

# Are wormy sheep worried? A qualitative behavioural assessment of sheep with intestinal parasites

E.P. Grant<sup>1\*</sup>, S.L. Wickham<sup>1</sup>, F. Anderson<sup>1</sup>, A.L. Barnes<sup>1</sup>, P.A. Fleming<sup>1</sup>, & D.W. Miller<sup>1</sup>

<sup>1</sup>School of Veterinary & Life Sciences, Murdoch University, WA, 6150 Australia

\*Corresponding author email: e.grant@murdoch.edu.au

**Qualitative behavioural assessment (QBA) is a technique for assessing sheep in states of altered welfare. QBA was used to investigate whether the behaviour of sheep with intestinal parasites ('unhealthy') differed compared to 'healthy' animals. Video footage was captured of ten Merino sheep from two treatments; 'healthy' and 'unhealthy', both before and after anthelmintic treatment. The 20 videos were assessed by 35 observers using a QBA methodology. Generalised Procrustes analysis identified three main dimensions of behavioural expression, and the position of sheep on these dimensions varied depending on treatment. Differences in behavioural expression were evident between 'unhealthy' and 'healthy' sheep, and also pre- and post-anthelmintic treatment. In conclusion, QBA can differentiate differences in sheep behaviour related to intestinal parasite burden.**

**Key words: helminth, QBA, welfare**

## I. INTRODUCTION

The general health and wellbeing of sheep in production environments can be subjected to challenges. Therefore it is important to regularly monitor and assess sheep welfare, but this can be difficult for large-scale enterprises with limited labour. Intestinal parasites are considered an important challenge for the sheep industry, with poor intestinal health associated with reductions in growth and performance [1]. The current method for detection of parasite burden is faecal egg count (FEC), which can be both disruptive for the sheep and time consuming for the staff. As such, the sheep industry is interested in developing alternative methods for detection of sheep with high intestinal parasitic burdens. To date, few studies have investigated the application of behavioural analyses for this purpose. Qualitative Behavioural Assessment (QBA) has been proposed as a methodology for assessing behaviour relevant to welfare, one that is naturally suited for on-farm application, being quick, easily to implement and non-disruptive [2, 3, 4]. As such, the present study explored the application of QBA to investigate the expressive behaviour of sheep with high intestinal parasitic burdens. The hypotheses tested were that; (i): sheep with high intestinal parasitic burdens, as indicated by high FEC and anaemia, will exhibit different behavioural expression to those sheep that are healthy (with respect to intestinal parasites), which can be identified using QBA; and (ii) that the behavioural expression of those same sheep would differ following anthelmintic treatment.

## II. MATERIALS AND METHODS

The behaviour of ten Merino sheep in varying conditions of intestinal health; 'healthy' (n=5; anthelmintic treatment not required based on FEC) or 'unhealthy' (n=5: anthelmintic treatment required based on FEC), were assessed using QBA. All sheep were selected from the same flock, and the allocation of individuals to treatment group was achieved by FEC and mucous membrane anaemia scores. Faecal sampling and subsequent (next day) video footage capture of the ten sheep in the paddock was conducted one week prior to treatment of all animals with an anthelmintic drench, and again two weeks following treatment, such that each sheep was filmed twice; once before treatment and once after. This footage was compiled into a series of assessment clips (n = 20) and presented, at random, to 35 observers for QBA analysis. Using a free choice profiling QBA methodology, observers first generated lists of descriptive terms, and these terms were then used to assess the clips using a visual analogue scale, ranging from minimum to maximum expression (i.e. 0-100). Patterns in behavioural expression perceived by observers using this methodology were identified by means of a generalised Procrustes (GPA) and principal component analyses resulting in the creation of a multidimensional matrix where each animal is represented along the continuum of the descriptive terms that best describe each dimension. Treatment differences in the behavioural expression of the sheep were analysed using repeated-measures ANOVA.

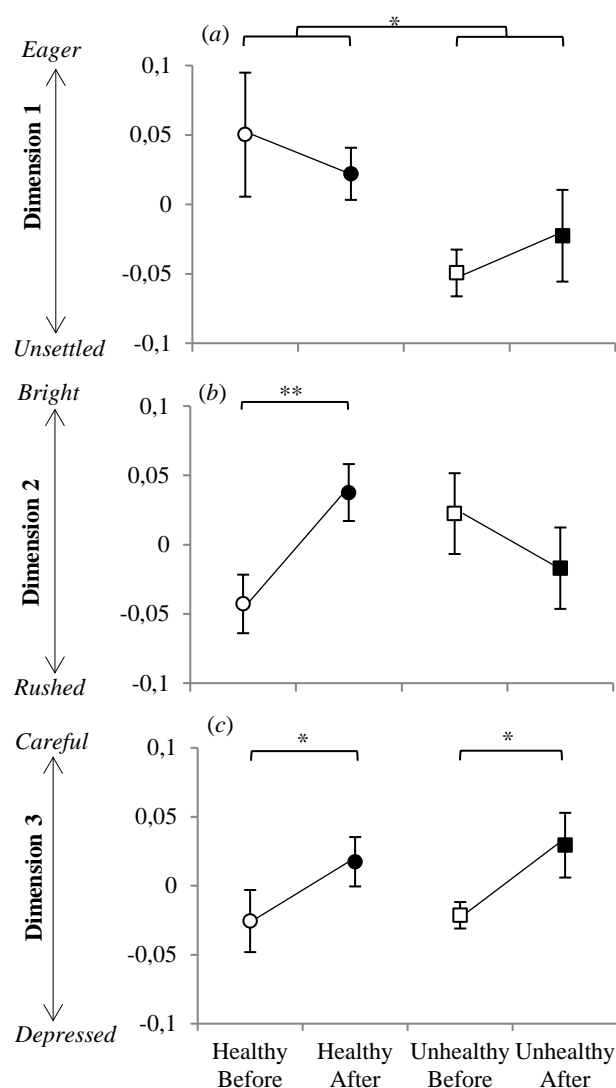


Figure 1. Position of sheep within their treatments on GPA dimensions 1 (a), 2 (b) and 3 (c) for before and after treatment intervention. \*  $P<0.05$ , \*\*  $P<0.001$

tool to help distinguish sheep with compromised intestinal health that need treatment, but it may also be used to monitor animals following treatment to test for effectiveness/resistance of the anthelmintic.

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## III. RESULTS AND DISCUSSION

There was good agreement ( $P<0.001$ ) between the observers in their assessments of the behavioural expression of the sheep, with the GPA consensus profile explaining 42% of the variation between observers. The three main dimensions of the consensus explained 25%, 17% and 10% of the variation in scores attributed to individual sheep, respectively.

In support of the hypotheses, significant differences in behavioural expression were identified on the three dimensions (Figure 1). Observers were able to distinguish differences in behavioural expression between the treatments, with 'unhealthy' sheep described as more 'unsettled/apprehensive' when compared to 'healthy' sheep (more 'eager/rushed') along GPA dimension 1 ( $P<0.05$ ).

In addition, the anthelmintic treatment altered the behavioural expression of the sheep. Specifically, there was a significant effect on Dimension 3 ( $P<0.05$ ), where both 'healthy' and 'unhealthy' sheep were described by the observers as having a less 'depressed/suspicious' demeanour following anthelmintic treatment. Moreover, on Dimension 2 the 'healthy' sheep were described as more 'bright/observant' following anthelmintic treatment ( $P<0.001$ ) intervention.

## IV. CONCLUSION

These findings demonstrate that sheep with different intestinal parasitic burdens display differences in behavioural expression, and these differences can be identified using the QBA methodology. Therefore, not only does the potential exists for QBA to be used as a