FOUR LEG NEWS

OUTCOME MEASURES – SUBJECTIVE LAMENESS EVALUATION

Hi Folks!
Well, of all the things I have set down to research, this one was perhaps the most shockingly dismal! I figured that with all of the years of veterinary medicine, lameness scales surely MUST have been objectively studied. But the truth is 'nope, not really'! So, I'll give the punch line up front: There isn't a validated subjective lameness scale! Really?? Yes, really! However, since other objective gait analysis measures aren't always feasible or practical in clinical practice, perhaps looking at subjective measures warrants a wee bit of time just the same. I hope you find this useful, enlightening, or head scratching information!! All in all, enjoy the read!
Cheers,
Laurie

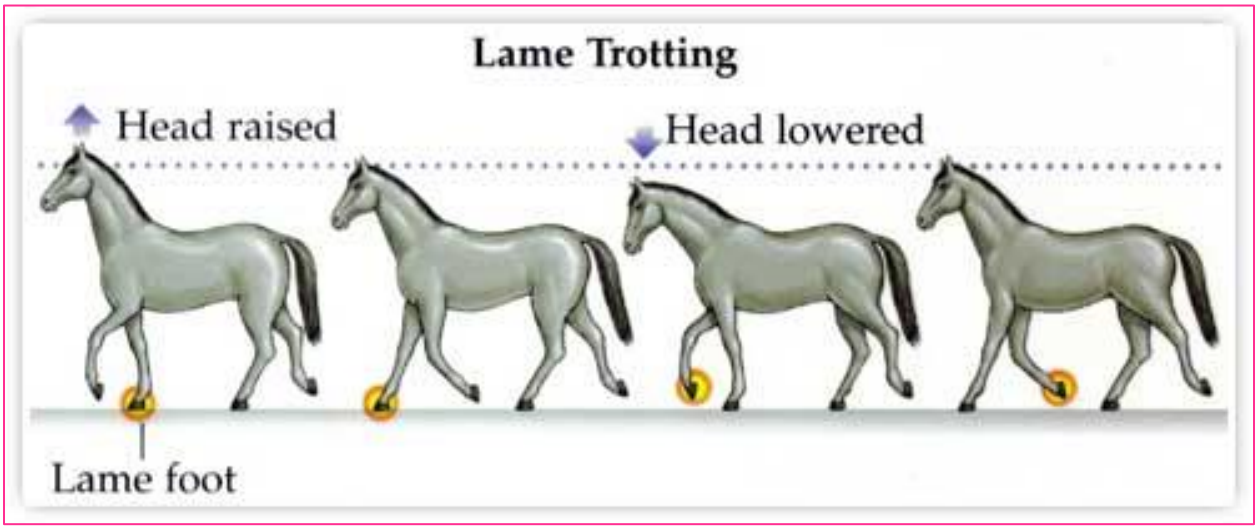
Why subjectively evaluate lameness?

Lameness scoring and lameness scales are abundant in veterinary medicine. However, none have been validated and there is no standardization in canine orthopaedics in regards to which lameness score to use.

The American Association of Equine Practitioners (AAEP) guidelines explain the grading system this way:

0. - Lameness not perceptible under any circumstances.
1. - Lameness is difficult to observe and is not consistently apparent, regardless of circumstances (e.g. under saddle, circling, inclines, hard surface, etc.).
2. - Lameness is difficult to observe at a walk or when trotting in a straight line but consistently apparent under certain circumstances (e.g. weight-carrying, circling, inclines, hard surface, etc.).
3. - Lameness is consistently observable at a trot under all circumstances.
4. - Lameness is obvious at a walk.
5. - Lameness produces minimal weight bearing in motion and/or at rest or a complete inability to move.

https://aaep.org/horsehealth/lameness-exams-evaluating-lame-horse (accessed June 1, 2020)



However, this scoring system may not be applicable to dogs. It should also be noted that subjective lameness evaluation scoring methods have not fared well compared to force plate analysis and vary greatly between observers (Quinn et al. 2007, Waxman et al. 2008). In cases of induced lameness, subjective evaluation of the lameness varied greatly between observers

and agreed poorly with objective measures of limb function (Waxman et al. 2008). Quinn et al. (2007) noted that subjective scoring scales most accurately reflect force plate gait analysis only when lameness is severe and subsequently do not replace force plate gait analysis. Evans and colleagues also compared visual observation of gait to force plate analysis. Their study evaluated Labrador retrievers—131 that were 6-months post-operative for unilateral cranial cruciate ligament injury and 17 normal controls. The observer only identified 11% of the 131 dogs that were 6-months post-surgery as being abnormal compared with force plate analysis, which revealed that 75% of the 131 dogs failed to achieve ground reaction forces consistent with sound Labrador retrievers (Evans et al 2005). Furthermore, a caregiver placebo bias has been noted for dogs with lameness from osteoarthritis (Conzemius & Evans 2012). The effect was noted in both owners and veterinarians when evaluating lameness and when compared to force plate analysis.

Force plate analysis is costly, time consuming, and is not typically available in a clinical setting. As such, grading of lameness is still practiced clinically. So, we might as well look at what scales are being utilized!

Lameness Scales

In the book entitled Canine Lameness, editor, and author of the chapter on Subjective Gait Analysis, Felix M. Duerr presents his own unvalidated numerical rating score (Duerr 2019).

Table 1.1 Unvalidated numerical rating score used by the author to subjectively quantify canine lameness.

Score	Lameness degree	Lameness description
0	None	*No identifiable lameness* Weight-bearing at all times
1	Slight	*Inconsistent lameness* that is difficult to observe and/or it is difficult to determine the affected limb (i.e. no consistent head movement/pelvic tilt is observed) Weight-bearing at all times
2	Mild	Clearly detectable lameness associated with minor *head movement/pelvic tilt* Weight-bearing at all times
3	Moderate	Clearly detectable lameness associated with obvious *head movement/pelvic tilt* Weight-bearing at all times
4	Severe	Clearly detectable lameness associated with obvious head movement/pelvic tilt *Occasionally non-weight-bearing/toe touching*
5	Non-weight-bearing	*Always non-weight-bearing/toe touching*

This scoring system can be applied at the walk and/or the trot depending on the patient's clinical status. The patient should only be scored during motion (i.e. off-loading at a stance is not included in this assessment). To increase the sensitivity, the scoring system can be applied for both gaits. If a comparison between different time points is performed, only the scoring within one gait can be compared.

Another numerical rating scale for subjective gait analysis was presented by Carr & Dycus (2016) in Today's Veterinary Practice.

TABLE 3.
Example of a Numerical Rating Scale for Visual Assessment of Gait

LAMENESS GRADE	DESCRIPTION
Grade 1	Sound at the walk, but weight shifting and mild lameness noted at trot
Grade 2	Mild weight-bearing lameness noted with the trained eye
Grade 3	Weight-bearing lameness, typically with distinct "head bob"
Grade 4	Significant weight-bearing lameness
Grade 5	Toe-touching lameness
Grade 6	Non–weight-bearing lameness

Note: *Grades 2 through 6 lameness can be observed at the walk or trot.*

The same authors also showed a Visual Analogue Scale (VAS) that could be used in conjunction with the numerical rating scale.

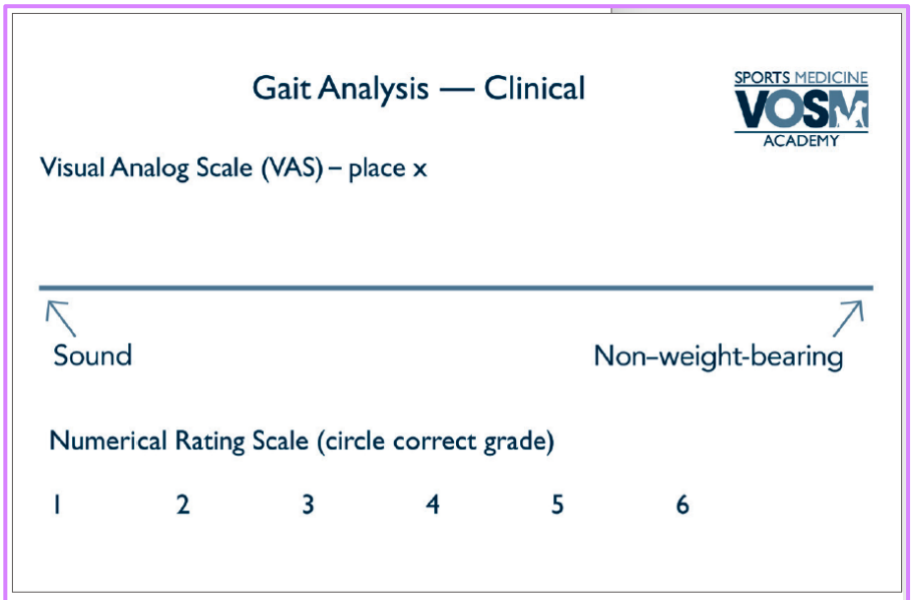


FIGURE 1. Example of the visual analog scale (VAS): The animal is graded on a 10-cm line, with one end of the line representing "sound" and the other end representing "non–weight-bearing." An "X" is placed along the scale, noting the degree of lameness, and then the VAS can be placed into the patient's record. Either the veterinarian or a trained staff member typically completes the VAS. Previous VASs can be compared to determine if there is improvement, decline, or no change.

They commented, “While force plate analysis has been shown to be superior to visual observation, visual observation is still a practical tool in clinical practice, and its importance should not be discounted.”

Other lameness scales could be found by google searching. Here’s are two found at the following URL:
https://cvm.ncsu.edu/wp-content/uploads/2015/06/Dunning-September2012VMF.pdf

Tables 2 and 3. Numeric lameness scoring systems

NUMERIC GRADE	DESCRIPTION
0	Normal, no lameness
1	Off weight bearing at a stance, no lameness noted at a walk/trot
2	Mild lameness at a trot, none at a walk
3	Moderate lameness at a walk/trot
4	Places foot when standing, intermittently carries limb when trotting
5	Non-weight bearing lameness

NUMERIC GRADE	DESCRIPTION
0	Sound
1	Occasionally shift weight
2	Mild lameness at a slow trot, none at a walk
3	Mild lameness while walking
4	Obvious lameness while walking, but places the foot when standing
5	Degrees of severity
6	Degrees of severity
7	Degrees of severity
8	Degrees of severity
9	Places toe when standing, carries limb when trotting
10	Unable to put the foot on the ground

(Tables modified from Sumner-Smith, G: Gait Analysis and Orthopedic Examination. *In* Textbook of Small Animal Surgery, 2nd ed.1993, p. 1578.

Additional Lameness Scales were found without reference to the original source. I like the inclusion of 'Stance'.

LAMENESS SCALE (0 – 4 Scale)				
Standing			Walking / Trotting	
0:	Normal stance		0:	No lameness
1:	Slightly abnormal stance (PWB)		1:	Lameness barely perceptible
2:	Moderately abnormal stance (TTWB)		2:	Lameness obvious, but not severe
3:	Severely abnormal stance (NWB)		3:	Severe lameness
4:	Unable to stand		4:	Partial or complete NWB

LAMENESS SCALE (1 – 5 Scale)	
Grade 1:	Difficult to observe; not consistently apparent regardless of circumstance (i.e. circling, inclines, hard surfaces)
Grade 2:	Difficult to observe at a walk or trot in a straight line; consistently apparent under certain circumstances (i.e. Circling, inclines, hard surfaces)
Grade 3:	Consistently observable under all circumstances
Grade 4:	Obvious lameness; marked head bob, hitching, or shortened stride
Grade 5:	Minimal weight bearing in motion and/or at rest; inability to move limb

Lastly, my google searching led me to what appears to be some unpublished research (Wolfe T. 2014). While the conclusion of the paper stated, "The 0 to 5 scale does not appear to be a valid form of gait analysis for most individuals to utilize to show changes in gait or to use as an outcome measure. It can be, however, moderately valid to utilize when charting progress of an individual dog by one practitioner."

The scale utilized in this study was as follows:
0/5 = Normal gait pattern
1/5 = Mild lameness, needing a trained eye to see
2/5 = Moderate lameness with a normal stride length and partial weight bearing
3/5 = Moderate lameness with shorter stride length and partial weight bearing
4/5 = Severe lameness with toe touch weight bearing and minimal use of the limb
5/5 = Non-weight bearing

References:

Carr BJ, Dycus DL. Canine Gait Analysis. Today's Veterinary Practice. March/April 2016: 91 – 100.

Conzemius MG, Evans RB. Caregiver placebo effect for dogs with lameness from osteoarthritis. *J Am Vet Med Assoc*. 2012;241(10):1314-1319.

Duerr, FM (2020). Subjective Gait Evaluation. In: *Canine Lameness*, (ed. FM Duerr), 5-13. Hoboken, NJ: WILEY Blackwell.

Dunning D. Orthopedic Rehabilitation. September 2012. https://cvm.ncsu.edu/wp-content/uploads/2015/06/Dunning-September2012VMF.pdf (accessed June 1, 2020).

Evans R, Horstman C, Conzemius M. Accuracy and optimization of force platform gait analysis in Labradors with cranial cruciate disease evaluated at a walking gait. Vet Surg 2005; 34(5):445-449.

Quinn MM, Keuler NS, Lu Y, Faria ML, Muir P, Markel MD. Evaluation of agreement between numerical rating scales, visual analogue scoring scales, and force plate gait analysis in dogs. *Vet Surg*. 2007;36(4):360-367.

Waxman AS, Robinson DA, Evans RB, Hulse DA, Innes JF, Conzemius MG. Relationship between objective and subjective assessment of limb function in normal dogs with an experimentally induced lameness. *Vet Surg*. 2008;37(3):241-246.

Wolfe T. Numerical Lameness score intra-rater reliability, inter-rater reliability, and validity in canine gait assessment. December 26, 2014. https://thek9bodyshop.com/about-therapists/publications/numerical-lameness/ (accessed June 1, 2020).

Final Thoughts

We all do gait analysis when we watch a dog come in or move down a hallway, even if we don't 'grade' it. However, if you take some time to pick a scale that resonates with you and that you feel comfortable with, perhaps you can have a modest degree of reliability with it. Or maybe this dissertation will make you feel like giving a number to what you see is of no use at all. Either way, you have been presented with information to base a decision upon.

On that note! Happy limp-spotting!

Laurie Edge-Hughes, BScPT, MAnimSt (Animal Physio.), CCRT, CAFCI

Four Leg Rehab Inc
PO Box 1581,
Cochrane, AB T4C 1B5 Canada
Laurie@Fourleg.com