

# Intra-rater reliability among postural and gait abnormalities detected using locomotion scoring with observations in milking parlor and headlock stanchions

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## Introduction

Dairy cow lameness is an important health issue, with a negative impact in animal welfare and productivity. Lameness has been assessed using a locomotion scoring (LS) system based on behaviors and postures related to gait. However, LS evaluation is a time consuming task that is not routinely performed on large dairies. Implementation of methods for early lameness detection that are easily incorporated into management could increase the rate of detection. The objective of this study was to evaluate the intra-rater reliability among postural and gait abnormalities detected using locomotion scoring with observations in milking parlor (MP) and headlock stanchions (S).

## Materials and Methods

The study was conducted on a 2,406 milking cow free-stall Holstein dairy with two 2x20 herringbone milking parlors in Tulare County, CA. On Day 1 and 2 of the study, cows (n = 2,205) were locomotion-scored as they exited the MP by a team of two trained veterinarians using a five point scoring system. Cows were classified as lame when LS  $\geq$  3. On Day 3 (n = 2,205), cows were evaluated in the MP (one evaluator in each milking parlor). Cows were classified as lame if they showed any of the following signs: uneven gait, arched back, favoring a limb, legs wide stance or medial rotation of hocks. On day 4, cows (n = 1,186) were observed by both evaluators while locked at S for estrus detection and AI. Cows were categorized as lame if they presented any of the following signs arched back, favoring a limb, legs wide stance or medial rotation of hocks. Intra-rater reliability among different methodologies for lameness detection (MP, S, and MP and S combined) was calculated

as percent agreement, kappa and prevalence-adjusted bias-adjusted kappa (PABAK). The validation of those methodologies as diagnostic tests was evaluated as sensitivity, specificity and predictive values using LS as a reference diagnostic technique for lameness.

## Results

Postural and gait abnormalities were detected in 7.9% (LS3), 1.3% (LS4) and 0% (LS5) of the cows based on LS evaluation, in 12.0% of the cows based on MP observations and 7.3% of the cows based on S observations. Intra-rater reliability between LS and MP observations was found to be poor, with 85.7% of agreement [kappa = 0.2 (95% CI: 0.19 – 0.31); PABAK=0.8 (95% CI: 0.68 – 0.74)]. Similarly, intra-rater reliability between LS and S observations was also poor, with 89.9% of agreement [kappa = 0.2 (95% CI: 0.10 – 0.29); PABAK = 0.8 (95% CI: 0.76 – 0.83)]. When combining MP and S as a diagnosis strategy the agreement with LS was 83.8% [(kappa = 0.1 (95% CI: 0.01-0.14); PABAK = 0.7 (95% CI: 0.63-0.72)].

Using LS as reference diagnostic technique, sensitivity was 37.9% for MP, 27.0% for S and 54.1% for MP and S combined. Specificity was 90.5% for MP and 94.1% for S, and their negative predictive values were 93.5% and 95.1% respectively. However, positive predictive values were meager (28.8% MP, 23.3% S).

## Significance

Postural and gait abnormalities observed in the MP and S were not acceptable predictors of lameness using LS as the reference diagnostic technique. Further research should be directed to assess concordance of the strategies described in the present study with painful hoof lesions.