The influence of fence height on joint angles of agility dogs.

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INTRODUCTION:

Dog agility is a popular sport in the UK and worldwide (Crufts, 2011). The UK has two governing bodies; The Kennel Club (KC) and United Kingdom Agility (UKA). Both have mini, midi and full height categories, but only UKA has a fourth height, standard, which falls between midi and full height (UK Agility 2004; Kennel Club, 2012b). The KC's Agility Liaison Council has previously discussed the introduction of a fourth height but have rejected the concept to date (Kennel Club, 2011). Consequently, dogs measuring 431mm to the whither would have to jump 650mm under KC regulations but only 500mm under UKA regulations (UK Agility, 2004; Kennel Club, 2012b). Under AKC rules the same dog would only have to jump a fence of 400mm (America Kennel Club, 2011); 250mm smaller than that required by the KC. The range of jump heights offered by UKA and AKC illustrate that other bodies recognise the need for a more staggered increase in heights, potentially to reduce the risk of injury to dogs within each height category; particularly soft tissue injuries to the shoulder and spinal region (O'Canapp 2007; Wernham et al, 2008; Levy et al, 2009).

The aim of this study was to identify the degree of joint angle change in agility dogs over fences of two different heights, set in relation to their wither height. From this, it was aimed that any increase in risk of injury to dogs competing at full height under KC regulations would be identified. This could subsequently be used to support the need for the addition of a forth height within the KC regulations.

METHOD:

Four German Shorthair Pointers, one Hungarian Visla, one Doberman and one Australian Kelpie all free from injury, including musculoskeletal disorders, were used within this study. Markers were attached to the forelimbs (point of shoulder, elbow, carpus, and metacarpal pad), the hindlimbs (sacroiliac joint, base of tail, tuber coxae, stifle, tarsus and metatarsal pad) and vertebral column (external occipital protuberance, C2, T6, T13) (Gradner et al, 2007; Marsh et al, 2009) and the dogs were asked to jump a bar jump, as seen in agility competitions. The jump heights were set specifically for each dog at 7% lower and 51% higher than the dog's height. These percentages were calculated by considering the height of fence in relation to body height that dogs that were just out of KC midi height would have to jump. Dogs between 350 and 430mm at the withers are eligible for midi height (400mm) (Kennel Club, 2011); however a dog measuring just 1mm more, at 431mm, must jump full height (650mm). For a dog of 431mm in height this is 51% greater than the dog's height (figure 2). Those dogs of 430mm who are at the top of the height category for midi are jumping 7% lower than themselves as the fence height is 93% of their height to the withers.

The fence was placed at the midpoint of the long side of an indoor equine arena with a Prowax surface. Jumping efforts were recorded using a JVC GY-HM700U HD camera positioned perpendicularly to fence at a distance of six metres; approach, take-off, bascule, landing and get away phases of the jump were captures captured. The angles of the spine at the base of the skull and the base of the neck, and the carpal, radio-humeral, scapulohumeral, tarsal, stifle, coxofemoral, sacroiliac and thoracolumbar joints were determined from still images using Dartfish software. Angles were measured for approach, take-off, bascule, landing and get away phases for both heights of fence. Take-off and landing distances were also determined using Dartfish. Joint angles, take-off distances and landing distances for the two heights were compared using Wilcoxon Matched Pairs analysis.

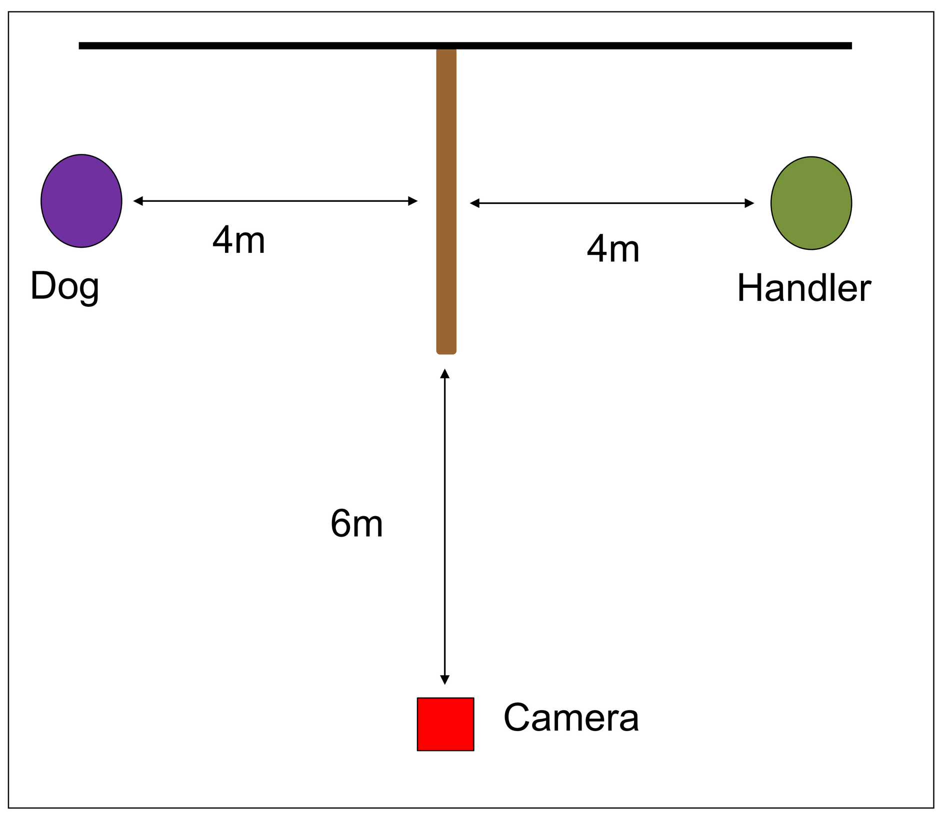

Figure 1: Placement of equipment during data collection

Figure 2: Study subject jumping 51% greater than its body height

RESULTS:

The base of the neck angle significantly (P≤0.05) increased for six of the seven dogs between the 7% lower jump (x=210.4°; SD±2.25) and 51% higher jump height (x=215.6°; SD±4.90) during the approach phase.

During the take-off phase, the hock and sacroiliac angles increased (P≤0.05) from the lowest to the highest height, however the radio-humeral, scapulohumeral and base of neck skull (P≤0.05) decreased. No statistically significant differences (P≥0.05) were found between the take-off distances for the two heights of jumps (figure 3).

The scapulohumeral joint and the elbow joint angles decreased significantly (P≤0.05) from the lowest (x=108.16°; SD±6.38; x=52.43°; SD±19.55 respectively) to the highest height fence (x=86.75°; SD±8.99; x=37.17°; SD±15.62 respectively) during the bascule phase. None of the angles measured changed significantly between the two heights of fence during the landing or get away phases, however landing distance was significantly longer for the higher fence height (P≤0.05).

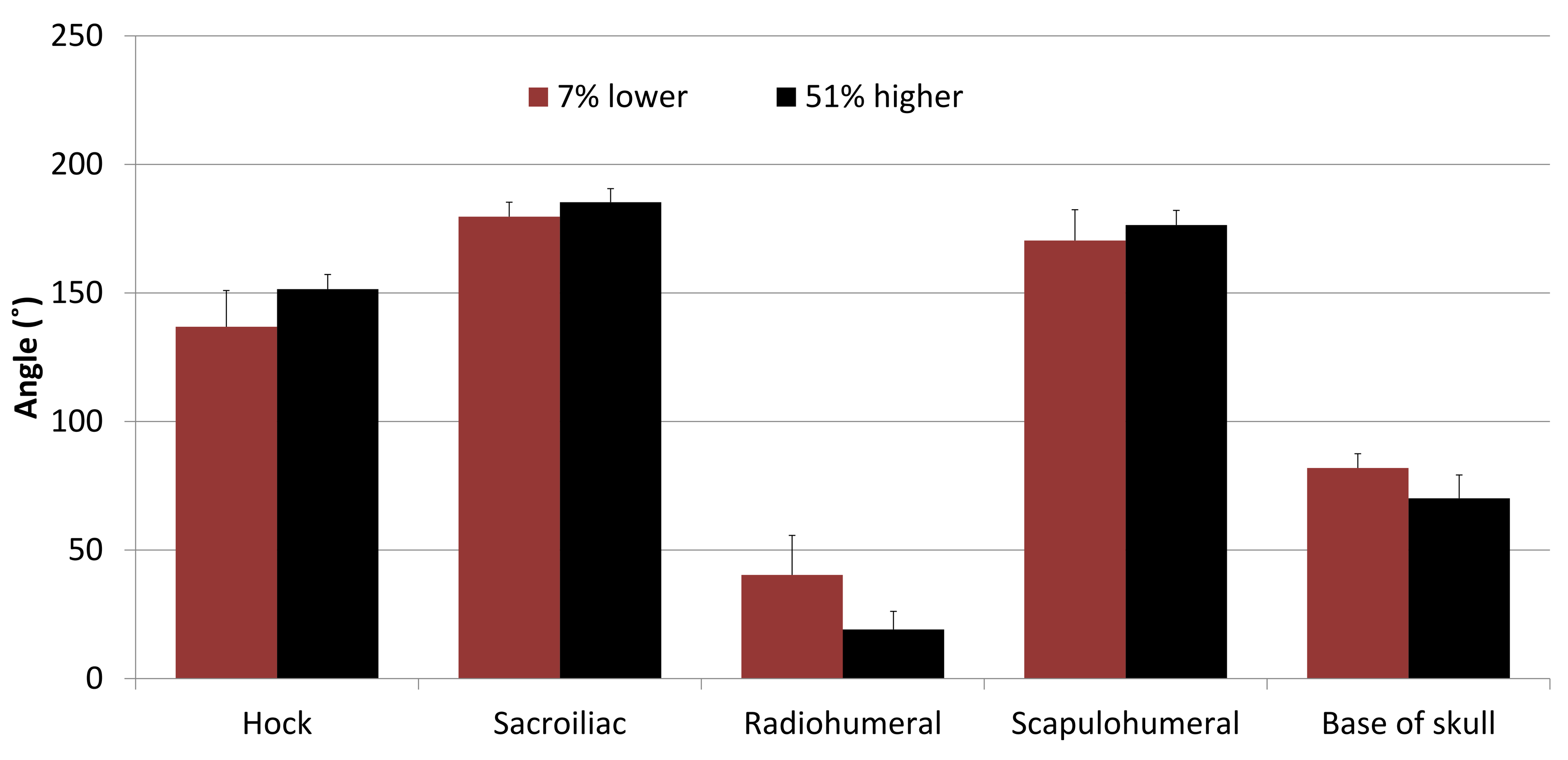

Figure 3: Mean values for joints significantly influenced during the take-off phase by the increase in fence height

CONCLUSIONS:

The findings demonstrate that an increase in fence height results in significant changes to the angulations joints in the forelimb and vertebral column; areas already identified in previous agility dog research as the most commonly injured. This indicates that those dogs who are only marginally within height requirements, and are to move out of the KC midi and in to the KC full height category, are potentially being put at a greater risk of developing injuries such as bicipital tenosynovitis or sacroiliac strain. Further research is needed to confirm injury location and prevalence in relation to the height of the dog and the height category they are competing at. Should a relationship be found, it would support findings from the current study and add emphasis to the suggestion that fence height categories, where dogs are required to jump large fences in comparison to their body size, need to be reviewed to support injury prevention.

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