed that the percentage of noisy calls was significantly higher during the thirteenth minute than on the third. Only in purely noisy calls, dominant energy was transferred into higher frequency bands. All other parameters did not differ for the third and thirteenth minutes.

In conclusion, relationships between call structures and physical behaviour during social conflicts provide tools for a quick estimate of animal welfare in different social situations.