Problem Solving Mobility Cases:

Improving your diagnostic acuity with veterinary rehabilitation techniques

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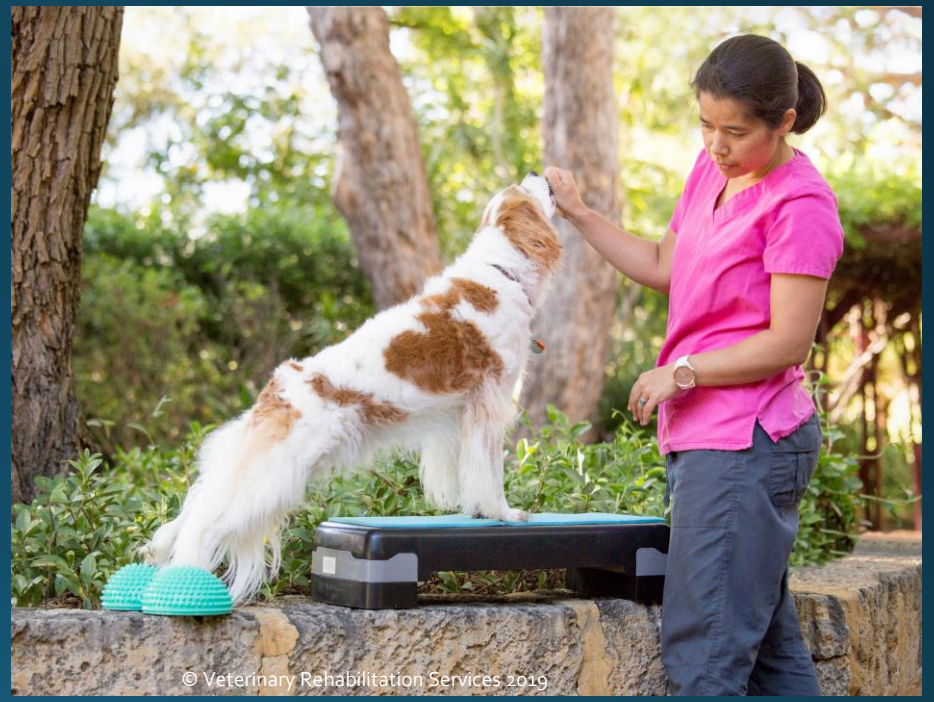
Declaration of Interest:

- Funding Sources – *Zoetis (paid consultant)*
- Financial Interests - *none*
- Other Interests – PASSION FOR REHAB!

- *All images & videos are mine, unless referenced*



Hill's
Transforming Lives

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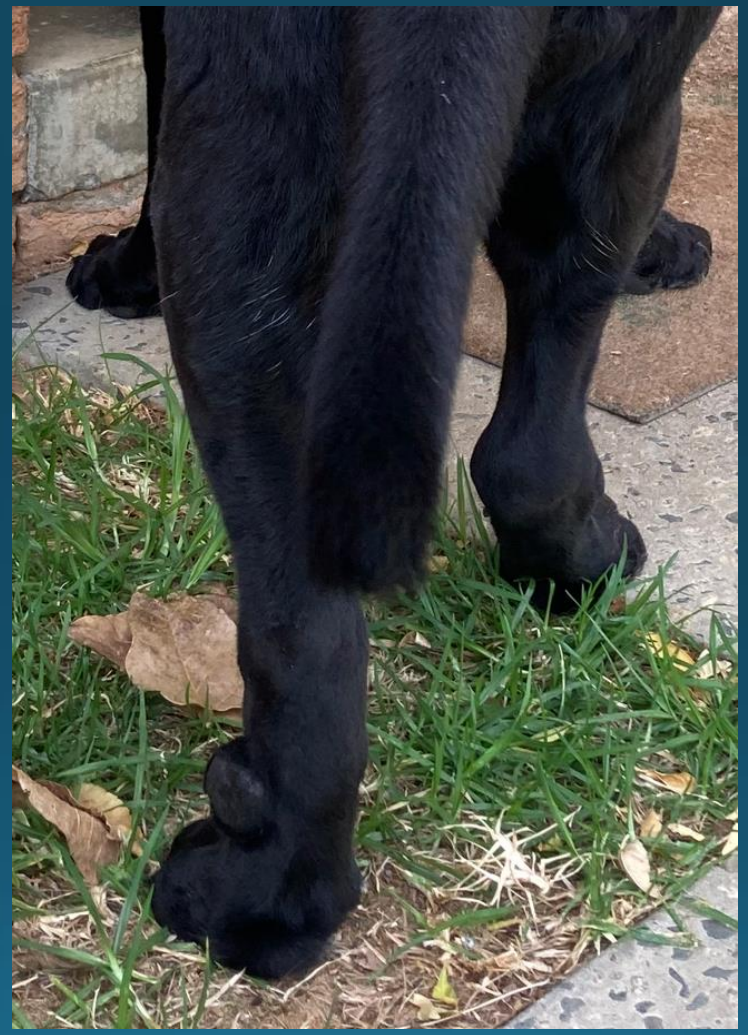
Primary joint changes:

- Pain
- Crepitus
- Effusion / thickening of joint
- ↓ ROM
  - →involuntary
  - →measured with goniometer

Lameness



Bonnie

Koda

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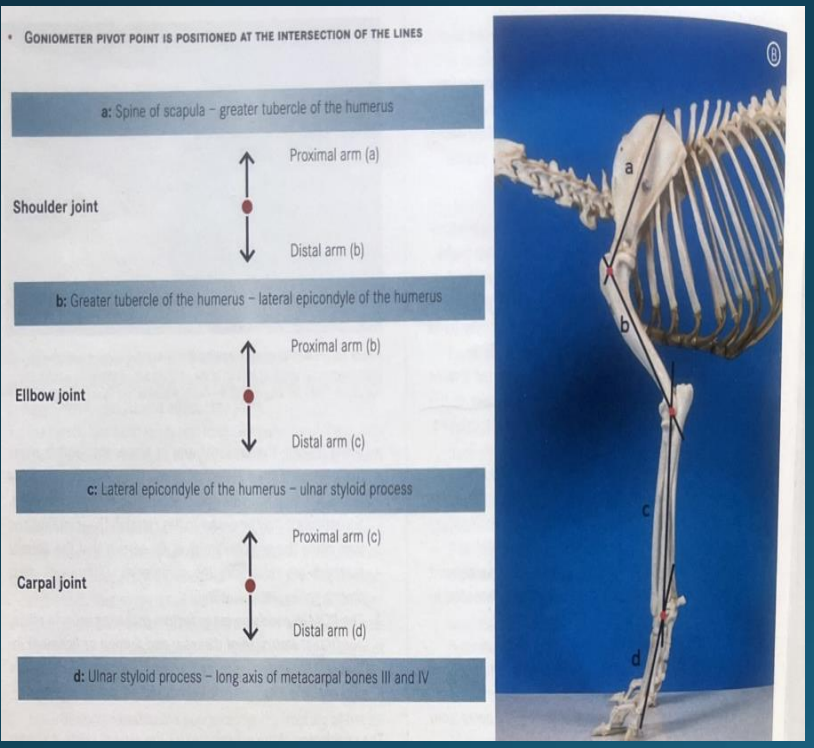
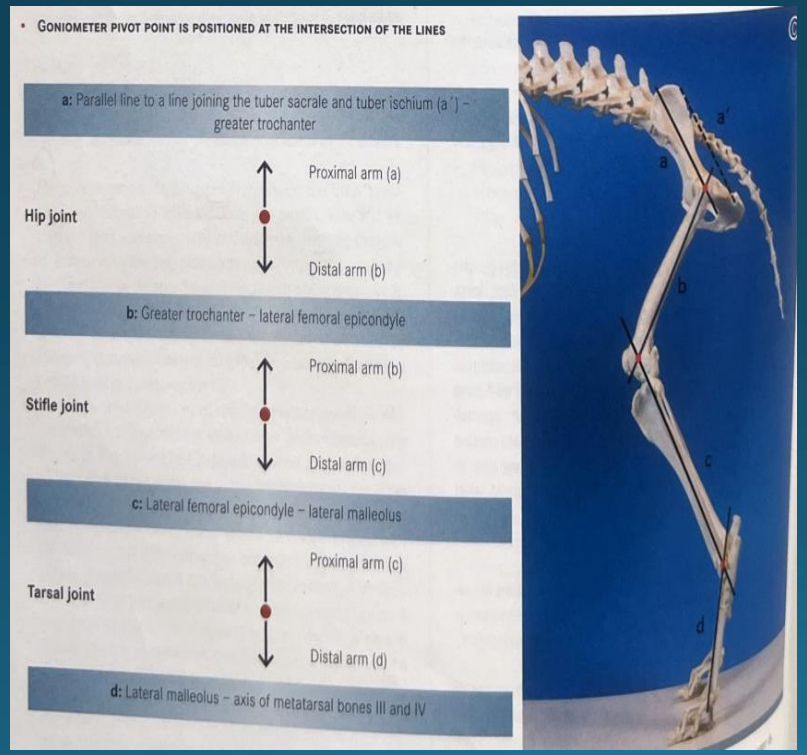
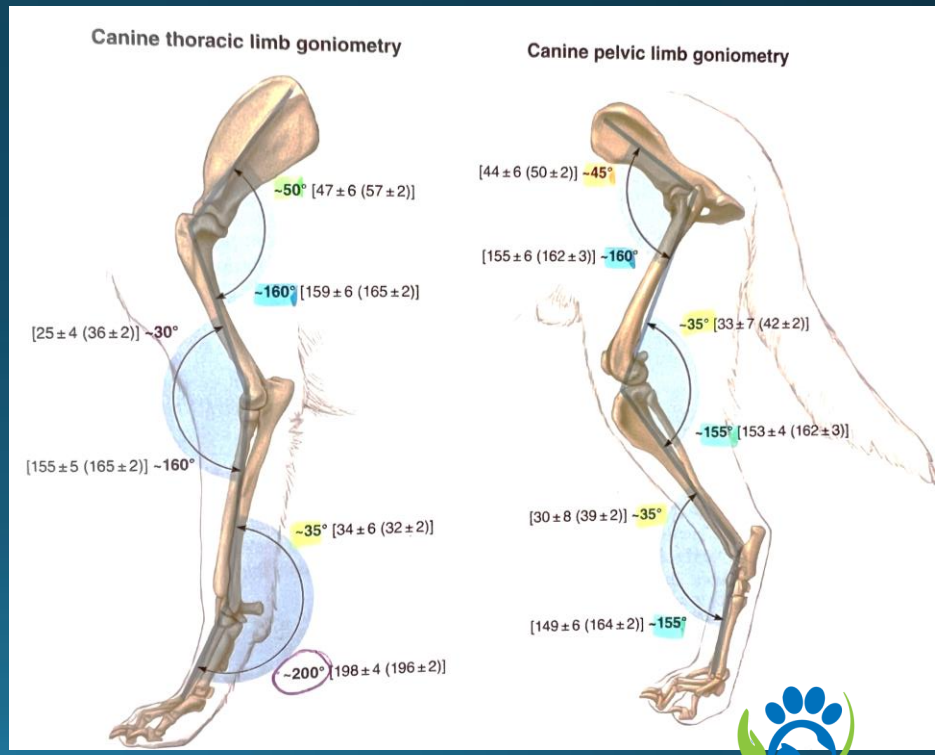
PROM measurement:

- Landmarks for each joint
- Normal values reported (Δ dog breeds, cats) (Reusing et al 2020, Jaeger et al 2007).





Source: Lorinson et al 2019



Source: Duerr 2020

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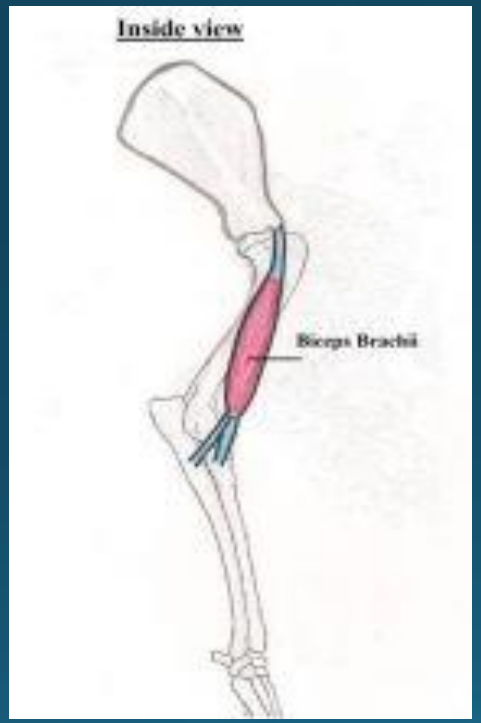
PROM traps:

- Shoulder F + elbow F
  - (≠ E, as stretches B Brachii)



Source: https://www.cram.com/flashcards/canine-muscles-and-their-actions-5571960

~60 vs ~85

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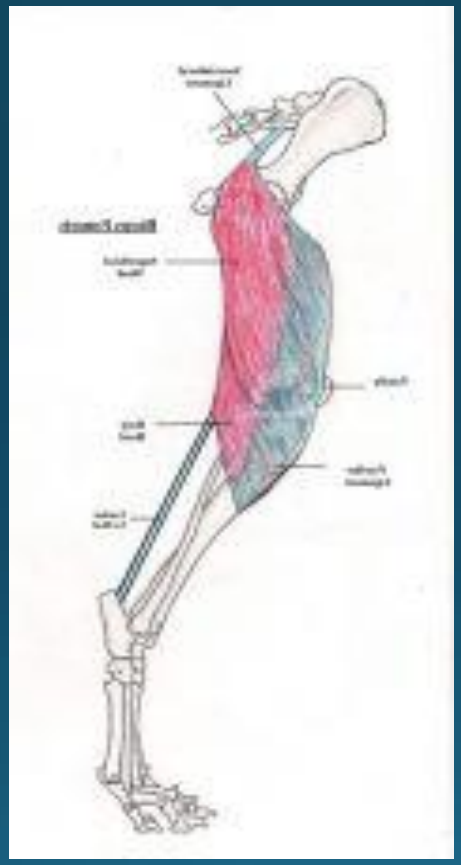
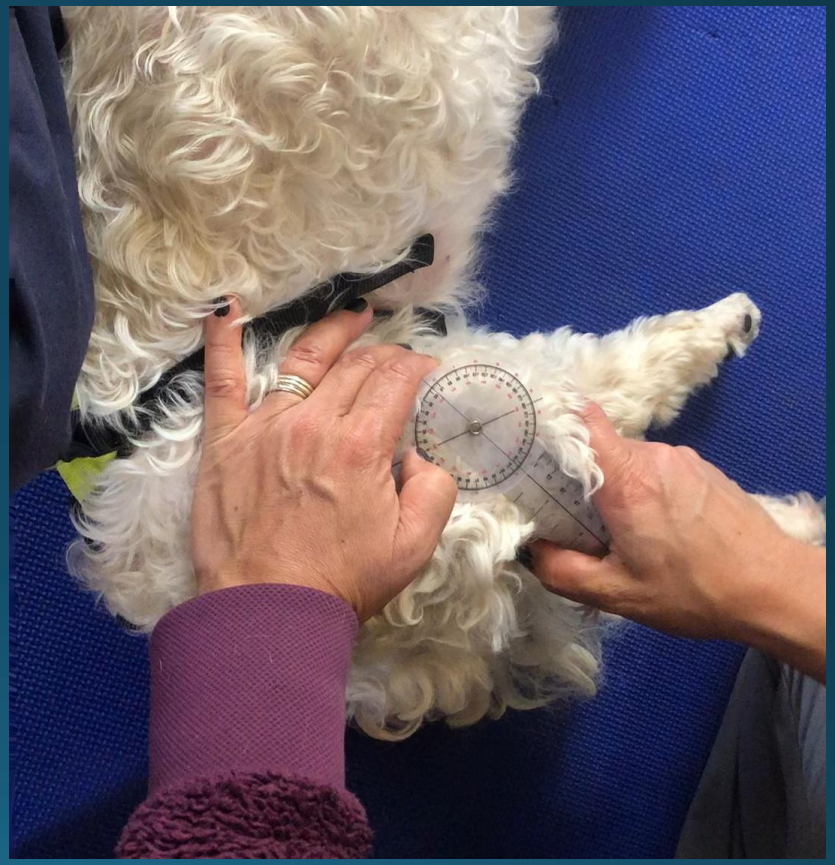
PROM traps:...

- Shoulder F + elbow F
  - (≠ E, as stretches B Brachii)
- Stifle E + hip neutral
  - (≠ F, as stretches hamstrings)





Source: https://www.cram.com/flashcards/canine-muscles-and-their-actions-5571960

~165 vs ~140

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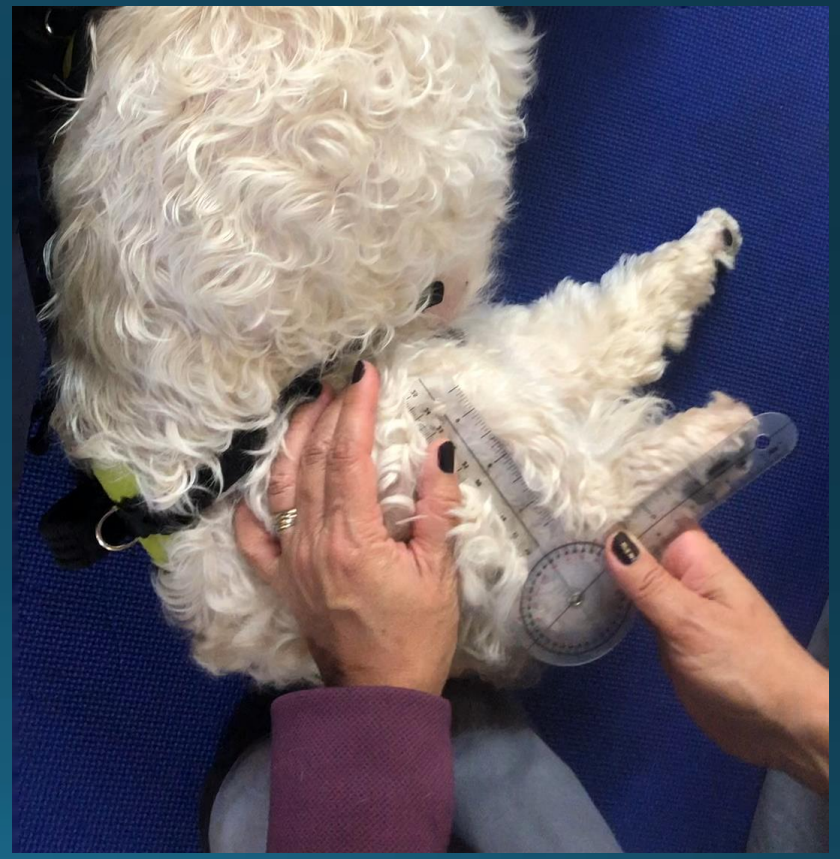
PROM traps:…

- Shoulder F + elbow F
  - (≠ E, as stretches B Brachii)
- Stifle E + hip neutral
  - (≠ F, as stretches hamstrings)
- Hock F + stifle F
  - (≠ E, as stretches gastrocs)

Source: https://www.cram.com/flashcards/canine-muscles-and-their-actions-5571960



~30 vs ~130

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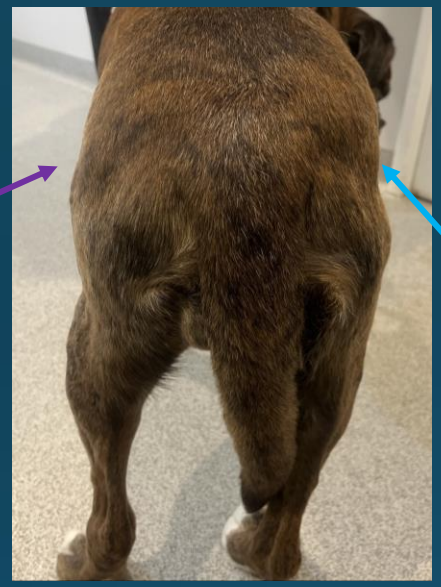
Muscle changes:

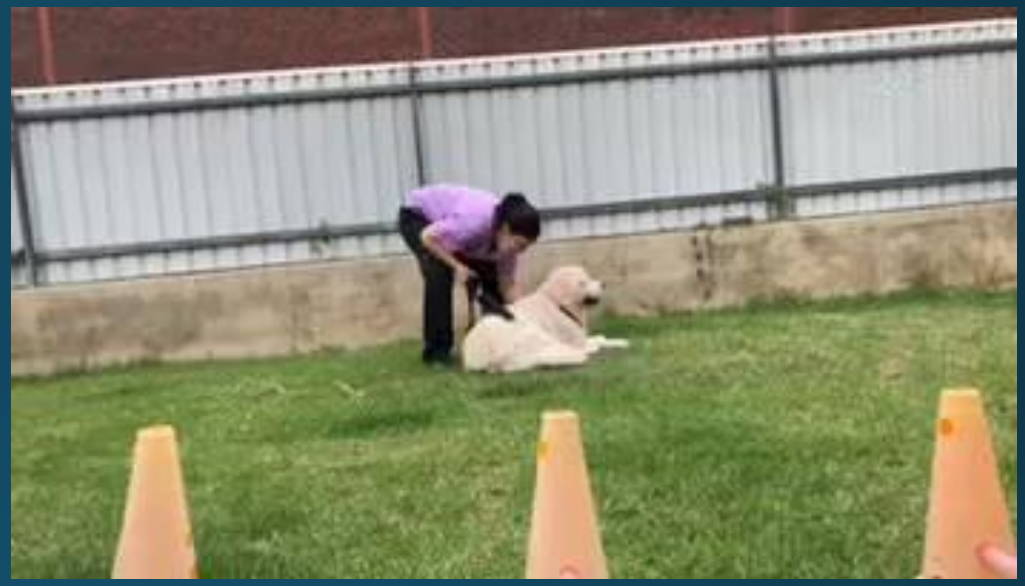
- Δ muscle tone
- ↓ flexibility
- Weakness

→ atrophy, fibrosis

→ ↑ instability, ↓use, pain



Koda



Hunter

(inhibits muscle contraction)

→Lameness, Δ transitions → Δ spine biomechanics

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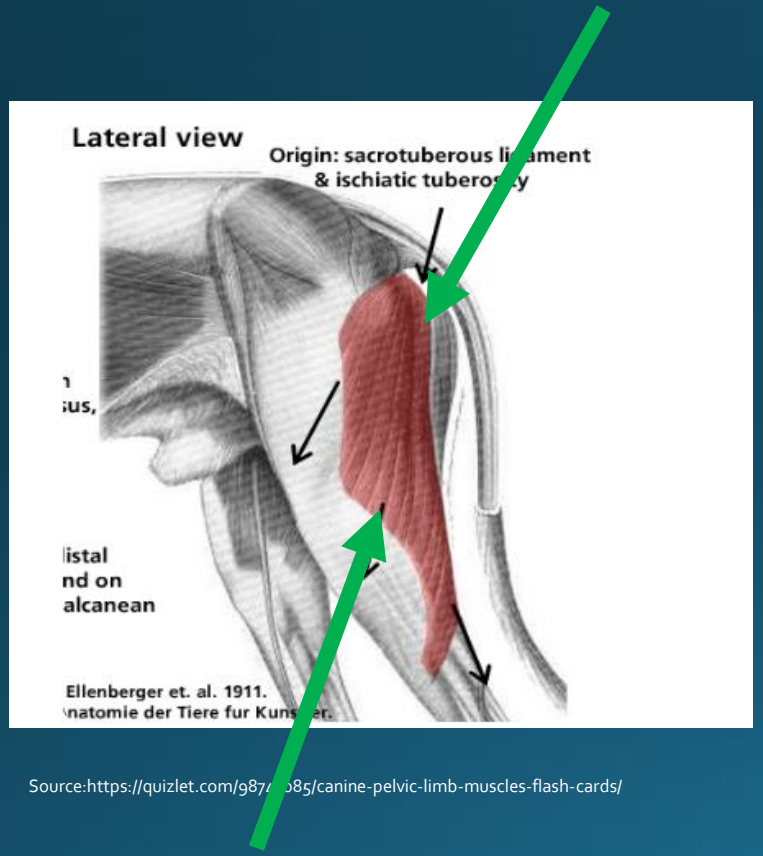
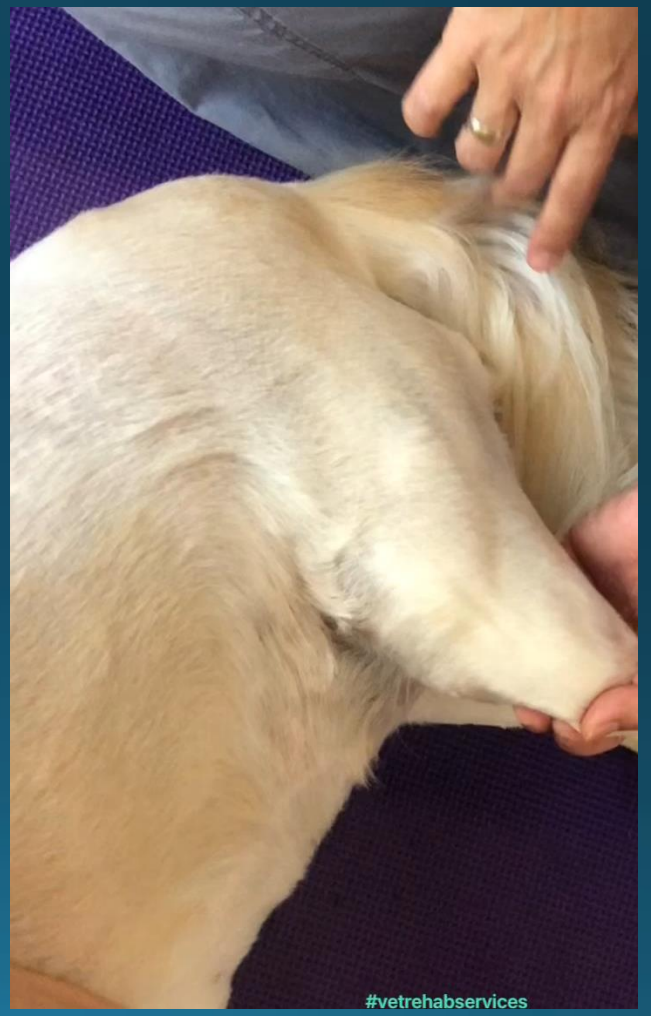
What is "flexibility"?

- How far a muscle will lengthen



Source:https://quizlet.com/987[illegible]085/canine-pelvic-limb-muscles-flash-cards/



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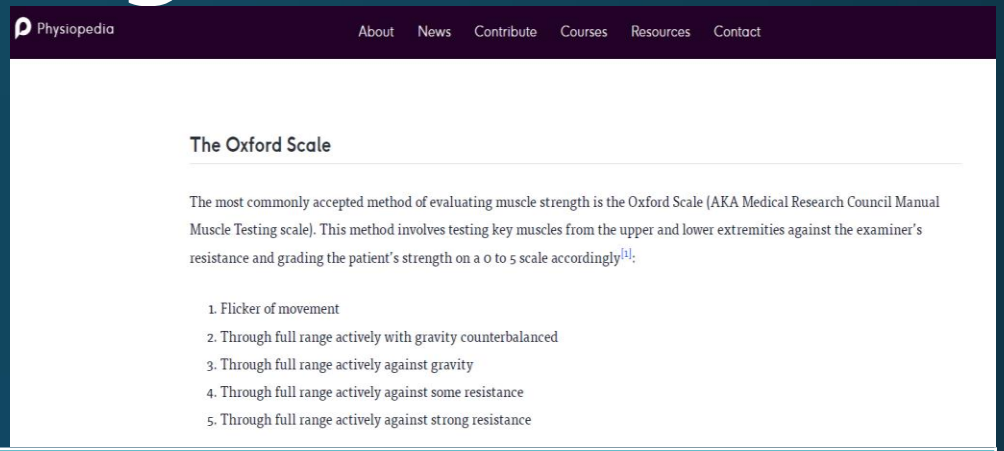
Assessing strength:



Source: https://www.physio-pedia.com/Muscle_Strength_Testing accessed 02.07/23

Proposed C-MMT (from Alvzarez et al 2023)

Grade	Term	Description
5	Normal	Maintain standing position against gravity on tested limb on incline with contralateral limb elevated
4	Good	Maintain standing position on an incline, but shows compensation with contralateral limb elevated
3	Fair	Maintain standing position without compensation when contralateral limb elevated on neutral ground
2	Poor	Maintain tested limb in standing position when contralateral limb elevated on neutral ground, but shows compensation
1	Trace	Fails to stand against gravity when contralateral limb elevated on neutral ground
0	Zero	Non-weight bearing on tested limb on neutral ground

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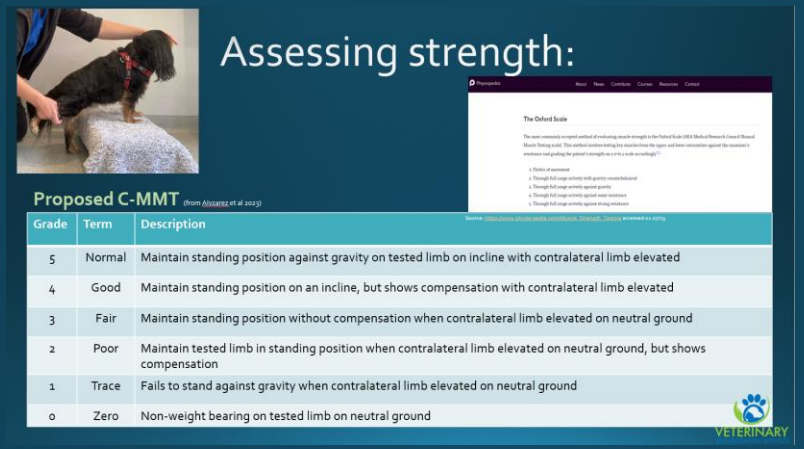
Musculoskeletal exam:

1. Posture / Strength
2. Toenails
3. Transitions
4. Gait
5. Neuro
6. Palpate soft tissues (fascia, muscles)
7. Spine
8. ID which part of limb
9. PROM



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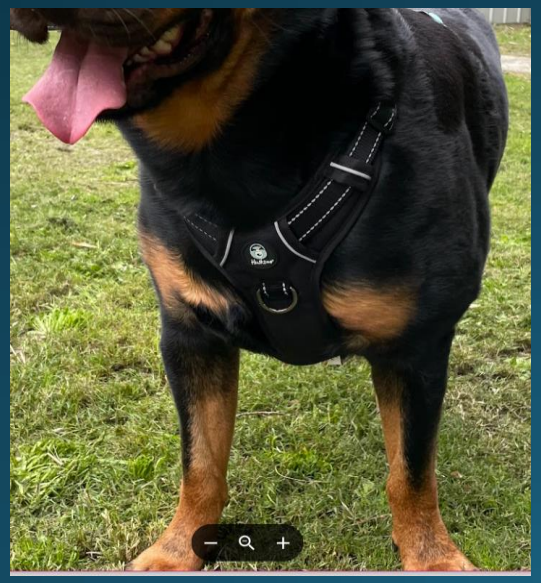
1. Posture / Strength

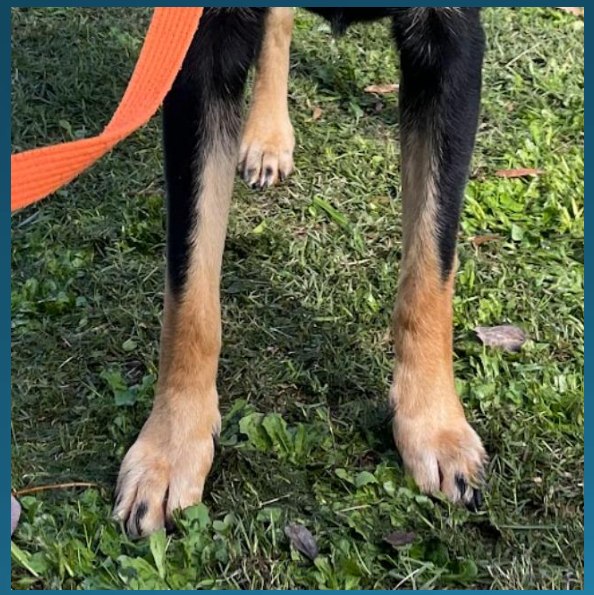
- Stand vs sit/down/pacing?
- Limb offloading?
- Limb internal vs external rot'n?
- Kyphosis vs lordosis?

Lucky

Zeus



Jem



Also Zeus

2. Toenails

- Dragging?
- Standing on tip toes?
- Toe fluff?
- Long?

Snuggles

Jessie

Dori

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3. Transitions

- Sit to stand
  - Pull self up?
  - Using 1 HL to push up?
- Sit – drop
  - Shuffling FL

Millie

Sam

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4. Gait

- Slow motion video
  - Towards / away from you:
    - **Hip hike**
    - **Spine rotation**
    - Tail movement
    - Circumduction
    - **Head bob**
    - Foot position
    - Ataxia

Pepper

Dash

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4. Gait…

- Slow motion video
  - To left / right of screen:
    - **Degree joint extension**
    - **Pelvic rotation**
    - **Degree spine flexion / extension**
    - Pace vs trot
    - **Neck / head carriage wrt horizon**
    - **Choppy or 2 engine gait**

Pepper

Frodo

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5. Neuro

- Placing
- Withdrawal
- Hopping
- Panniculus
- Circling (slow motion, reducing in size)

Frank

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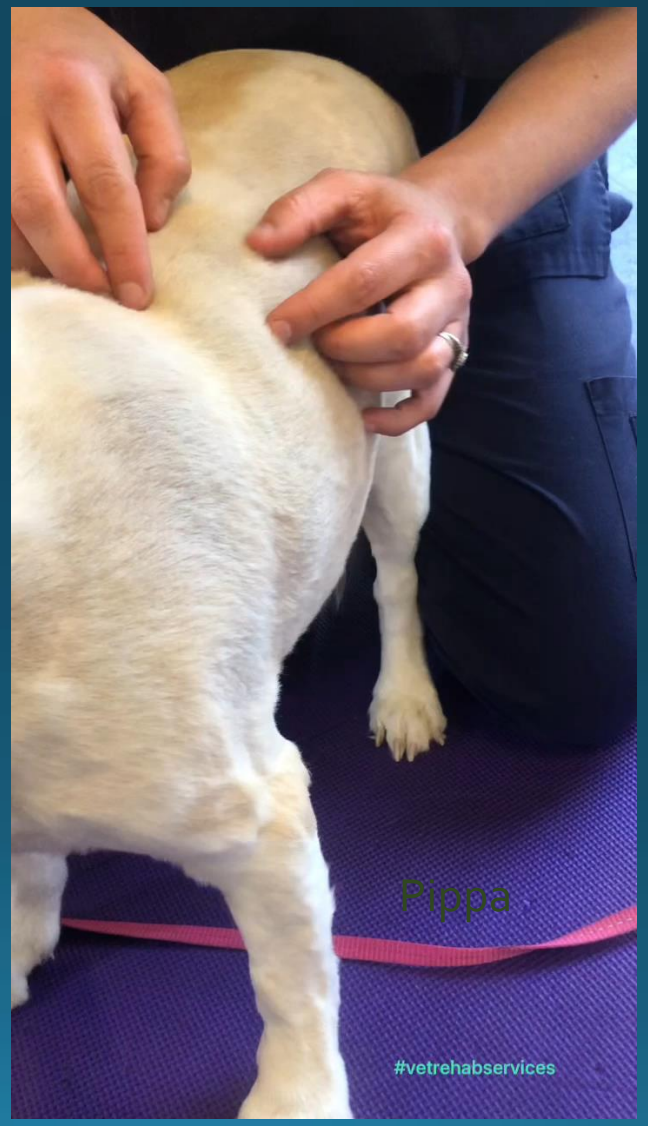
6. Palpate Soft tissues - fascia:

- Fascial
  - Tension
  - Triggers



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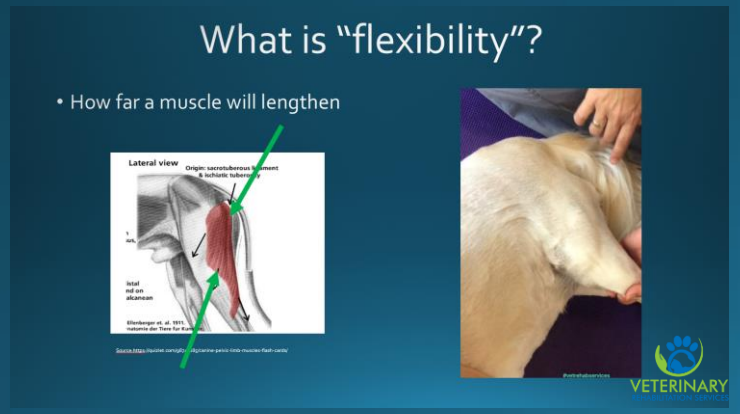
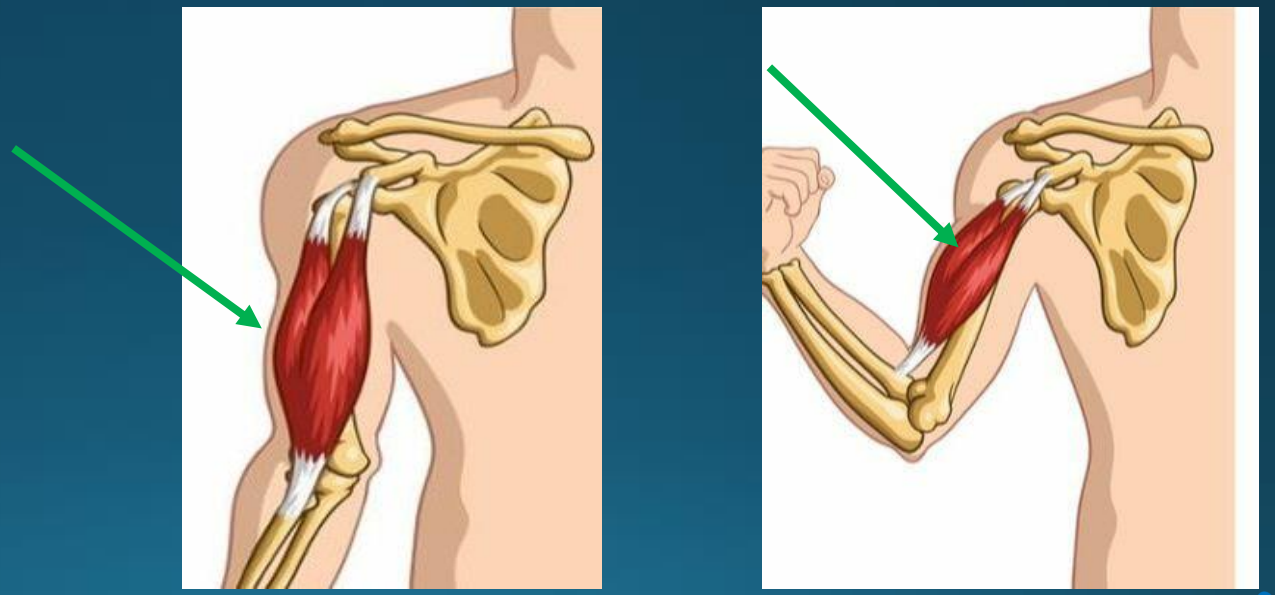
6. Palpate soft tissues - muscles:

- Epaxial muscles
  - Shape
  - Tone
  - Pain
    - *Pressure required to elicit?*
    - *Pain scales (Monteiro et al 2022)*

- Flexibility limb muscles

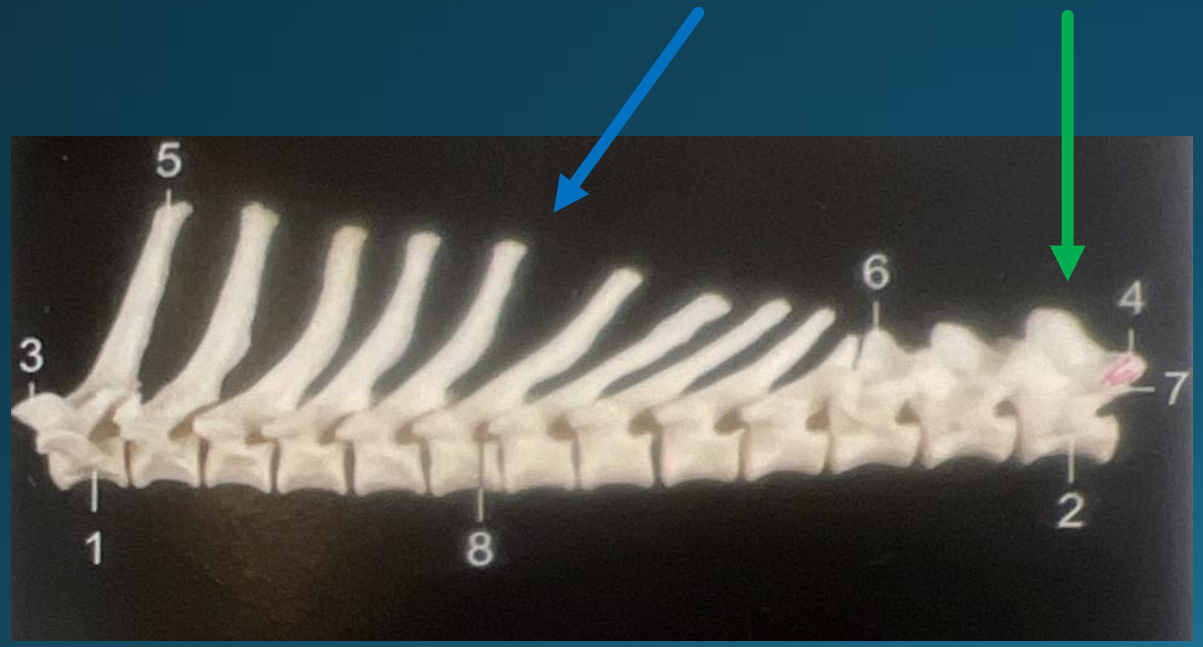




Source: https://www.ptbomassage.com/biceps-brachii.html

7. Spine

- Pain?
  - Discogenic?
  - Facet joint?



Source: Bockstahler 2019

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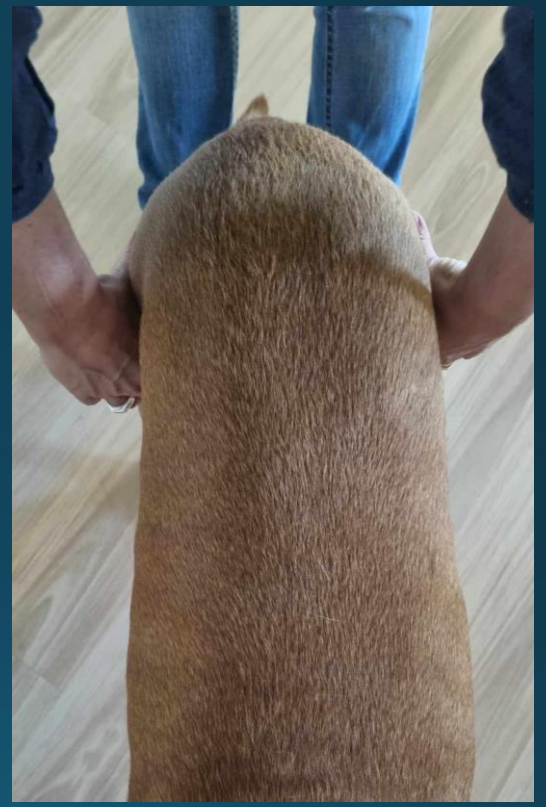
8a. Which part of limb affected?

- Muscles of proximal limb:
  - Symmetry, tone, pain?
    - Femur (cr & cd)
      - Quadriceps (↑ tone/pain or atrophy w/ hip OA)
      - Hamstrings (↑ tone/pain w/ CCL disease)
    - Scapula (cr & cd to scapular spine)
      - Supraspinatus (atrophy w/ shoulder OA)
    - "Hypertrophy"?
      - Benign – ie/Intramuscular lipoma
      - Malignant – ie/rhabdomyosarcoma



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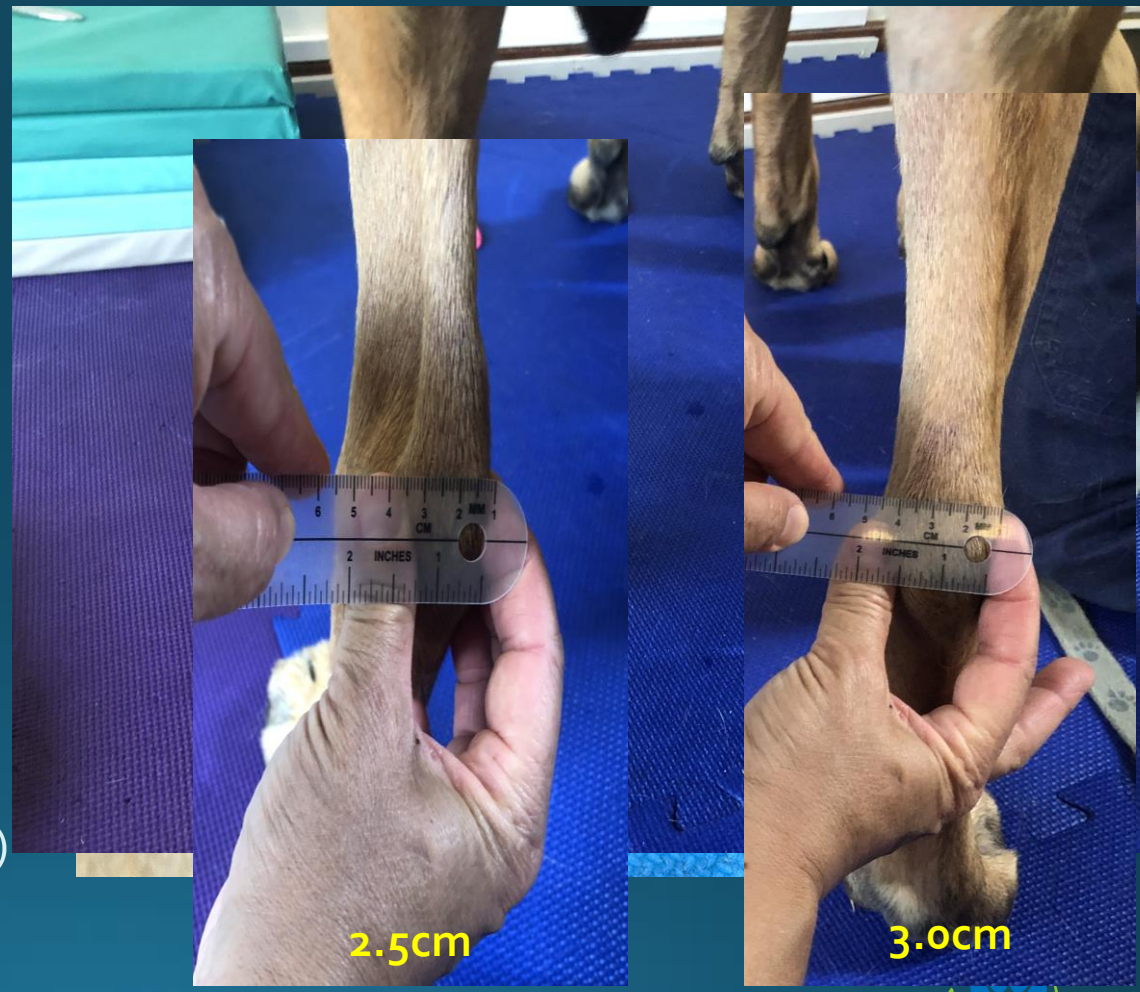
8b. Which part of limb affected?

- Soft tissues of distal hindlimb:
  - Symmetry, pain?
    - Stifles
      - Patellar tendon
        - Identifiable? (if not → stifle effusion)
        - Painful? (→ patellar tendinopathy)
    - Hocks
      - Calcaneal tendon?
      - Periarticular fibrosis / boney thickening?
    - Plantar metatarsals
      - Thickening / pain? (→ flexor tendinopathy)



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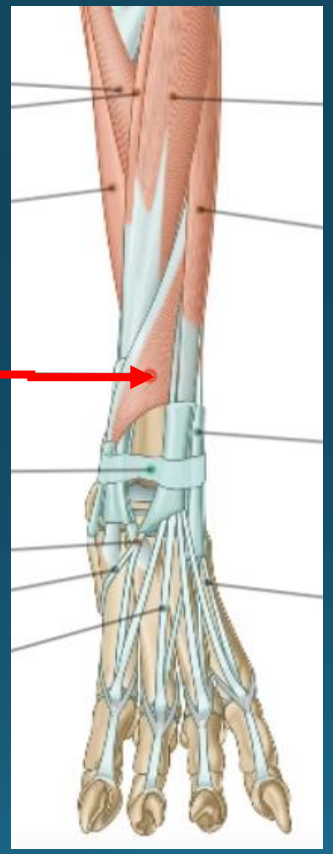
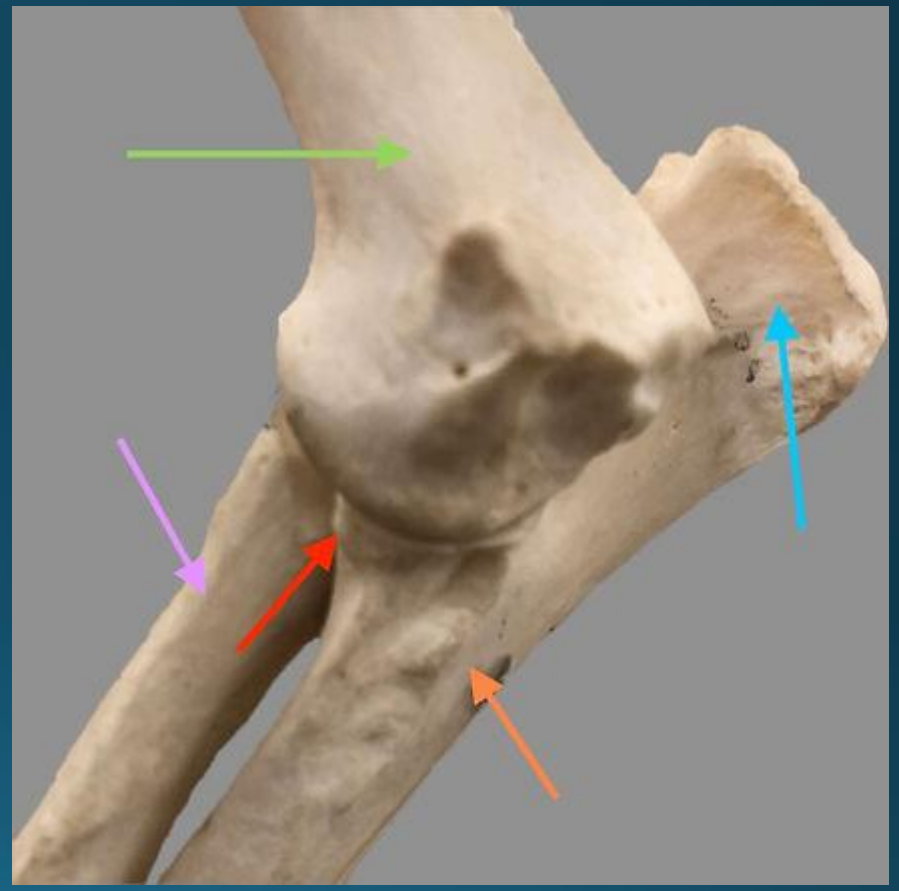
8b. Which part of limb affected?

- Soft tissues of distal forelimb:
  - Symmetry, pain?
    - Elbows
      - MCP
    - Carpi
      - Abductor Pollicis Longus
    - Toes (HL toes too!)
      - 2=5 vs 3=4



Source: https://www.imaios.com/en/vet-anatomy/dog/dog-myology?mic=dog-myology-illustrations&afi=330&is=3091&il=en&l=en&ul=true accessed: 30.3.24



Elbow Anatomy, Medial or inside view.
Green arrow - Humerus; Blue arrow - Olecranon process of ulna; Lavender arrow - Radius;
Red arrow - Medial coronoid process of ulna; Orange arrow - ulna

Source: https://www.mylamedog.com/post/elbow-dysplasia-or-elbow-displeasure Accessed 30.3.24

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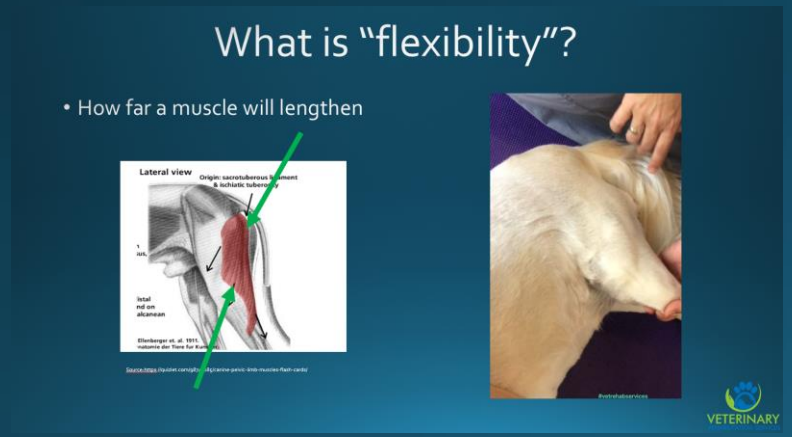
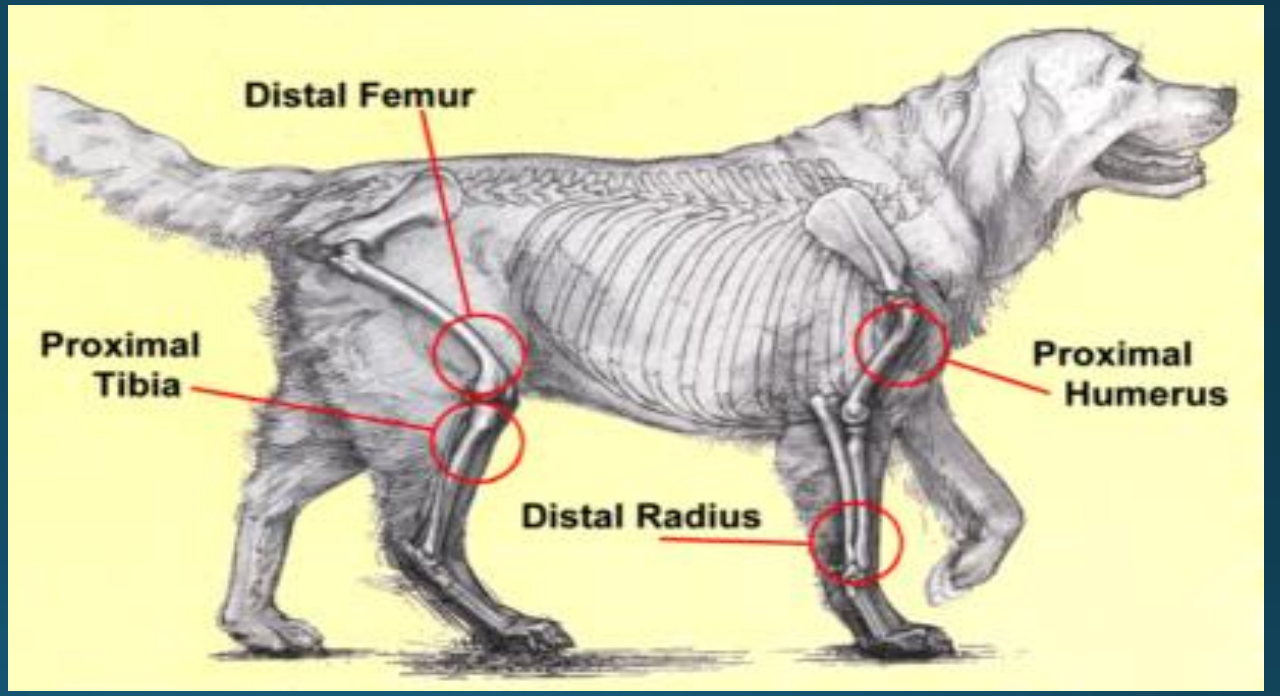
8c. Which part of limb affected?

- Bones
  - Rule out osteosarcoma
- Limb muscles
  - Flexibility





Source: https://www.marvistavet.com/osteosarcoma.pml accessed 5.7.23

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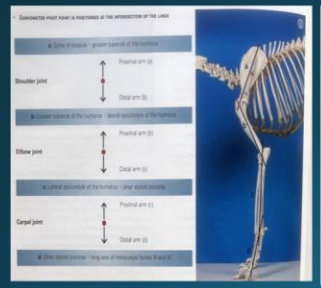
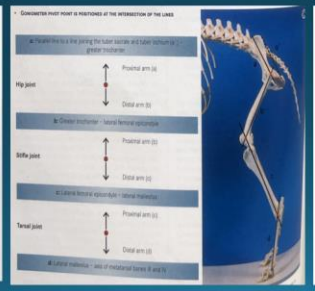
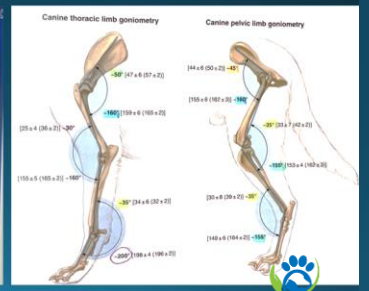
9. PROM

PROM measurement:

- Landmarks for each joint
- Normal values reported (Δ dog breeds, cats) (Reusing et al 2020, Jaeger et al 2007).



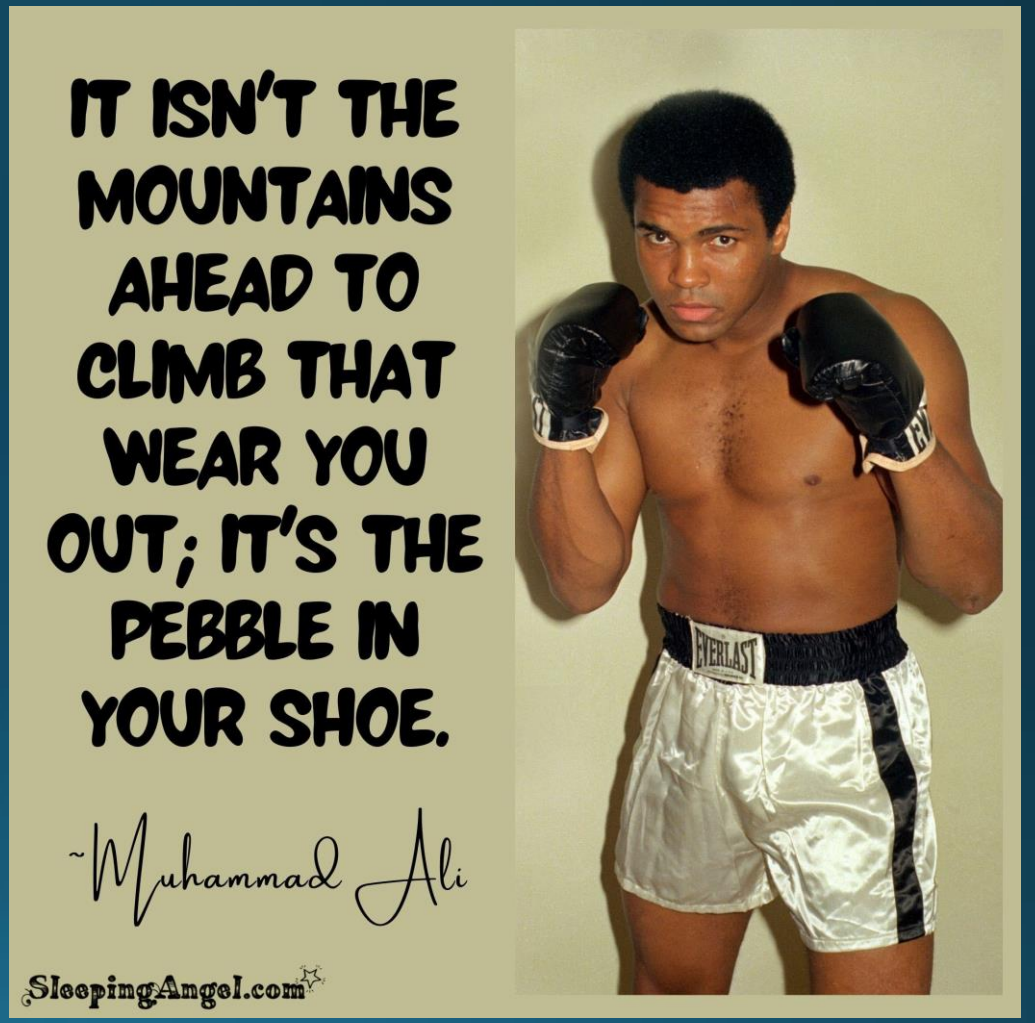




Source: Lorinson et al 2019

Source: Duerr 2020

source: https://www.fourleg.com/Blog?b=399
accessed 30.3.24



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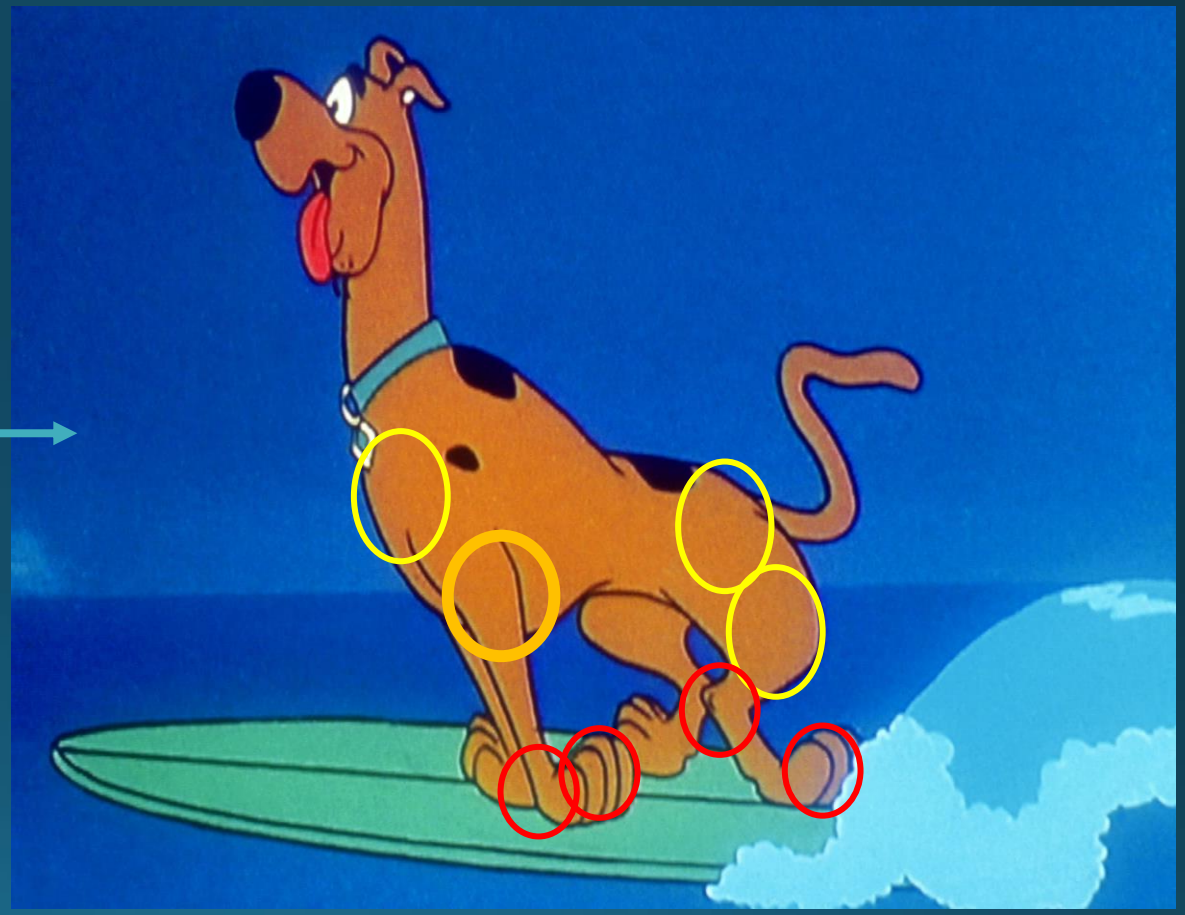
Condensed 15 minute version:

1. Posture / strength
2. Toenails / toe fluff
3. Transitions
4. Gait
5. Neurologic exam - abridged
6. Soft tissue palpation – fascia, mm
7. Palpation – spine
8. Palpation – limbs
9. PROM in standing



Source: https://tubitv.com/series/30000685 4/scooby-doo-where-are-you

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Condensed 15 minute version:…

1. Posture / strength
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8. Palpation – limbs
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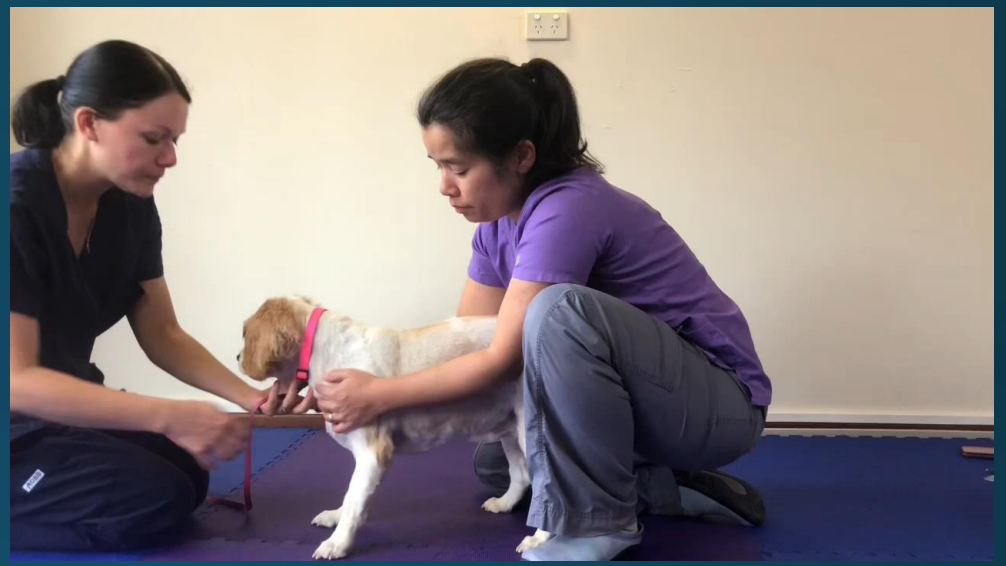

What needs to be looked at in more detail?

Refine diagnosis: palpate in lateral & compare to opposite limb

Treatment trial & book recheck

There's no sign of OA!

→ mm, tendon, ligament problem

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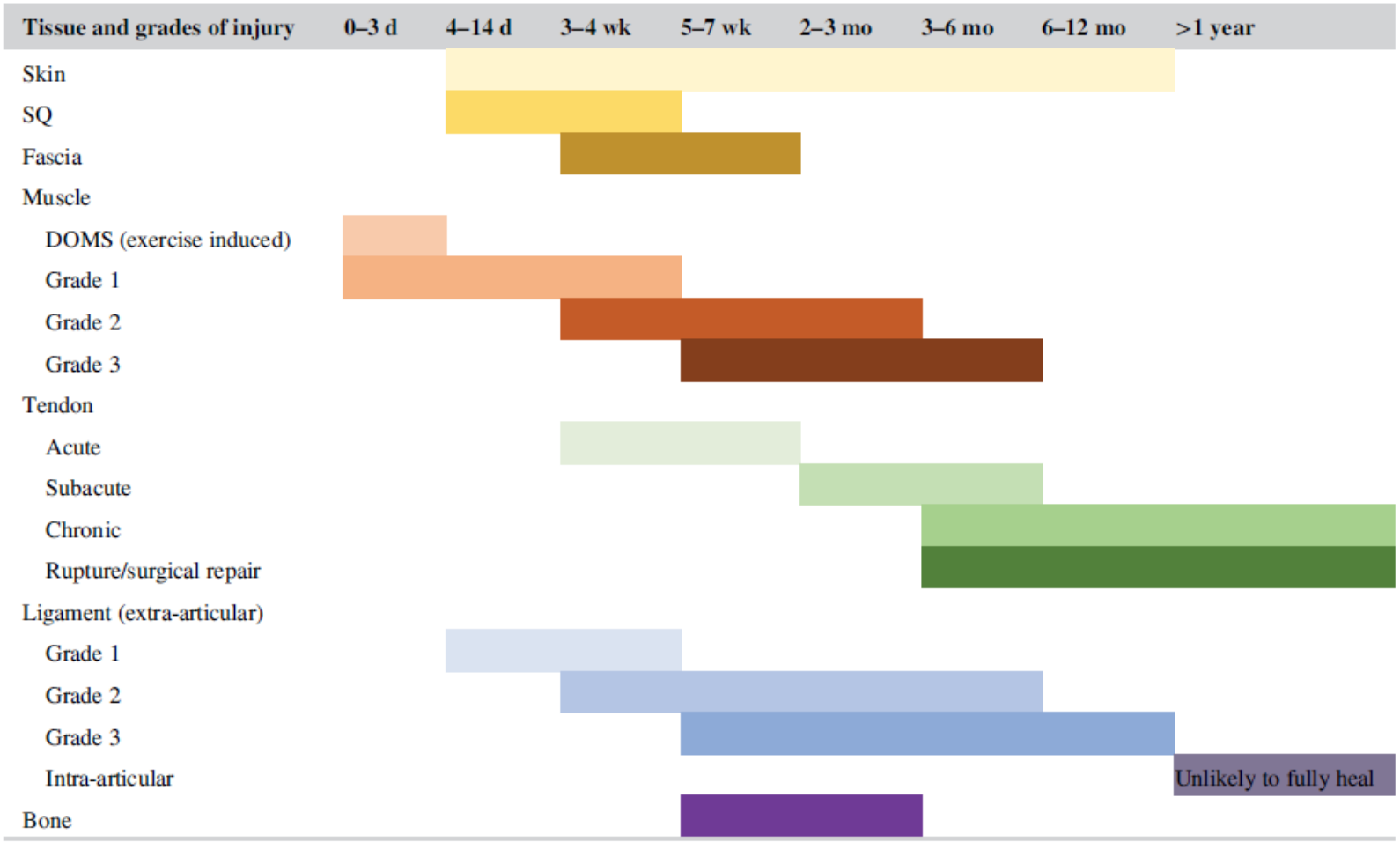
Ligaments:

- CCL
- Carpi / Hocks
  - Medial / lateral
    - Short in F, Long in H
  - Dorsal / palmar / plantar
- Elbow
- Shoulder

TABLE 2 Approximate rates of tissue healing[a]



Abbreviations: DOMS, delayed onset muscle soreness; SQ, subcutaneous.

[a]Expected time frame for tissue healing after injury. Rate of healing is influenced by the degree of tissue damage (Grade), particularly with muscle, tendon, and ligament injury. Muscle: Grade 1, mild damage (<5% of fibers), minimal loss of strength and function; Grade 2, moderate fiber damage, loss of strength and function; Grade 3, complete rupture of muscle/muscle-tendon and loss of function. Ligament: Grade 1, stretching, little/no tear, no joint instability; Grade 2, partial tear, mild instability; Grade 3, complete rupture, loss of function. The shaded cells correspond to the range of healing time for the specific tissue injury indicated in the left column. Healing time varies based on degree of tissue injury.

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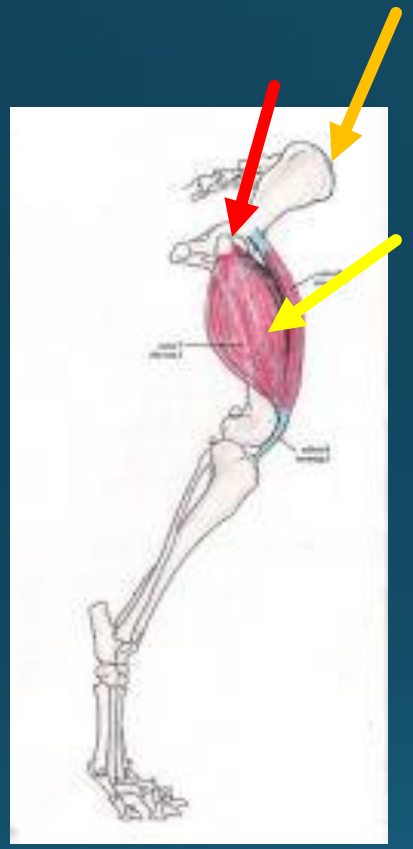
Sources: Fig 1 & 2: Marcellin-Little et al (2007), Table 2: Kirkby-Shaw et al (2020)

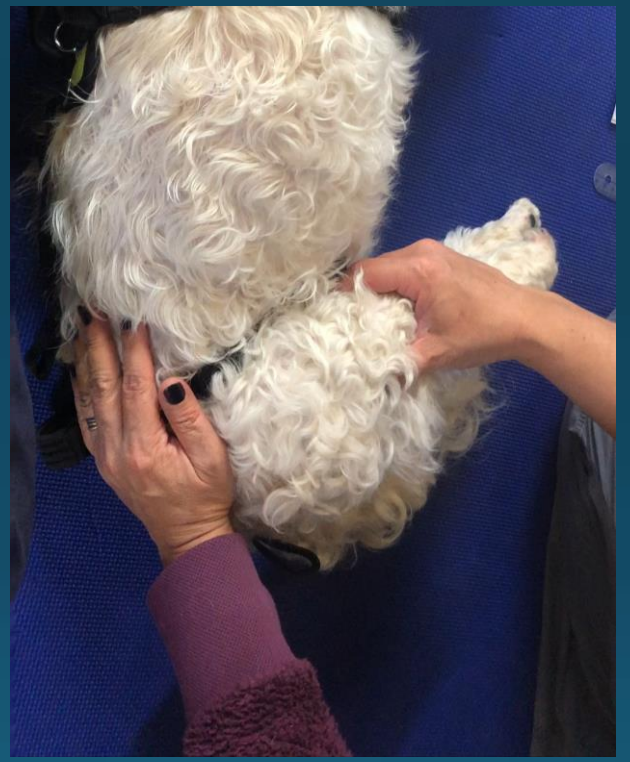
Common OA Ddx:

Hip OA vs

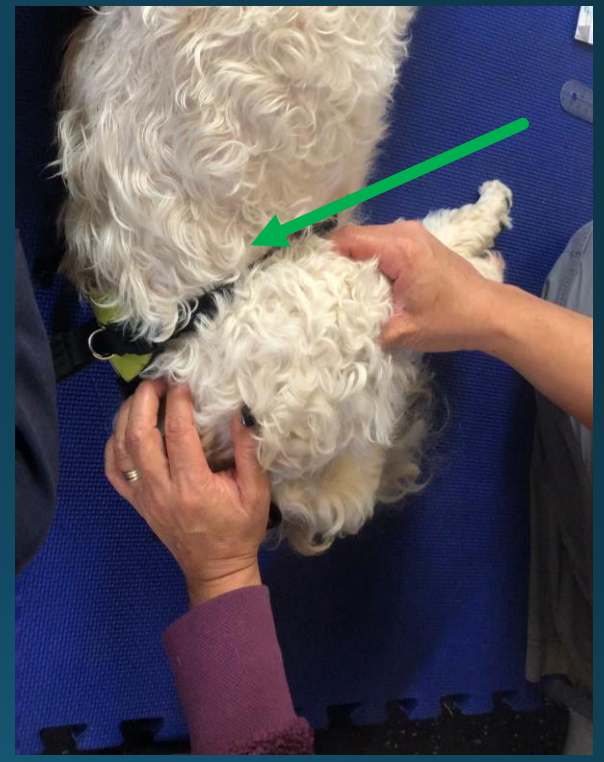
- Lumbosacral pain
- Tight quadriceps
- Iliopsoas pain



Source: https://www.cram.com/flashcards/canine-muscles-and-their-actions-5571960



Hip vs Lumbosacral joint



Iliopsoas stretch

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Common OA Ddx:...

HL OA vs

- Spinal pain

Lucky

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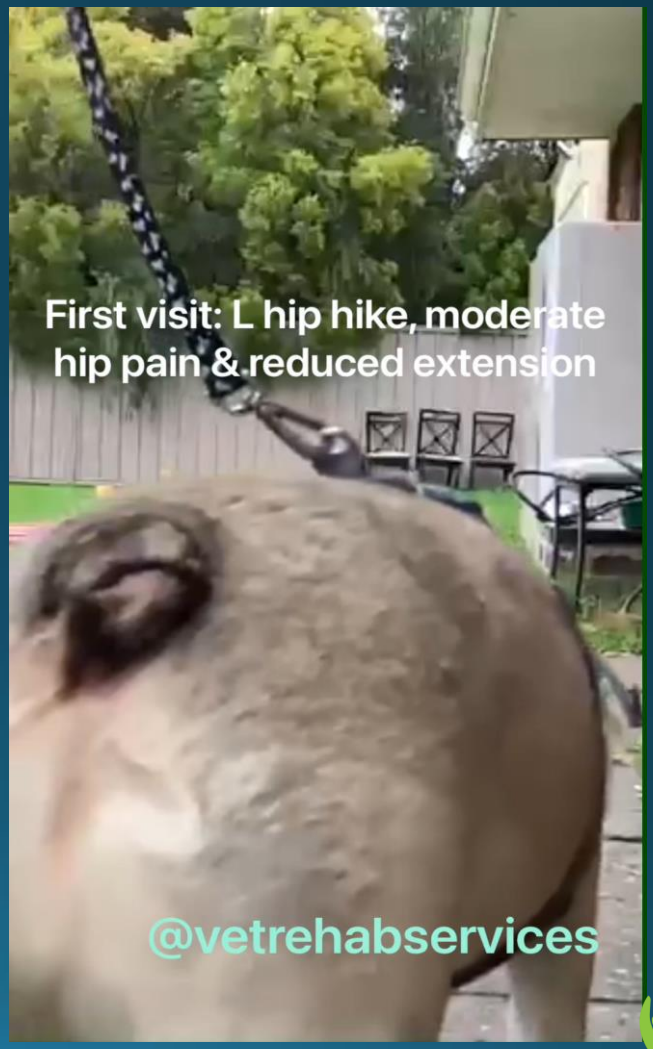
Common OA Ddx:...

FL OA vs

- Neck pain

Hugo



Harvey

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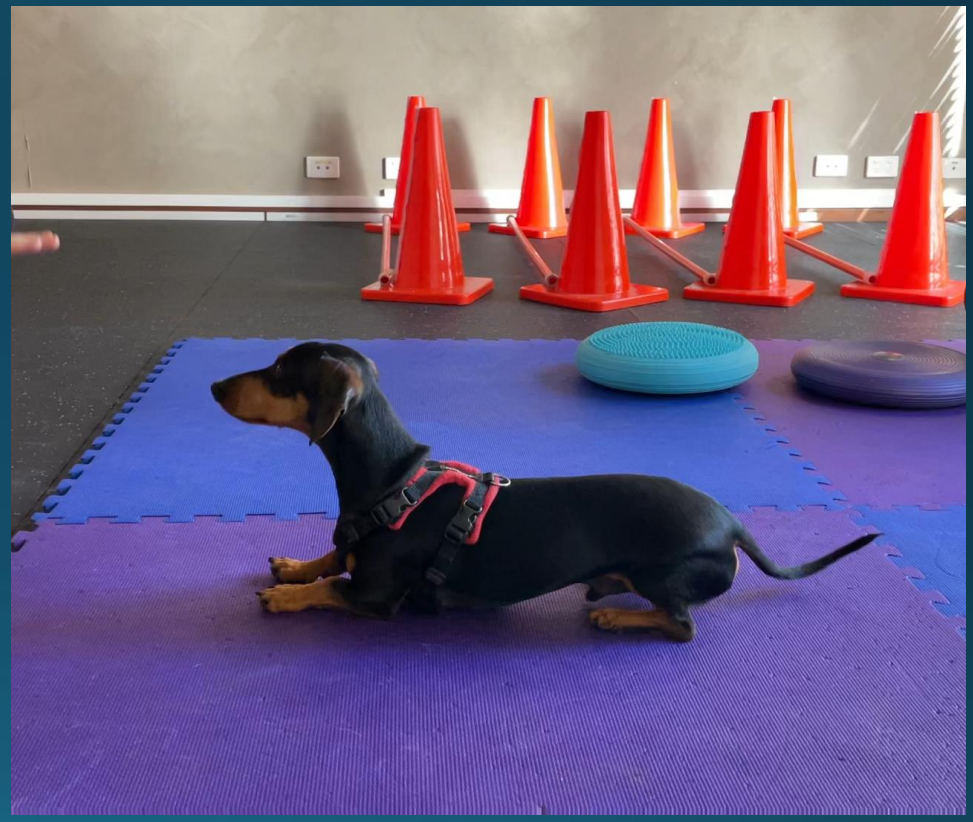
Common OA Ddx:…

It's the "shoulder"!

- Nope.
  - Elbow, carpus, toes >> shoulder
  - Unless…
    - The supraspinatus is atrophied → then maybe
    - It's a dachshund
    - It's a young dog → Osteochondritis Dissecans
    - It's a herding dog → Medial Shoulder Syndrome



Lancelot our unicorn:

- *Non-neuro,*
- *Well behaved Dachshund,*
- *Normal shoulder PROM!*

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Other tips:

- Msk exam for EVERY patient

Source:
https://pharmacy.amazon.com/dp/B084BNB842?

- INI with multimodal OA tx

  → reassess / refer

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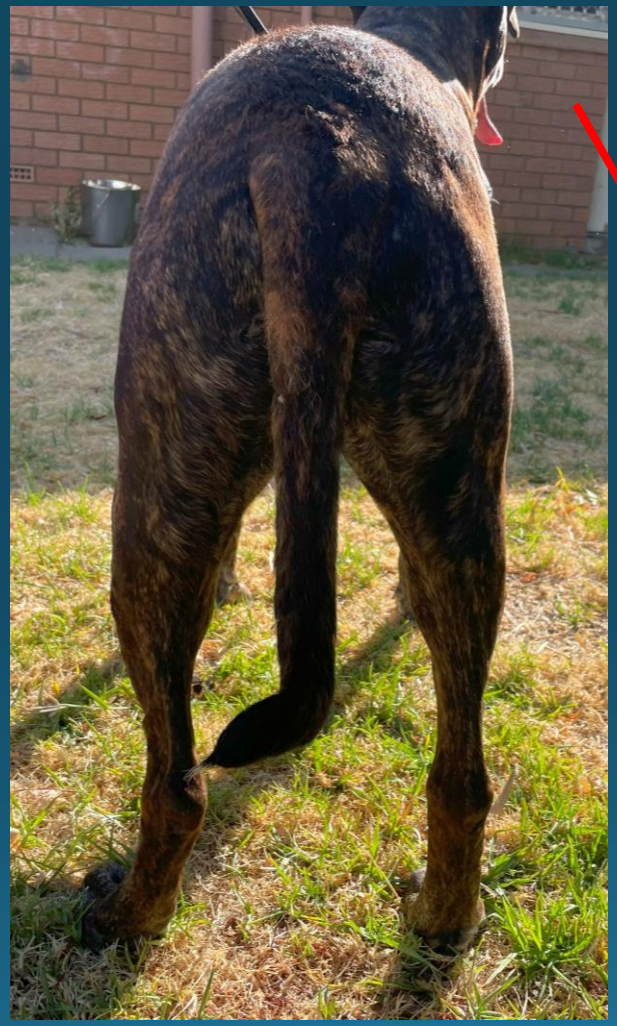
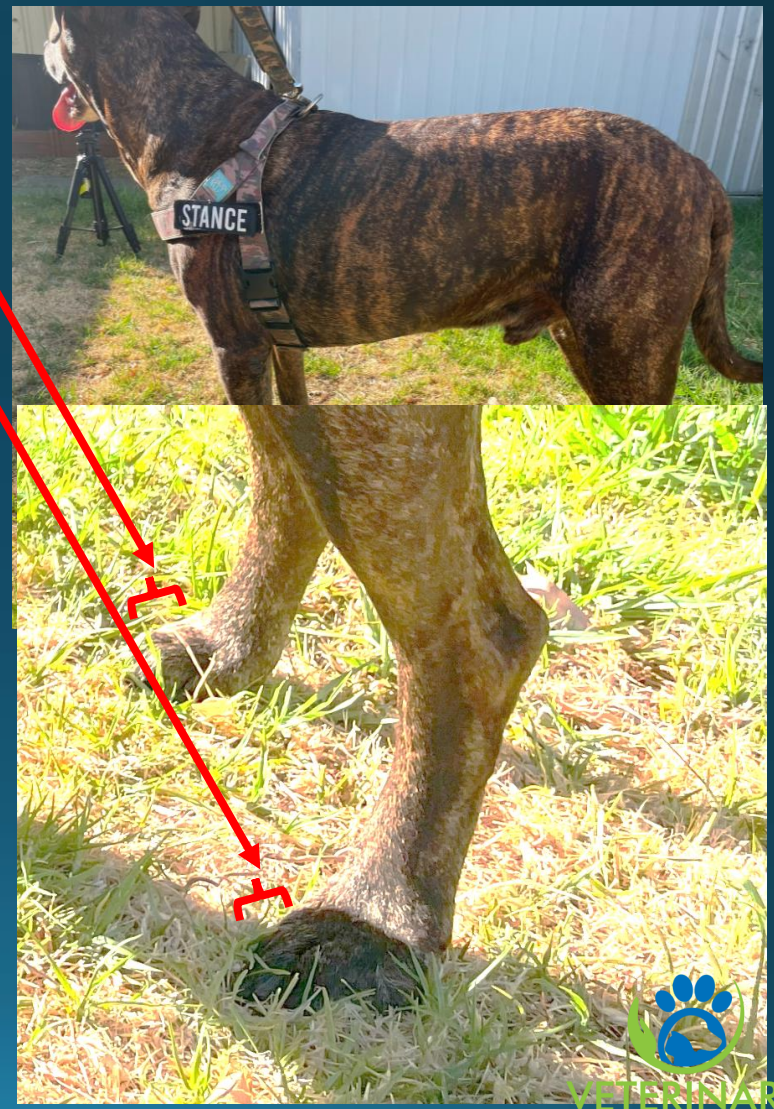
Case 1: "Stance" 10yo MN Mastiff

Hx	- **Lame in LH for past 3 months** - **treated for OA with Beransa monthly x 2, 2 fishoils daily & "hemp" but there had been no improvement in his lameness, so his owner has presented for a second opinion.**
BCS	6/9
Posture/ stance	Offloads ??
Toe nails	??
Gait / Transitions	Subtle RF lame, normal transitions
Neuro	No panniculus (this can be a normal finding), but CPs, withdrawal, patellar, sciatic = normal
Strength	At least 3/5 in FL, 5/5 in HL (nervous peer, scared of the step)





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Case 1: "Stance" 10yo MN Mastiff…

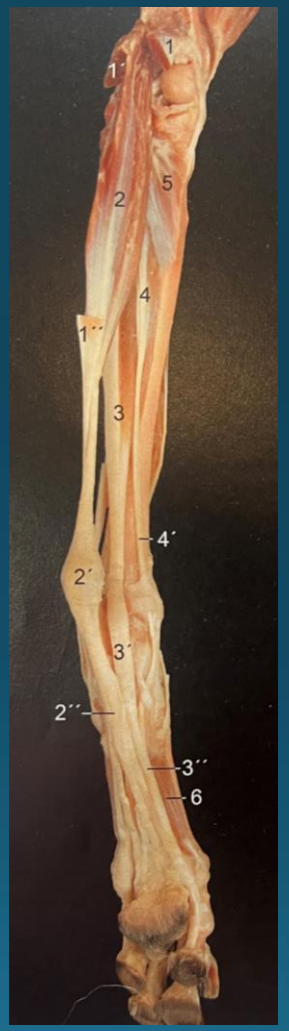
	Palpation:
skin roll	Tight, worst at T/L junction →??
Epaxials	Lumbar = High tone → ??
Spine	Mild pain mid lumbar spine →??
Limb mm	L thigh: 62 cf R 63cm → ??
Distal limb	??
PROM	↓ L stifle E (150, mm spasm), ↓R hip E (150, P) ↓R carpus E (+10, P, L was +20 C), ↓R elbow E (150 P + effusion, L 170C)
MM flexibility	??

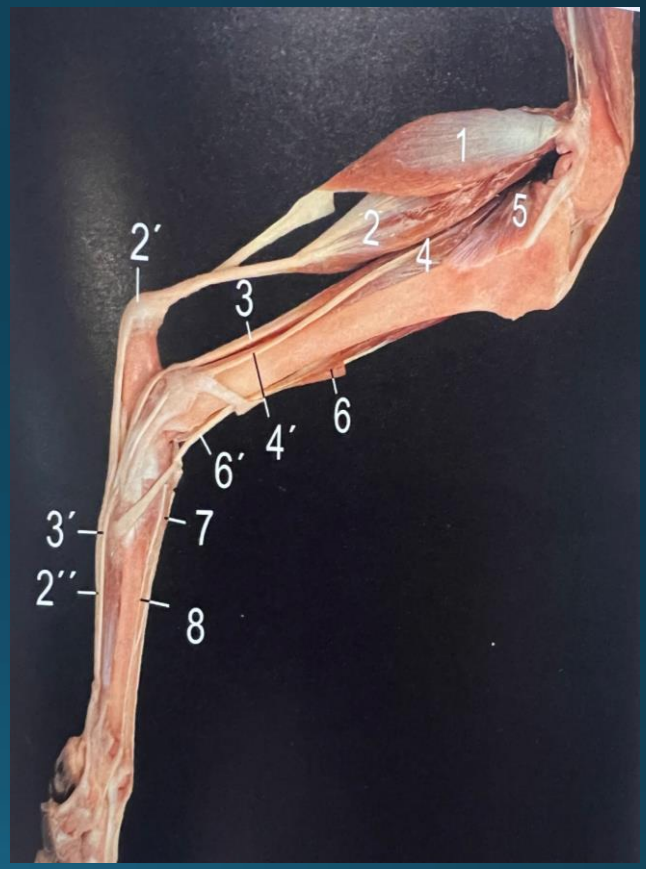
P = painful, C = comfortable

Case 1: "Stance" 10yo MN Mastiff…

	Palpation:	Is it OA?
skin roll	Tight, worst at T/L junction →FL & HL problem or spinal P	
Epaxials	Lumbar = High tone → HL or spine	
Spine	Mild pain mid lumbar spine	**Maybe** = IVDD/facet OA
Limb mm	L thigh: 62 cf R 63cm → look at LH.	
Distal limb	Plantar bowing at distal 1/3 L MTs 14cm L vs 13cm R → look at flexor tendons	
PROM	↓ L stifle E (150, mm spasm), ↓R hip E (150, P) ↓R carpus E (+10, P, R was +20 C), ↓R elbow E (150 P + effusion, L 170C)	***NO** = L stifle* ***Yes** = R hip, carpus, elbow*
MM flexibility	LH Digital flexor tendons = moderately painful to stretch & on palpation in "neutral" → ***FLEXOR TENDINOPATHY***	

P = painful, C = comfortable





Source: Bockstahler (2019)
1: gastrocnemius medial muscle belly,
2: superficial digital flexor

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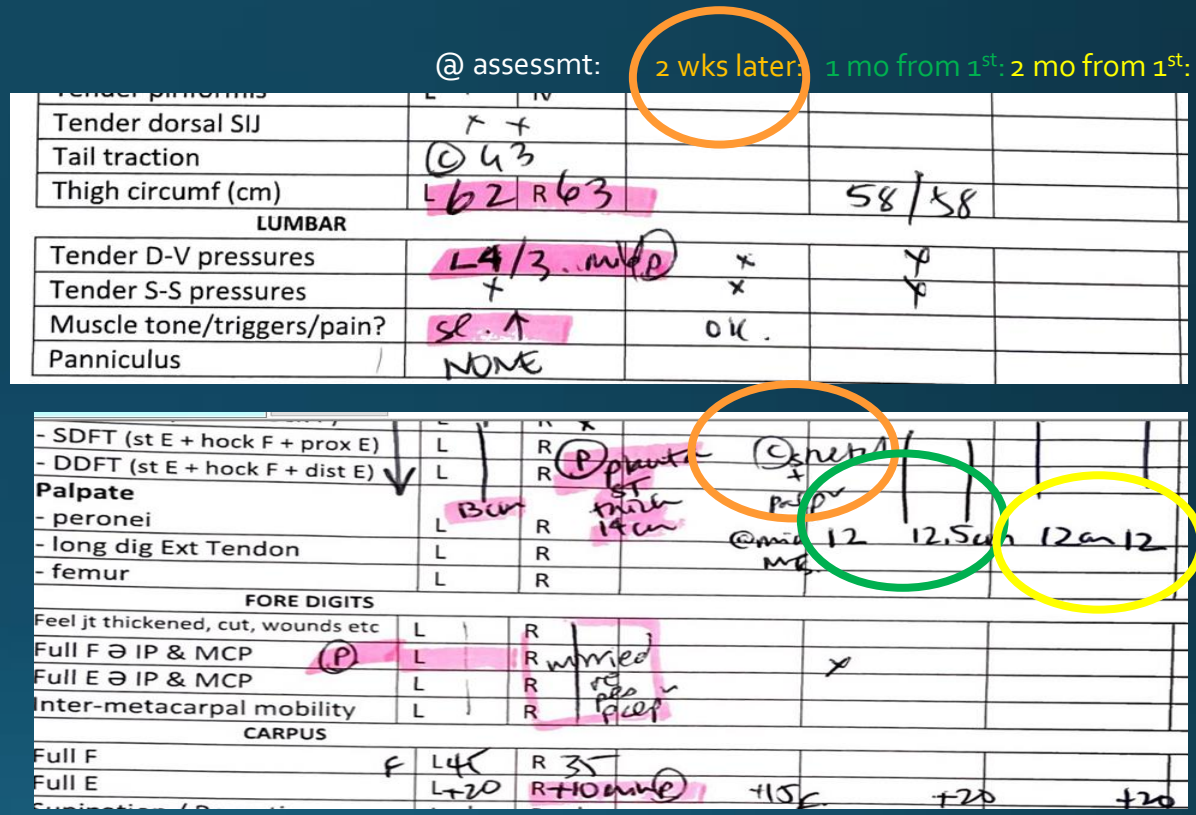
Case 1: "Stance" 10yo MN Mastiff…

	Conclusion:
Is there OA?	Yes → R elbow & carpus, R hip No → LH digital flexor tendinopathy (limiting L stifle E as SDFT originates on distal femur with gastroc) Maybe → IVDD/facet OA
Tx change	→ Manage OA, spinal P & target tx at tendinopathy. @ first r/c 2 wks later, comfort & range improved: - L stifle E (170 C), R hip E (160 Fibrous) - R carpus E (+15, C), R elbow E (165C, subtle effusion) - LH flexors & spine = comfy @ r/c 1 month after that, when O had run out of meds: - All gains maintained, thigh size even, flexors measure 12.5cm L, 12cm R at L mid MTs, toes stay long once tendons ruptured. - O's comment, dog "accidentally" let run with other dog – hasn't seen him run "so well" in a long time. @ r/c 2 months from first visit – off all meds, plantar MTs now 12cm, all gains maintained.

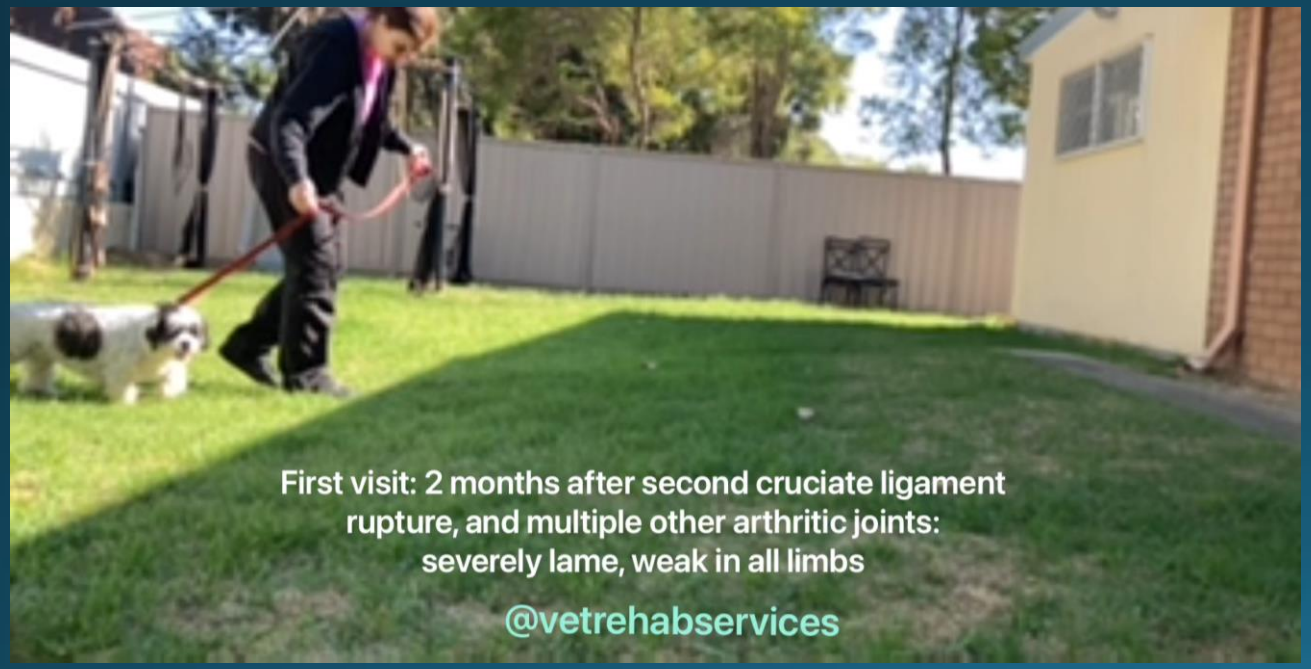
P = painful, C = comfortable

@ assessmt: 2 wks later: 1 mo from 1st: 2 mo from 1st:

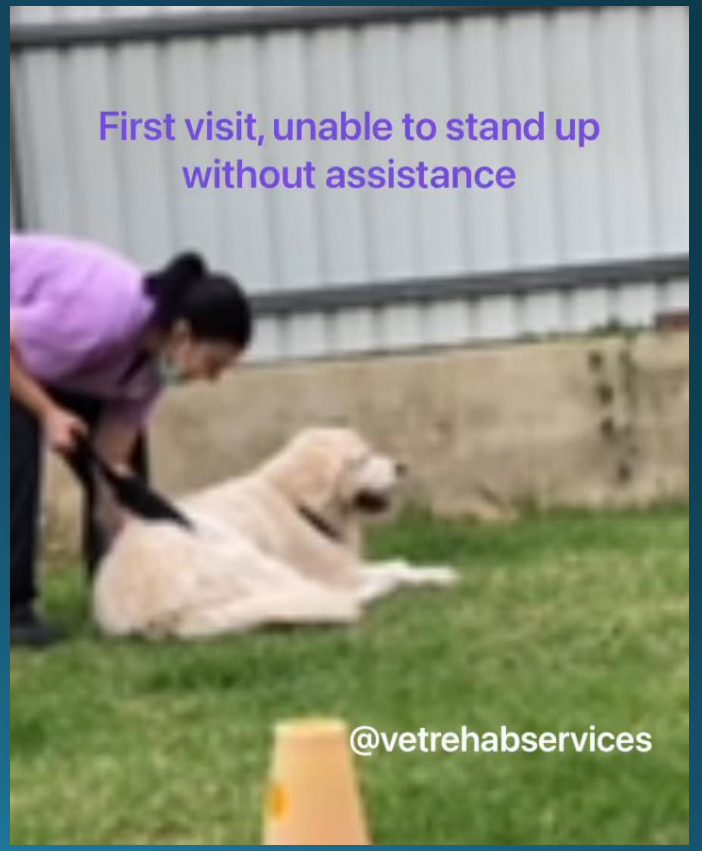


Keys to improving patient outcomes?

1. Look @ spine, soft tissues for abnormalities & tx accordingly
2. Localise sites contributing to lameness more precisely



Jess



Hunter

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Questions?

Hill's

Transforming Lives

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