Supplementary material folder 3

Table 1 expanded with quotes from articles: Primary cam morphology, its defining attributes and empirical referents; quotes from articles in italics

Attribute	Description	Empirical Referent
Attribute 1: Tissue types involved in primary cam morphology	Distinguish between bone and soft tissue (cartilage) on an MR imaging	3 T MR imaging
"Cam morphology was quantified using the alpha angle for bone and cartilage, which was treated as a continuous variable given there is no agreed diagnostic threshold (figure 1). Radiographic epidemiological studies suggest alpha angles above 60 degrees are elevated and potentially diagnostic. Cartilage alpha angle was chosen as the primary outcome measure because in the skeletally immature hip the secondary ossification centre does not accurately reflect overall hip shape. Furthermore, it is non-ossified structures that impact in femoroacetabular impingement". [1]		
Attribute 2: The size of primary cam morphology	Small; moderate; large; pathologic; significant; severe	Alpha angle (degrees), impingement angle (degrees), offset measure (millimetres), offset ratio, femoral head ratio (FHR) of Murray, triangular index, relationship between the width of the femoral neck and diameter of the femoral head. Outcome variables are continuous and/or dichotomous using different cut-off values: alpha angle (≥50°, >50°, ≥50.5°, >50.5°, >51°, >55°, ≥55°, >57°, >60°, >62°, >62.5°, >65°, >78°, >83°), head-neck offset <8mm, anterior offset ratio <0.135, FHR >1.35, triangular index ≥0mm.
'3D multiplanar reconstructions were performed using OsiriX Software (V.6.0.2, Pixmeo). Radial images were acquired around the axis of the femoral neck at 30° intervals. Alpha angle and epiphyseal extension were measured using custom-developed software on the radial slices at 11 o'clock, 12 o'clock, 1 o'clock, 2 o'clock and 3 o'clock. These positions were selected as they include the most frequent locations of cam morphology and pilot data suggested the magnitude of cam morphology was greatest at 1 o'clock. To account for variation in the location of cam morphology, the primary outcome measure was maximum cartilage alpha angle from 11 o'clock through to 3 o'clock.' [1]		
Attribute 3: The site (location) of primary cam morphology	Femur; femoral head-neck; Superior; anterior; inferior;	Radiographs, CT scans or MR imaging

posterior; lateral; antero-lateral;
12 to 11 o'clock positions

'the morphology of the femoral head-neck junction is such that the alpha angle measurements are significantly higher at the anterosuperior femoral head-neck position (1:30 radial position) compared with the anterior position (3:00 radial position)' [2]; *'the circumference of the deformity clearly extended from anterior to anterolateral quadrants'* [2]; *'males anterolateral quadrant; females anterior quadrant'.* [2]

'We used a clock face system to record the localization of cam-type deformities on radial sequences, with 12 o'clock denoting a superior location, 3 o'clock an anterior, 6 o'clock an inferior, and 9 o'clock a posterior location'; [3] *'clockface system on the radial cuts at 7 defined points ranging from 9 o'clock (posterior head-neck junction) to the 3-o'clock position (anterior head-neck junction). The analysis was simplified by converting left sided images into right-sided joints'* [4]; *seven measurements from 9 o'clock to 3 o'clock positions - superior half of the femoral head);* [5]

'To account for variation in the location of cam morphology, the primary outcome measure was maximum cartilage alpha angle from 11 o'clock through to 3 o'clock.' [1]

Attribute 4: The shape of primary cam morphology	Cam-shape; pistol-grip deformity; bump; hump; flattening; aspherical; oval-shaped;	Qualitative judgement or quantified on radiographs, CT scans or MR imaging

'The α angle is an indicator for head asphericity' [4]

'shape defined by a set of landmark pints that are positioned along the contour of the bone' [6]

Attribute 5: Ownership of primary cam morphology	More common in asymptomatic males (vs females) More common in asymptomatic athletes/sporting cohorts (vs non-athletes) Reported: males vs females; athletes vs non-athletes One hip (unilateral); both hips (bilateral); left and right hips; Reported: Per hip; per person; both per hip and per person	Qualitative judgement or quantified on radiographs, CT scans or MR imaging

'Cam-type deformities were seen in 868 male and 1192 female participants, respectively, as follows: pistol grip deformity, 187 (21.5%) and 39 (3.3%);' [7]

'Males participating in competitive sport are at particularly elevated risk of developing cam morphology…'; [1]

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'…CAM impingement is more common in the elite ice hockey athlete in comparison with non-athletes.'; [8]

'The prevalence of bony morphological variants in our cohort [professional adult male soccer players] was as follows: cam morphology, 59% of hips and 71% of players;'; Of the 113 injuries included in the analysis, 85 (75%) were categorised as adductor-related, 15 (13%) iliopsoas-related, 8 (7%) inguinal-related, 14 (12%) pubic-related, and 1 hip-related (1%) groin pain.' [9]

'To investigate the differences between ethnicities in the continuous measures, a univariate linear regression model with generalized estimating equations (GEE) was used to account for the correlation between the left and right hips of each individual.' [10]

'Cam morphology was assessed with MRI of both hips using a 3 Tesla Philips Achieva platform and torso coil (Philips Healthcare).' [1]

'Therefore, the Huber-White-Sandwich estimator was adopted with clustering for laterality to account for the inclusion of left and right hips that are not independent measurements.' [1]

'The presence of a cam deformity per hip was defined when it was present in either view. The presence per person was defined when a cam deformity was present in either view in either hip.' [11]

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