

# Observer reliability of a locomotion scoring scale in sheep



J. Kaler, G. J. Wassink and L.E. Green



Ecology and Epidemiology Group, Dept. Biological Sciences,  
The University of Warwick, Coventry, CV4 7AL, UK E-Mail: j.kaler@warwick.ac.uk

## INTRODUCTION

- Locomotion scoring scales are used to monitor lameness in various livestock species
- Lameness in sheep is one of the biggest health and welfare problems in U.K.
- Two Locomotion scoring scales are developed previously (Ley et al., 1989 and Welsh et al., 1993)
  - Both these numerical rating scales are subjective and lack sensitivity

## AIM

- To develop and test the between and within observer reliability of a 7 point numerical verbal locomotion scoring scale in sheep

Posture and locomotion	0	1	2	3	4	5	6
Bears weight evenly on all four feet							
Uneven posture							
Short stride							
Noticeable flicking of head in time with short stride							
Excessive flicking of head							
No weight bearing on affected limb when standing							
Discomfort when moving							
No weight bearing on affected limb when moving							
Extreme difficulty on rising							
Reluctant to move							
More than one limb affected							
Will not stand or move							

## METHODOLOGY

### 1. Observers and Observations

- Three observers randomly selected
- Sample size required : 30, based on 3 observers, expected inter observer reliability  $\rho_1 = 0.85$  and accepted inter observer reliability  $\rho_0 = 0.7$  or higher,  $\alpha = 0.05$ ,  $\beta = 0.2$  (Walter et al., 1998)

### 2. Locomotion Videos and Training

- 65 videos with range of locomotion scores 0 - 6 were made. Each clip 35-50 sec long
- 30 videos were randomly selected for testing observer agreement
- Observers were trained using 10 locomotion videos and also given test videos

### 3. Testing

- 30 videos burnt to a DVD with a 40 sec lag between each video
- Observer asked to independently assess the videos and assign the score
- Observers re assessed the same thirty clips presented in randomised order after 4 hours

### 4. Data analysis

- Observer Reliability (Inter and Intra)
  - Percent exact agreement and one/more than one score disagreement
  - Intraclass correlation coefficient (two way random effect model)
  - Weighted kappa Coefficient
  - Observer association- Pearson's correlation coefficient
  - Observers bias – one way ANOVA

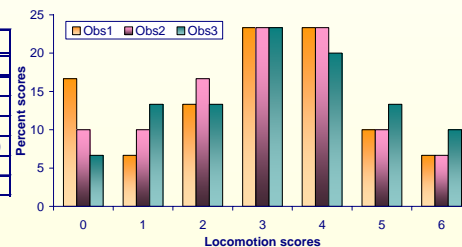
## RESULTS

- There was high inter and intra observer reliability (Table 1) with no evidence of observer bias ( $F=0.23$ ,  $df=2, 87$ ,  $p=0.79$ )

Table 1: Levels of agreement between and within observers (n=30)

	Between Observers			Within Observers		
	1 & 2	2 & 3	1 & 3	1	2	3
Exact agreement	70%(21)	70% (21)	63% (19)	77% (23)	73% (22)	77%(23)
One score disagreement	30% (9)	27%(8)	33% (10)	20% (6)	23% (7)	17% (5)
More than one score disagreement		3% (1)	3% (1)	3% (1)	3% (1)	7% (2)
Intraclass correlation coefficient		0.93 (0.87-0.96)		0.89 (0.79-0.94)	0.92 (0.84-0.96)	0.90 (0.81-0.95)
Pearson correlation coefficient	0.95	0.92	0.94	0.92	0.93	0.90
Weighted Kappa	0.95 (0.91-0.98)	0.91 (0.85-0.97)	0.93 (0.87-0.98)	0.92 (0.82-1)	0.93 (0.86-0.99)	0.89 (0.77-1)

Figure 1: Distribution of locomotion scores by observers



## CONCLUSION

- The locomotion score scale presented is reproducible and repeatable when used by trained observers.

## ACKNOWLEDGEMENTS

- MLC for funding, T.R.N. George and Elisabeth Hawker for contributing to this study

## REFERENCES

- Ley, S.J., Livingston, A., Waterman, A.E. 1989. The Effect of Chronic Clinical Pain on Thermal and Mechanical Thresholds in Sheep. Pain, 39, 353-357.
- Walter, S.D., Eliasziw, M., Donner, A. 1998. Sample Size and Optimal Designs for Reliability Studies. Statistics in Medicine, 17, 101-110.
- Welsh, E.M., Gettinby, G., Nolan, A.M. 1993. Comparison of a Visual Analogue Scale and a Numerical Rating Scale for Assessment of Lameness, using Sheep as a Model. American Journal of Veterinary Research, 54, 976-983.