Validation of scan sampling techniques for behavioural observations of pastured lambs

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Abstract

The study of farm animal behaviour is a critical tool for assessing animal welfare. Collecting behavioural data with continuous sampling or short scan sampling intervals (eg every 60th second) is considered ideal as this provides the most complete and accurate dataset; however, these methods are also time and labour intensive. Longer sampling intervals provide an alternative in order to increase efficiency, but these require validation to ensure accurate estimation of the data. This study aims to validate scan sampling intervals for lambs (Ovis aries) housed on pasture. Grazing, lying, standing, drinking, locomotion, and mineral consumption were evaluated from six pens of crossbred lambs (six lambs per pen) for 15 h. Data from 1-min instantaneous scan sampling were compared with data from instantaneous scan sampling intervals of 5, 10, 15, and 20 min in two statistical tests: generalised linear mixed model and regression analysis. Using the mixed model, the percentage of time each behaviour was performed did not differ amongst sampling intervals for all behaviours except grazing, which was statistically different at 20-min intervals. Using regression analysis, lying and grazing estimations were accurate up to 20-min intervals, and standing was accurate at 10- and 20-min intervals only. Locomotion, mineral consumption, and drinking demonstrated poor associations for all tested intervals. The results from this study suggest that a 10-min instantaneous scan sampling interval will accurately estimate lying, grazing, and standing behaviour for lambs on pasture. This validation will assist with the efficiency of future data collection in lamb behaviour and welfare research.

Keywords: animal welfare, lamb, pasture, scan sampling, sheep, validation

Introduction

The study of farm animal behaviour is considered an integral parameter for assessing animal welfare (Gonyou 1994). Understanding the behavioural needs and preferences of farm animal species provides the basis for scientists to investigate the impact of animal management strategies on behavioural deviations and overall welfare of that individual or group (Gonyou 1994). To date, the most common methods to evaluate behaviour in livestock species include continuous or scan sampling. Continuous sampling is considered the gold standard for collecting behavioural data as it provides the most complete and accurate dataset (Lehner 1992); however, this method is time and labour intensive, particularly in studies with large sample sizes and a high number of behaviours recorded, and may not be feasible due to technological or logistical limitations. To avoid this problem, researchers often rely on scan sampling methodology by recording behaviours at selected time-points within a sample period and estimating a proportion of time the animal spent performing a specific behaviour (Martin & Bateson 2007). In particular, short scan sampling intervals (eg every 60th second) are especially similar to continuous observation for certain behaviours (Mitlöhn et al 2001; Miller-Cushon & DeVries 2011). However, even a short scan interval can prove to be inefficient and identifying a longer, appropriate scan sample technique that provides accurate data in an efficient time-period could be subjective. Therefore, recent research has focused on validating scan sampling techniques among a variety of farm animal species, including laying hens (Daigle & Siegford 2014), broiler chickens (Kristensen et al 2007), dairy calves (Miller-Cushon & DeVries 2011), dairy cows (Endres et al 2005; Ledgerwood et al 2010; Kitts et al 2011), feedlot cattle (Mitlöhn et al 2001), and pigs (Arnold-Meeks & McGlone 1986; Whalin et al 2016). Despite these recent publications, the authors are unaware of research validating scan sampling techniques for lambs in a pasture setting.

In the United States, over 60% of sheep flocks are primarily managed on pasture (ie any fenced area specifically cultivated to raise forage or browse; USDA 2012). This trend is similar internationally with the majority of sheep raised in either pasture or rangeland systems (Nowak et al 2008). Therefore, most sheep behavioural research has been conducted on pasture systems, including work evaluating behavioural deviations due to influences of stocking density (Lin et al 2011), flock dynamics (Bojkovski et al 2014),