Automated monitoring of behavioural-based animal welfare indicators

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Abstract

On-farm scoring of behavioural indicators of animal welfare is challenging but the increasing availability of low cost technology now makes automated monitoring of animal behaviour feasible. We discuss some of the issues with using automated methods to measure animal behaviour within the context of assessing animal welfare. Automated feeders (eg for dairy calves) can help measure the degree that animals are hungry and have potential to identify sick animals even in group housing. Such equipment is best used for longitudinal studies of individual animals rather than making comparisons between farms. Devices attached to animals (eg accelerometers or GPS devices) can help measure the activity levels of animals with a high degree of accuracy and can easily be transported between farms, making them best suited for welfare assessment at the group level. Automated image analysis has great potential to assess movement within groups of animals, but following individual animals can be difficult. The techniques have been validated against traditional methods (eg direct observation). The accuracy of measures taken automatically varies between methods but can be increased by combining measures. Technological developments have provided us with a variety of tools that can be used to monitor behaviour automatically, and these have great potential to improve our ability to monitor animal welfare indicators on-farm. However, it is important that methods be developed to measure a wider range of behaviour patterns. Animal welfare assessment schemes should not place undue emphasis on behavioural indicators solely on the basis that they can be monitored automatically.

Keywords: animal behaviour, animal welfare, automated monitoring, behavioural indicators, farm animals, on-farm assessment

Introduction

An article search, using the words ‘automation’ or ‘automatic’ and ‘animal welfare’ reveals that the number of scientific articles using these words increased from 5 in 1997 to 80 in 2010. It is clear that the implications of farm automation for animal welfare are being recognised, including the potential of automation to monitor animal welfare. At its simplest, automated assessment of animal welfare involves using automation to take measures on some aspect of an animal, which a human then interprets in terms relevant to animal welfare; for example, using machines to measure the activity of an animal, which a person then uses to decide whether the animal is lame. In addition, computer algorithms are being developed to make higher order inferences from data collected automatically, eg judging whether an animal is lame or not. In this paper, we focus on using automated methods of measuring animal behaviour. We do not deal intensively with the technical aspects of the equipment available, nor do we attempt a comprehensive review of all of the uses to which automation has been put. Instead, we focus upon some of the issues in using automation to increase the use of on-farm behavioural recording in the context of assessing animal welfare at both the level of the individual animals and at the farm and group level. We include self-assessments of animal welfare carried out by farmers themselves as well as third-party audits.

Why automate? Most recent analyses of the concept of animal welfare accept that behavioural issues are a key aspect. This is apparent in the Five Freedoms (www.fawc.org.uk/freedoms.htm), which include the ‘freedom’ to perform most normal patterns of behaviour. Furthermore, behavioural measures, such as the occurrence of aggression or stereotypic behaviour, are important indicators of welfare problems. Including behavioural-based welfare criteria is, therefore, essential for an overall welfare assessment (Blokhuis et al 2010). Despite this, current on-farm welfare assessment schemes often focus heavily on health issues and include few behavioural measures. We suggest that this is due mainly to the difficulty, time involved and cost in taking behavioural measures during farm visits (Edwards 2007; Sørensen et al 2007); the occurrence of behaviour patterns is often erratic over time or else their recording requires long periods of observation, while on-farm assessments need to be done in a short period of time (Edwards 2007; Webster 2009). These problems are likely to