

A preliminary study to investigate the passive range of motion of the proximal limb joints and relationships to British Veterinary Association/Kennel Club (BVA/KC) hip score in dogs

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Summary:

Implications Joint range of motion (ROM) data may be an effective, low cost, monitor of susceptibility to hip dysplasia (HD) in dogs and for evaluation of any progression.

Introduction Hip dysplasia continues to be one of the most common orthopaedic diseases in dogs. Dogs afflicted with HD can often show minimal to no clinical signs but it can be a highly debilitating condition. Currently, prediction or measurement of HD is only available through orthopaedic examination and pelvic radiographs. It would be beneficial to be able to assess any progression of the disease on a more regular basis. Joint ROM describes the limits of which a particular joint can move, in its physiological planes of motion, either actively or passively. Passive ROM demonstrates the integrity of the joint capsule, ligaments, fascia and articular surfaces of the joint without the influence of muscle activity. The aim of the present study was to provide scientific data on passive joint ROM of the shoulder, elbow, hip and stifle joints and whether there are relationships between particular joint ROM and to BVA/KC hip score in dogs.

Material and methods 16 KC registered, healthy, sound, single breed (Siberian Husky) dogs of mixed gender (9 female, 7 male) and age >1 year (mean±s.d.: 7.6±3.8 years), that live and work together, were used to minimise genetic and environmental effects. Goniometry was used to measure joint range of motion as it has been validated in dogs (Jaegger *et al*, 2002) as a reliable, repeatable, non-invasive method of measuring passive ROM and is economical and easy to learn. Dogs were conscious, placed in lateral recumbency and specific bony landmarks identified. Triplicate goniometer measures of joint flexion and extension were measured on both sides of each dog for the shoulder, elbow, hip and stifle joints. All measures were taken by the same investigator who was previously tested for acceptable repeatability of measurement as per Jaegger *et al*, 2002. Wither height and body weight were also measured. Mean values of the triplicate measures were computed for each dog. Data was analysed using Students t-test and Pearson Moment Correlation statistics to investigate gender, age (<6yrs vs. >6yrs) and laterality effects on joint range of motion and any relationships to BVA/KC hip score.

Results Gender and age had no significant effect ($p>0.05$) on joint range of motion measures for flexion or extension of the shoulder, elbow, hip and stifle joints.

Table 1 Joint ROM measures for all dogs (mean±s.d., (range))

Joint	Joint flexion (degrees)		Joint extension(degrees)	
	left side	right side	left side	right side
Shoulder	61.4±8.3 (46.7-72.7)	65.6±9.0 (51.0-81.3)	128.3±12.8 (106.3-158.7)	114.3±7.8 (102.3-127.0)
Elbow	29.9±4.9 (19.7-37.7)	26.2±5.0 (19.7-38.7)	132.1±7.3 (118.0-143.7)	133.6±7.5 (120.0-146.0)
Hip	71.9±8.7 (57.0-91.7)	65.2±8.1 (45.7-77.7)	121.3±9.8 (106.0-139.0)	126.8±7.7 (113.7-141.7)
Stifle	34.7±4.7 (26.0-45.7)	42.5±4.5 (35.0-51.7)	125.7±7.7 (107.3-137.7)	125.0±5.9 (115.7-135.0)

There were statistically significant differences between the left and right side ROM measures of the hip ($p<0.01$), stifle ($p<0.01$), shoulder ($p<0.001$) and elbow ($p<0.05$) joints with differences in joint flexion being the dominant effect. There was a significant correlation between total BVA/KC hip score and joint ROM means for left elbow extension ($r=0.559$, $p=0.02$) and right hip extension ($r=0.518$, $p=0.04$). There was a significant correlation between right side BVA/KC hip score and left elbow extension ($r=0.606$, $p=0.01$) and right hip extension ($r=0.704$, $p=0.002$). There was no significant ($p>0.05$) laterality effect for neither hip nor elbow extension ROM.

Conclusion Bilateral ROM measurement is important to consider. Dogs tested radiographically to have a higher hip score on a particular side, may predispose to an increased extension range of that hip joint and the contralateral forelimb elbow extension. This could have implications in monitoring limb joint function of dogs, with and without a BVA/KC hip score test, as an indicator of sub-clinical changes related to movement dysfunction.

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References: Jaegger, G., Marcellin-Little, D.J., Levine, D. 2002. American Journal of Veterinary Record. 63(7) 979-986.