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Assessment of sociability in farm animals: The use of arena test in lambs

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ABSTRACT

The present study aimed to evaluate an experimental approach to individually assess social reactivity among sheep. INRA401 male lambs ($n = 163$) were reared together outdoors as part of a larger flock. Fifteen days after weaning the animals were individually exposed to an arena test of 2 phases (1-social attraction, 2-social isolation) during which proximity toward conspecifics and vocal and locomotor reactivity were measured. One day after the test their inter-individual distances were measured when grazing over a 2-h period in order to estimate their sociability on pasture. This was made using scan sampling recording the identity of the nearest neighbour for each individual, which led to the establishment of a sociability index. Overall, we found that high-pitched bleats recorded during the attraction phase ($r = 0.22$) and the isolation phase ($r = 0.23$) of the arena test as well as the locomotor activity measured during the isolation phase ($r = 0.27$) were positively correlated with the sociability index. Furthermore, the behaviour of lambs during the isolation phase of the arena test (i.e. vocal and locomotor agitation) appeared to be a significant predictor explaining 13% of the variance of the sociability on pasture. The behavioural reactivity measured through the arena test thus reflects at least to some extent the sociability of sheep. Those results are very encouraging as they suggest that the sociability of lambs could indeed be evaluated through a short experimental test, which is less time consuming than field ethological observations.

1. Introduction

In modern production systems, farm animals are often faced with challenging situations implying behavioural or physiological stress they have to cope with. Depending on the rearing system (i.e., extensive or intensive), animals can beside others be exposed to social challenges such as isolation, crowding or social instability (Cockram, 2004; Dwyer and Bornett-Gauci, 2004; Goddard et al., 2006). How animals cope with such challenges has been shown to be associated with welfare and production traits: social buffering indeed influences the individual's ability to cope with its environment (Nicol, 1995, e.g. *sheep*: Porter et al., 1995; da Costa et al., 2004, *cattle*: Mounier et al., 2006) while social relationships can impact the grazing behaviour of individuals (Dumont and Boissy, 1999) and flocking tendency facilitates flock management (Hinch, 1997). Knowing that social attraction influences a variety of behaviours relating to animal welfare and economic performances (Estevez et al., 2007), the assessment of sociability in farm animals can be of great importance.

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In farm animals, social motivation is often evaluated by behavioural tests carried out under constraining experimental situations. The arena test is without doubt the most commonly used test for assessing behavioural reactivity even if the absence of standardized tests hampers the development of a comparative approach (Forkman et al., 2007). However, the link between the reactivity of the animals during such a test and their sociability in more natural situations (e.g. on pasture) remains unknown and we can therefore question the effective predictive power of the arena test regarding sociability in a rearing context.

In the context of a broader study aiming at understanding the genetic component of the behavioural profiles increasing livestock's adaptability to outdoor rearing systems, we submitted lambs to an arena test adapted from Boissy et al. (2005). This test aimed to measure the social motivation of lambs through two successive phases: (1) attraction toward familiar flock-mates and (2) reactivity to social isolation. Along with social reactivity, such a composite test also implies confounding factors such as the novel and confined environment or human handling just before the test, which can interfere with the true social aspect of the test (Sibbald et al., 2005). The aim of the present study was thus to evaluate the predictive power of the arena test in assessing lambs' sociability. This was done first by measuring the correlation between the behavioural reactivity of the animals individually submitted to an arena test and their sociability in a non constrained situation (i.e. on pasture) and then by assessing if the behaviour of lambs during the arena test could predict their behaviour on pasture. Our hypothesis was that the more lambs would be attracted to or reactive to the separation from flock-mates during the experimental test, the more they would stay close to other animals on pasture.

2. Materials and methods

2.1. Animals and management

The study was carried out at the INRA experimental farm of La Fage (Aveyron, France). The flock consisted of INRA401 ewes, a fixed crossbreed between Romanov × Berrichon-du-Cher (Ricordeau et al., 1992). The ewes were kept on rangeland in a single flock throughout the year including during the lambing period. Lambs were born between mid March and mid April and were weaned at 87 days of age. The lambs were then maintained as a single flock of approximately 700 individuals and were fed *ad libitum* with hay and concentrate. The animals had minimal contact with humans until testing, which occurred two weeks after weaning (i.e., in June–July).

A total of 170 male lambs (10–14 animals per day) were individually exposed to an arena test. Sociability observations were carried out on small groups of lambs on pasture the day after having been exposed to the arena test. There was one group of 10, three groups of 11, five groups of 12, three groups of 13 and two groups of 14 male lambs (i.e., mean = 12 animals per group). Due to video recording problems during the arena test, analysis could only be performed on 163 of those 170 animals.

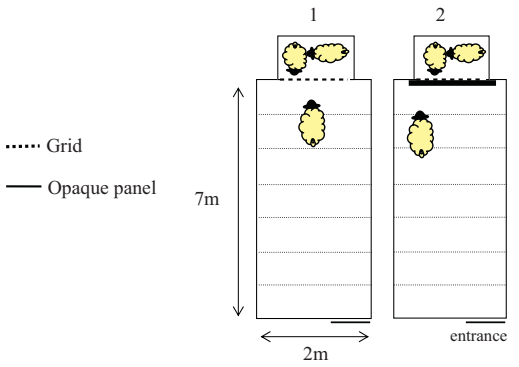

Fig. 1. Experimental setup of the arena test for estimating the social reactivity of lambs. The animals were individually exposed to two phases: (1) Social attraction (30 s). (2) Isolation (1 min).

2.2. Experimental setup

Lambs were first individually exposed to an arena test consisting of two consecutive phases: (1) in presence of flock-mates and (2) after flock-mates were removed. Lambs were then observed at pasture the day after the arena test for their relative social proximity.

The day before being tested in the arena, the lambs were removed from the main flock, moved indoors and placed in a small pen (10 × 10 m) with *ad libitum* access to water, hay and concentrate for the night. The next day each lamb was individually tested using an arena test, in a completely new indoors environment. This test was adapted from the arena test used by Boissy et al. (2005). A mean of 12 male lambs were tested each day. At the end of the testing day, lambs were conducted to a small outdoor enclosure (15 m × 15 m). Coloured numbers were sprayed on both flanks of each lamb so that each individual could be identified at a distance. Animals had unlimited access to water but no food except the grass of the enclosure to ensure that they would be motivated to graze the following morning. The next morning lambs were moved to a pasture plot where observations of the social proximity were carried out. After the observation of social proximity at grazing, animals were moved into a communal pasture with the other male lambs that had already been tested the previous days. They had unlimited access to water and were complemented with concentrates.

2.2.1. Arena test

This test aimed to evaluate the social motivation of lambs through two successive phases: (1) attraction toward familiar flock-mates and (2) reactivity to social isolation. The test was carried out in an enclosure with a dirt floor surrounded by 2 m high solid walls (Fig. 1). Three flock-mates not used as subjects in the present experiment, were placed behind a grid barrier at one end of the testing pen. Those flock-mates consisted of male and female lambs extracted randomly from the main flock. The enclosure was divided into seven 1 m wide zones, zone 7 being just in front of the flock-mates. The first phase began when the lamb to be tested entered the arena (i.e., one leg inside zone 1) and lasted 30 s. The second phase began when an opaque panel