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Applied Animal Behaviour Science 99 (2006) 106–117
APPLIED ANIMAL BEHAVIOUR SCIENCE
www.elsevier.com/locate/applanim

Does the use of a device to measure heart rate affect the behavioural responses of lambs to humans?

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Accepted 4 October 2005
Available online 15 November 2005

Abstract

Devices used to measure cardiac activity (elasticized belt, electrodes, etc.) in standardised behavioural tests could be stressful for the animals, and therefore affect their responses. Preliminary habituation to the device is not always possible. To date, the impact of carrying such devices has been poorly evaluated. In the present experiment, we examined the impact of a device used to measure cardiac activity on the behavioural responses of handled and non-handled lambs in a standard human test. We also studied variations in heart rate in response to human presence and separation. Twenty-one lambs were separated from their dam 12 h after birth: 11 received no additional human contact (non-handled) and 10 received additional contact for 1 week and then 1 day a week until 6 weeks. They consisted of stroking and milk-feeding (handled). At 6.5 weeks of age, each lamb was submitted twice to a behavioural test. The procedure comprised three phases: the lamb stayed alone for 2 min, then for 2 min with the familiar stockperson, and then alone for 2 min again. The tested lambs were equipped or not with a cardiac device in a cross-over design. The device used to measure cardiac activity led to a decrease in vocalisations and locomotion ($P < 0.05$). It had only a limited impact on the behavioural differences between handled and non-handled lambs. It reduced slightly the time spent near the stockperson for the non-handled lambs (mean ± S.E. 0.1 ± 0.1 s with cardiac device versus 3 ± 1 s without; $P < 0.05$) but had no effect on the handled lambs (35 ± 15 s versus 23 ± 10 s; $P > 0.1$). In handled lambs, the frequency of vocalisations and the heart rate decreased as the stockperson entered ($P < 0.05$). When he left, we observed an increase in frequency of

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0168-1591/$ – see front matter
doi:10.1016/j.applanim.2005.10.004

vocalisations but no change in heart rate ($P > 0.1$). No change in heart rate was observed for the non-handled lambs.

We conclude that the device used to measure cardiac activity led to a general decrease in activity but did not affect the difference between handled and non-handled lambs. Consequently, this method seems to be appropriate for further exploring artificially reared lambs' perception of humans, with few risks of behavioural alterations. However, the absolute values of locomotor and vocal activities should be taken with caution. Behavioural and physiological measures were not totally consistent, which questions then-respective emotional significance.

Keywords: Sheep; Human–animal relationship; Handling; Affinity; Heart rate; Methodology

1. Introduction

The relationship between farm animals and their stockperson may affect animal welfare (for review see Boivin et al., 2003). Many behavioural tests have been developed to characterise this relationship, including measuring the animals' spontaneous approach patterns toward a stockperson (rabbits: Bilko and Altbacker, 2000; horses: Lansade et al., 2004; cattle: Pajor et al., 2003; blue foxes: Pedersen et al., 2002; sheep: Tallet et al., 2005). These tests are not only used to assess fear of humans (e.g. Hemsworth and Barnett, 1992) but also attraction toward the stockperson (e.g. Markowitz et al., 1998) and the potential calming effect (reduction of vocalisations or locomotion) induced by his/her presence (e.g. Boivin et al., 2000).

Physiological measurements such as cardiac activity are increasingly used in these tests (e.g. in horses: Sondergaard and Halekoh, 2004 and in cattle: Raussi et al., 2003). Indeed, the combination of behavioural and physiological measures is essential for understanding the emotional perception of a situation by animals (Désiré et al., 2002), especially since interpreting behaviour is not always easy. A typical example is immobility: staying immobile does not always reflect a calm state, as stress can also lead to immobility (Boissy, 1998). While immobility is associated with a low heart rate, stress-induced immobility is associated with a higher heart-rate (in dogs: Reese et al., 1984).

Different methods are used to measure cardiac activity. Some authors use surgery to implant the device, most often with small animals (Cabanac and Cabanac, 2000; Korte et al., 1998; Mandile et al., 2003). Others use a less invasive method where the transmitter is fitted on a belt (Goddard et al., 2000 and Désiré et al., 2004 in sheep; Roussel et al., 2005 in goats; Takeda et al., 2003 in heifers; Mohr et al., 2002 in calves and cows). This method is able to differentiate handled and non-handled animals (e.g. Raussi et al., 2003). However, carrying a belt could be stressful for the animals if they are not habituated to it. Indeed, rats carrying a device such as a radio-collar have a lower cardiac activity than free rats (Mikesic and Drickamer, 1992). Radio-transmitters can also lead to an increase in energy expenditure (Godfrey et al., 2003). Habituation of the animals to the equipment is not always possible or done, in particular because it necessitates frequent prior handlings which could affect the human–animal relationship. Consequently, some authors such as Markowitz et al. (1998) have avoided cardiac measurement in young lambs because they