

# Normal Joint Range of Motion in the Dog and Cat

## Appendix B

Charles D. Newton



- [The Shoulder](#)
  - [The Elbow](#)
  - [The Forearm, the Carpus, and the Forepaw \(Manus\)](#)
  - [The Carpus](#)
  - [The Hip](#)
  - [The Knee](#)
  - [The Tarsus](#)
  - [The Hindpaw](#)
- 

## The Shoulder

The dog or cat shoulder joint is a modified ball-and socket joint. It is capable of flexion, extension, abduction, adduction, internal rotation, external rotation, and circumduction. Its primary motion, however, is flexion and extension. See Figures B-1 to B-3.



FIG. B-1 Flexion-extension of the shoulder (A) Zero starting position: With the dog or cat in lateral recumbency, the brachium is placed perpendicular to a line running along the scapular spine. The brachium should also be parallel to the thoracic wall. (B) Flexion is measured in degrees away from the zero starting position (A-B). (C) Extension is measured in degrees away from the zero starting position (A-C).



FIG. B-2 Abduction-adduction of the shoulder. (A) Zero starting position: The dog or cat is in lateral recumbency or standing, and the shoulder is in 45° extension. Care must be taken to prevent movement of the scapula away from the body wall. (B) Abduction: The outward motion (abaxial) from the zero starting point. (C) Adduction: The inward motion (axial) from the zero starting point, measured in degrees.

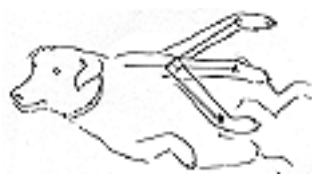


FIG. B-3 Internal and external rotation of the shoulder. (A) Zero starting position: Same as for flexion-extension, but the antebrachium must also be at right angles to the brachium. Extreme care must be taken to firmly hold the scapula so that it does not rotate from the body wall, thus allowing inaccurate measurement. (B) External rotation: Measured in degrees away from neutral in the axial direction (A-B). When the antebrachium rotates in, the humeral head rotates out. (C)

Internal rotation: Measured in degrees away from neutral in the abaxial direction (A-C). When the antebrachium rotates out, the humeral head rotates in.

## The Elbow

The dog or cat elbow is a hinge joint, whose entire motion is in one plane. Only flexion and extension occur within this joint: hyperextension is abnormal. See Figure B-4.



FIG. B-4 Flexion-extension of the elbow. (A) Zero starting position: The antebrachium (forearm) is placed at  $90^\circ$  to an axis running down the humeral shaft. (B) Flexion is measured in degrees away from the zero starting position (A-B). (C) Extension is measured in degrees away from the zero starting position (A-C). Hyperextension is measured in degrees of motion greater than full extension at  $90^\circ$ .

## The Forearm, the Carpus, and the Forepaw (Manus)

Pronation and supination are minimal movements in the dog when compared to cat or man. The motion mainly comes from the radial-ulnar, and intermetacarpal soft tissue, not from rotation of the radial head. Such motion is to be compared to eversion and inversion of the metatarsus. See Figure B-5.

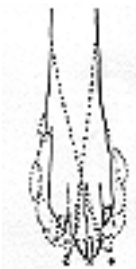


FIG. B-5 Pronation-supination of the elbow. (A) Zero starting position: The forelimb and palmar surfaces of the carpus and metacarpus are held in neutral extension and flat against an examining surface. These motions occur about a line between metacarpals III and IV. (B) Pronation (eversion of paw) is measured in degrees away from the zero starting position at the heads of the metacarpal bones (A-B). (C) Supination (inversion of paw) is measured in degrees away from the zero starting position (A-C).

## The Carpus

The dog or cat carpus has natural motion in flexion, extension, and radial and ulnar deviation. Any rotatory circumduction present is unmeasurable. See Figures B-6 and B-7.

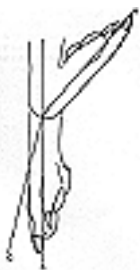


FIG. B-6 Flexion-extension of the carpus. (A) Zero starting position: The extended carpus is in line with the forelimb. (B.) Flexion is measured in degrees away from the zero starting position (A-B). (C) Extension is measured in degrees in the opposite direction from the zero starting position (A-C).

FIG. B-7 Radial and ulnar deviation. (A) Zero starting position: The metacarpus is held in neutral position and neutral supination-pronation. (B.) Radial deviation:



Medial deviation measured in degrees away from the zero starting position (A-B).  
 (C) Ulnar deviation: Lateral deviation measured in degrees away from the zero starting position (A-C).

## The Hip

The dog or cat hip is a ball-and-socket joint. Motion is measured with the dog or cat in lateral recumbency when flexion and extension are being determined. In all hip ranges of motion, care must be taken to eliminate rotation of the pelvis. See Figures B-8 to B-10.



FIG. B-8 Flexion-extension of the hip. (A) Zero starting position: With the animal in lateral recumbency, the femur is positioned to be at right angles to a line connecting the tuber sacrale and tuber ischi of the pelvis. (B.) Flexion is measured in degrees away from the zero starting position (A-B). The examiner's hand should be over the pelvis to detect when the pelvis starts to rotate. (C) Extension is measured in degrees away from the zero starting position and away from flexion (A-C). Pelvic rotation must be eliminated.



FIG. B-9 Abduction and adduction of the hip. (A) Zero starting position: The dog or cat lies in dorsal recumbency with the thigh in neutral position and perpendicular to the examining surface. The leg (crus) must be at right angles to the thigh. (B) Abduction: The outward motion (abaxial) from the zero starting position measured in degrees (A-B). (C) Adduction: The motion inward (axial) from the zero starting position measured in degrees. (A-C). The opposite limb should be extended out of the way to allow the motion.

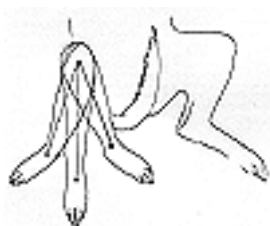


FIG. B-10 Internal and external rotation of the hip. (A) Zero starting position: With the dog or cat in dorsal recumbency, the hip is placed in neutral and the tibia at a right angle to the femoral shaft. (B) External rotation: Measured by rotating the lower leg toward the animal's body (axially). This rotates the femoral head externally and is measured in degrees away from zero starting position (A-B). (C) Internal rotation: Measured by rotating the lower leg (crus) away from the animal's body (abaxially). This produces internal rotation of the femoral head and is measured in degrees (A-C).

## The Knee

The dog or cat knee is a complex joint with multiple parameters for motion; however, the principal motion is hingelike. Flexion is considered as that motion which carries the tibia away from the zero starting position. The motion opposite to flexion, moving toward straight-legged position, is extension. Any motion of the tibia cranial to the straight-legged position is abnormal and is called hyperextension. See Figure B-11.



FIG. B-11 Flexion-extension of the knee. (A) Zero starting position: The tibial axis is held at a right angle to the femoral axis. (B) Flexion is measured in degrees from the zero starting point (A-B) (C) Extension is measured in degrees from the zero starting position (A-C). Hyperextension is measured in degrees occurring after the knee has extended 90°.

## The Tarsus

The dog or cat tarsus (tarsocrural joint) is a modified hinge joint, with its primary motion being flexion and extension between the distal tibia and the proximal tibial tarsal bone. Slight amounts of rotation are present, but are negligible. Motion must be determined with the knee flexed, to release the gastrocnemius tendon pull. see Figure B-12.

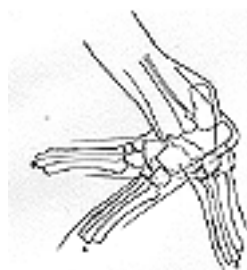


FIG. B-12 Flexion-extension of the tarsus. (A) Zero starting position: The distal paw is held at right angle to the leg, which is right angle to the thigh. (B) Flexion: Measured in degrees from the zero starting point (A-B). (C) Extension: Measured in degrees from the zero starting position (A-C) Hyperextension: Measured in degrees of motion greater than full extension at 90°.

## The Hindpaw

Determination of motion is a function of soft tissue motion between the metatarsals, as well as rotation within the tarsal bones ([See Fig. B-5](#)).

(A) Zero starting point: The metatarsus must be at right angle to the leg, with the plantar surface of the paw also at right angles to the leg. The pivotal point is a line between metatarsus III and IV.

(B) Eversion: The plantar surface is turned to face laterally, which requires pronation and abduction. The motion is in degrees from the zero starting point.

(C) Inversion: This is a combination of supination and adduction of the metatarsus. The motion is in degrees of motion away from the zero starting point and is measured at the heads of the metatarsal bones.

Joint	Dogs	Cats
Neck	45°	45°
Shoulder	180°	180°
Elbow	135°	135°
Wrist	135°	135°
Forelimb	135°	135°
Thoracic	135°	135°
Lumbar	135°	135°
Sacrum	135°	135°
Pelvic	135°	135°
Hip	135°	135°
Knee	135°	135°
Ankle	135°	135°
Tarsus	135°	135°
Metatarsals	135°	135°
Phalanges	135°	135°
Claw	135°	135°

TABLE B-1. Joint Range of Motion: Average of Ten Mixed Breed Dogs and Ten Domestic Short-Haired Cats