Oxford consensus on primary cam morphology and femoroacetabular impingement syndrome: part 2—research priorities on conditions affecting the young person's hip

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ABSTRACT

Introduction Primary cam morphology is highly prevalent in many athlete populations, causing debilitating hip osteoarthritis in some. Existing research is mired in confusion partly because stakeholders have not agreed on key primary cam morphology elements or a prioritised research agenda. We aimed to inform a more rigorous, inclusive and evidence-based approach to research on primary cam morphology and its natural history by working towards agreement on a set of research priorities for conditions affecting the young person's hip.

Methods An international expert panel—the Young Athlete's Hip Research (YAHiR) Collaborative—rated research priority statements through an online two-round Delphi exercise and met online to explore areas of tension and dissent. Panellists ranked the prioritised research statements according to the Essential National Health Research (ENHR) ranking strategy. Reporting of results followed REPRISE (REporting guideline for PRIority SEtting of health).

Results A diverse Delphi panel (n=65, Delphi rounds 1 and 2; three ENHR strategy surveys: n=49; n=44; n=42) from 18 countries representing six stakeholder groups, prioritised and ranked 18 of 38 research priority statements. The prioritised statements outlined seven research domains: (1) best practice physiotherapy, (2) rehabilitation progression and return to sport, (3) exercise intervention and load management, (4) primary cam morphology prognosis and aetiology, (5) femoroacetabular impingement syndrome prognosis and aetiology, (6) diagnostic criteria, and (7) screening. The panel recommended areas of tension and dissent for the research community to focus on immediately.

Conclusion While informing more rigorous, inclusive and evidence-based research, this consensus is a roadmap for researchers, policy-makers and funders to implement research dedicated to reducing the cost and burden of hip disease related to primary cam morphology.

INTRODUCTION

Primary cam morphology is mostly a benign bony prominence that develops at the femoral head–neck junction of the hip. It is, however, highly prevalent in many athlete populations[1–3] and causes debilitating hip osteoarthritis in some,[4] thus placing existing and potential athlete-patients at risk of future hip disease.

Two aspects relevant to research focus and quality, highlighted in the introduction of a linked paper (Oxford consensus study, part 1) underpinned the work reported in this paper. First, clinicians and researchers cannot predict with accuracy who will develop primary cam morphology, whose primary cam morphology will be inconsequential and who will end up with a total hip replacement—research into risk factors for aetiology and poor outcomes of primary cam morphology is needed. Second, existing research is mired in confusion partly because clinicians, athletes, patients and researchers have not agreed on a conceptual or operational definition of primary cam morphology, key terminology or a taxonomy of subtypes.[5]

We reported in a linked paper (Oxford consensus study, part 1) how an international group of clinicians, athletes, patients and researchers—representing the Young Athlete's *Hip* Research (YAHiR) Collaborative—engaged with, challenged and improved four key areas on primary cam morphology and its natural history. The four key areas identified for further attention by a preliminary concept analysis[5] were the following: (1) a new conceptual definition for the morphology based on five defining attributes; (2) more consistent terminology commending the important (although from a small and select expert panel) Warwick Agreement[6]; (3) taxonomy distinguishing between primary and secondary cam morphology and (4) challenges of operationalising the hip morphology. However, agreement on a prioritised research agenda for the field, the focus of this paper, is lacking.

The problem of largely investigator-driven health research agendas, marginalising the voices of other stakeholders including patients, caregivers and the community, has fuelled a mismatch between the interests of patients and researchers, and a possible misdirected allocation of limited resources.[7–9] This spotlighted the need for transparent research priority setting with stakeholders.[7 10–17]

The Warwick Agreement expert panel, including one patient, prioritised and ranked 23 femoroacetabular impingement (FAI) syndrome research questions in 2016,[6] while more recent consensus statements on hip-related pain[18–21] and FAI imaging[22–24] proposed and discussed, without prioritising or ranking, additional research topics.

Research partnerships with athletes, patients, researchers and clinicians should agree on a prioritised research agenda for conditions affecting the young person's hip. If not, crucial questions will remain unanswered, scarce resources will continue to be directed to areas with low or no impact, and research waste will continue.

Here we report on our aim to inform a more rigorous, inclusive and evidence-based approach to research on primary cam morphology and its natural history. The specific objectives of the research were to:

1. Ascertain the level of agreement among experts on definitions, terminology, taxonomy and imaging outcome measures for research on primary cam morphology.
2. Work towards agreement (and highlight residual disagreements) on a set of research priorities on conditions affecting the young person's hip, focusing primarily on primary cam morphology and its natural history.
3. Hold two education events to engage stakeholders, disseminate the latest evidence and stimulate debate.
   - *Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series*.
   - *Young Athlete's Hip Research Collaborative Symposium*.

We report the results of objective 2 and our dissemination strategy (objective 3) in this paper and that of objective 1 in a linked paper (Oxford consensus study, part 1).

METHODS

This methods section focuses on objectives 2 and 3 of the Oxford consensus study while a linked paper (Oxford consensus study, part 1) describes the methods to achieve objective 1. Online supplemental file 1 describes and elaborates on the combined Methods for parts 1 and 2 of the Oxford consensus study.

We held a sequential, two-round online Delphi survey and two synchronous online mixed stakeholder group meetings (Interacting Group Process) to explore the level of agreement among a panel of experts on primary cam morphology definitions, terminology, taxonomy and imaging outcome measures for research, and to work towards agreement on a set of research priorities on conditions affecting the young person's hip. The prioritised research statements were further ranked according to the Council on Health Research for Development's Essential National Health Research (ENHR) ranking method.

Study design: Delphi method and research priority setting process

Delphi method: For this three-stage consensus study (figure 1), an experienced steering committee managed the design, conduct and dissemination rigour. A two-round Delphi method was used to prioritise the research statements (domain 5 of the Delphi method). We modified the classical Delphi method slightly by replacing an open qualitative first round with a preselected list of statements based on a literature review and synthesis of steering group members' knowledge.[25–27] Three online Microsoft Forms surveys followed to further rank the prioritised statements according to the Council on Health Research for Development's ENHR strategy for research priority setting.[28]

Research priority setting—ENHR strategy to rank the prioritised statements: We adapted the ENHR 'mini-module', asking the Delphi panel to apply a 0 to 3 Likert Scale score to category 1 criteria, and 1 to 3 Likert Scale for remaining six criteria. A maximum three points per criterium resulted in an equal weighting of six points per category (figure 2 and online

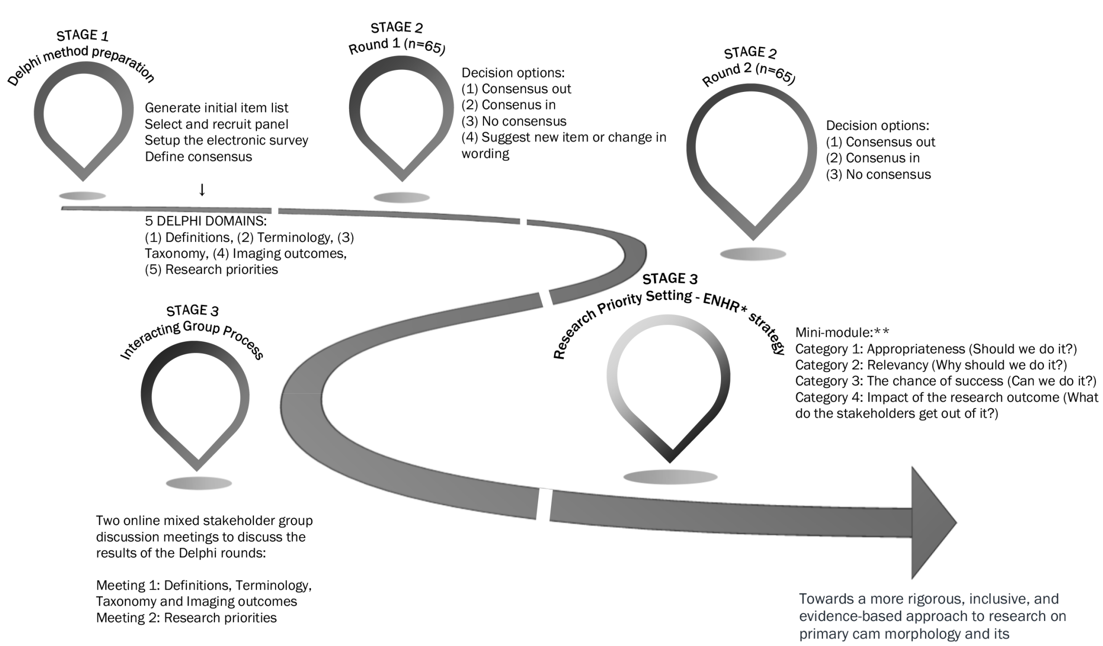

Figure 1 Oxford consensus study flow chart. Stage 1: prepare for Delphi method; stage 2: Delphi method online rounds; stage 3: virtual discussion meetings and ENHR strategy for research priority setting. *Essential National Health Research; **Mini-module adapted from Ref. 28.

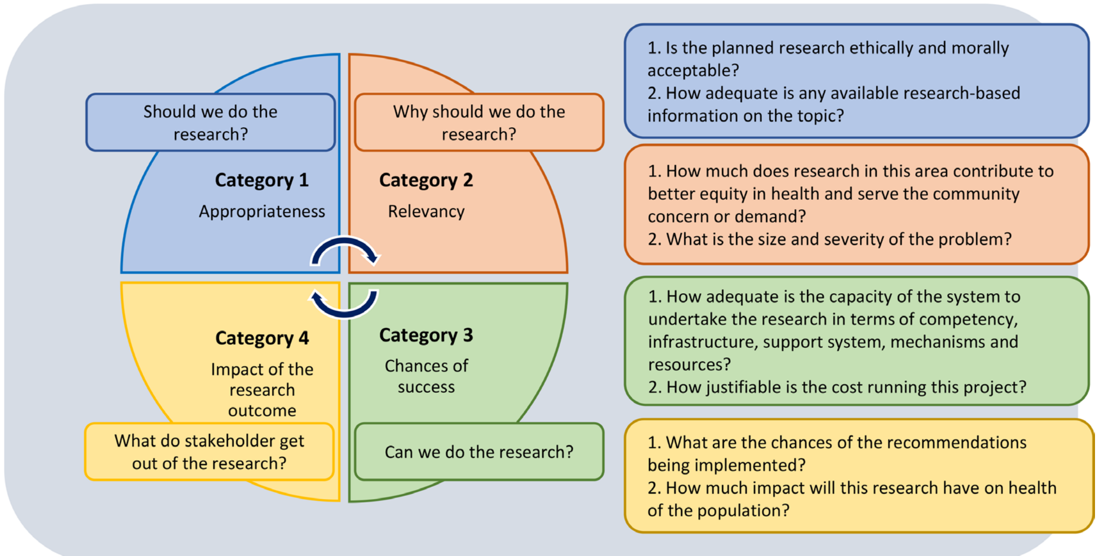

Figure 2 Four categories (and two criteria for each) of the Essential National Health Research ranking strategy.[28] We applied a 0 to 3 Likert Scale score to category 1 criteria, and 1 to 3 Likert Scale score for the remaining six criteria. A maximum three points per criterium resulted in an equal weighting of six points for each category.

supplemental files 8a, 8b and 8c and 9). We shared and discussed the ENHR ranking strategy results with Delphi panel members during optional online meetings. Our research priority setting project will be registered on the Ludwig Boltzmann Gesellschaft Open Innovation in Science Center's worldwide Priority Setting Database of research priority setting projects, adding rigour and transparency.[29]

The Delphi and ENHR exercises allowed panel members to participate anonymously, reducing the potential influence of dominant individuals.[30] Reporting of results followed the 31-item REporting guideline for PRIority SEtting of health (REPRISE)[7] (online supplemental file 2) and the Conducting and REporting DElphi Studies (CREDES)[31] (online supplemental file 3).

Stage 1: planning

Steering committee: The study steering committee included members of the YAHiR Collaborative and aimed for a robust Delphi method and ENHR ranking process. Interpreting 'diversity' as more than representation of certain demographic groups, the steering committee ensured a diverse (eg, sex/gender, country of residence, profession), informed (knowledgeable about primary cam morphology and its natural history) and representative of previously minoritised groups relevant to this research field (eg, participants from the Global South, patient and public representatives and women) international Delphi panel. By prioritising anonymity and access to adequate topic-specific resources, the online Delphi method and ENHR ranking strategy supported a more equitable and inclusive process (online supplemental file 4: steering committee terms of reference).

Delphi and ENHR ranking panel: We describe in a linked paper and online supplemental file 1, how the 'closeness continuum' was adapted and applied to purposively recruit a maximum variation sample of 73 experts for this study, based on the steering committee's judgement and knowledge of the context.[32] With steering committee oversight, the lead author invited all potential participants. Participants were not reimbursed.

Sample size: The Delphi study steering committee oversampled to compensate for possible attrition over rounds (at a rate of 25% per round). As consensus is normally achieved in an average of three rounds, the steering committee aimed to recruit a starting sample of 50 to 100 panel members.

Patient and public involvement (PPI): We involved patient and public partners in the planning, delivery and dissemination phases of the Oxford consensus through the YAHiR Collaborative's PPI group. The latter group was represented in the Delphi study steering committee. We supplied all members of the PPI group with a glossary, mentored them on definition use and content (during individual and one PPI group online meetings) and invited them to weigh in on each Delphi round as well as in ENHR ranking surveys.[33] They had access to the recordings of the *Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series*, providing a good knowledge base including the current evidence, and issues, allowing an informed assessment. Members of the PPI group lead and actively participated in the mixed stakeholder group discussions following the Delphi rounds (stage 3 below).

Delphi software: We used DelphiManager, 'a web-based system designed to facilitate the building and management of Delphi surveys' for the Delphi rounds and Microsoft Forms for the ENHR research ranking exercise.[34]

Ethical considerations: Research participants provided informed online consent for the study as part of the DelphiManager surveys and their identities kept anonymous during the online Delphi and ENHR ranking rounds. The University of Oxford's Medical Sciences Interdivisional Research Ethics Committee (MS IDREC) provided ethics approval (R73576/RE001).

Statement preparation: We created an extensive list of statements and conceptual framework of all the potential future research priorities for primary cam morphology and its natural history. We based the initial statement list on a concept analysis of primary cam morphology,[5] the early results of a qualitative study to explore stakeholder perspectives on factors contributing to high-quality research on how primary cam morphology develops, the Lisbon Agreement on Femoroacetabular Imaging[22–24] and the research recommendations of recent (since January 2016) consensus recommendations on research in the field.[6 18–24] Members of the Delphi study steering committee independently reviewed the statements, followed by an iterative, asynchronous

Table 1 Definition of consensus

Category	Definition	Action
Consensus in (high agreement)	Scored as very important (7 to 9) by ≥70% of panel members *and* not important (1 to 3) by <15% of panel members.	Item retained for the next survey round/consensus meeting.
Consensus out (low agreement)	Scored as not important (1 to 3) by ≥70% of panel members *and* very important (7 to 9) by <15% of panel members.	Item discarded after round 2 (to be ratified at the face-to-face consensus meeting).
No consensus	Neither criteria above are met.	Item retained for the next survey round/consensus meeting.
Suggest rewording	Scored as important but must be reworded.	Provide the opportunity for panel members to suggest rewording. The study steering committee will consider retaining a reworded item for the next survey round.

online process to review, discuss, modify and approve the final statements. The steering committee provided additional descriptive information ('Help Text') where appropriate and asked stakeholders, including members of the PPI group, to provide feedback on the draft Delphi survey. Stakeholders examined the survey's face validity (eg, comprehensibility and acceptability) and refined language, formatting and layout.

Panel information pack and training: All panel members had access from the outset of the project and throughout the Delphi process to the course material, including recorded presentations, of the first eight webinars of the *Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series* (online supplemental file 5). Panel members had full-text access to five recent consensus statements,[6 18–21] and a summary of their research recommendations is described in online supplemental file 6. Completion of the webinars and/or reading of the consensus statements were not required.

Consensus definition: The steering committee agreed on a consensus definition prior to the Delphi rounds (table 1).

Stage 2: online Delphi rounds

The consensus process involved a sequential, two-round Delphi survey.

Round 1: Invited participants provided informed consent and registered for the study in one of the six stakeholder groups. The statements were presented in a sensible and logical order in five questionnaire domains (definitions, terminology, taxonomy, imaging outcomes and research priorities).

Panel members scored each statement using a 9-point Likert Scale ranging from 1 ('not important/disagree') to 9 ('critical/agree'), based on the Grading of Recommendations Assessment, Development and Evaluation scale for scoring the importance of including the item in the final list of statements.[35] Round 1 included free-text sections allowing participants to propose new or modified statements and provide general study feedback. The steering committee reviewed, discussed and considered the proposed new statements or statement modifications suggested by participants in round 1 and resolved any uncertainties. All statements were kept unchanged for round 2.

Round 2: Participants had access to the visual distribution (histograms) of round 1 scores for each statement stratified by stakeholder group. Panel members saw their score and then rescored (or not if they chose to defend their outlying score) each statement on a scale of 1 to 9 based on the average scores of the group. We documented changes in scores from round to round, and panel members could provide reasons when their score boundaries changed between round 1 and round 2, for example, to defend their outlying score(s) (online supplemental file 7).

The steering committee and Delphi panellists explored and discussed reasons for outlying scores, disagreement and dissent (including statements with overall consensus) during the online Interacting Group Process (stage 3). The steering committee considered further Delphi rounds (applying the same criteria). However, the two Delphi rounds resulted in high consensus and surfaced important disagreements and areas of dissent to proceed to online consensus discussions, including how to implement the study's findings.

Stage 3: online Interacting Group Process and research priority setting using the ENHR ranking exercise

Interacting Group Process—online mixed stakeholder group discussion meetings: Facilitated by Delphi steering committee and PPI group members, Delphi panellists discussed all discordant items as well as areas of tension and dissent, during two online mixed stakeholder group meetings, based on the Interacting Group Process. The second meeting, reported in this paper, discussed research statements prioritised after the two Delphi rounds. The first meeting discussed the Delphi round results for the first four domains: definitions, terminology, taxonomy and imaging outcomes (Oxford consensus study, part 1). To create a safe space for panellists to share their views, the steering committee facilitated discussions in small zoom breakout rooms that were not recorded. Group leads documented the discussions in a field diary and maintained speaker anonymity.

Research priority setting—ENHR strategy: An online Microsoft Forms survey process followed to further rank the prioritised statements according to the ENHR strategy for research priority setting as described earlier (online supplemental files 8a, 8b and 8c).[28]

Feedback: Following the ENHR ranking exercise, panellists were able to attend one of six optional, time-zone friendly online feedback-and-discuss meetings.

Data analyses

Delphi method: We describe detailed data analysis, including descriptive statistics, qualitative analysis of panellist feedback and dissent analysis in a linked paper (Oxford consensus study, part 1) and online supplemental file 1. We applied outlier, bipolarity and stakeholder group analysis to explore possible dissent (dissent analysis).

ENHR ranking exercise: We created Excel spreadsheets of panellists' ranking-question scores and qualitative feedback (using three Microsoft Forms surveys) for each of the 18 Delphi method-prioritised research statements. We calculated mean scores for the eight ranking criteria (0 to 3 Likert Scale score to category 1 criteria and 1 to 3 Likert Scale for the remaining six criteria). A maximum three points per criterium resulted in an equal weighting of six points for each of the four categories (figure 2). The final statement ranking score was calculated by

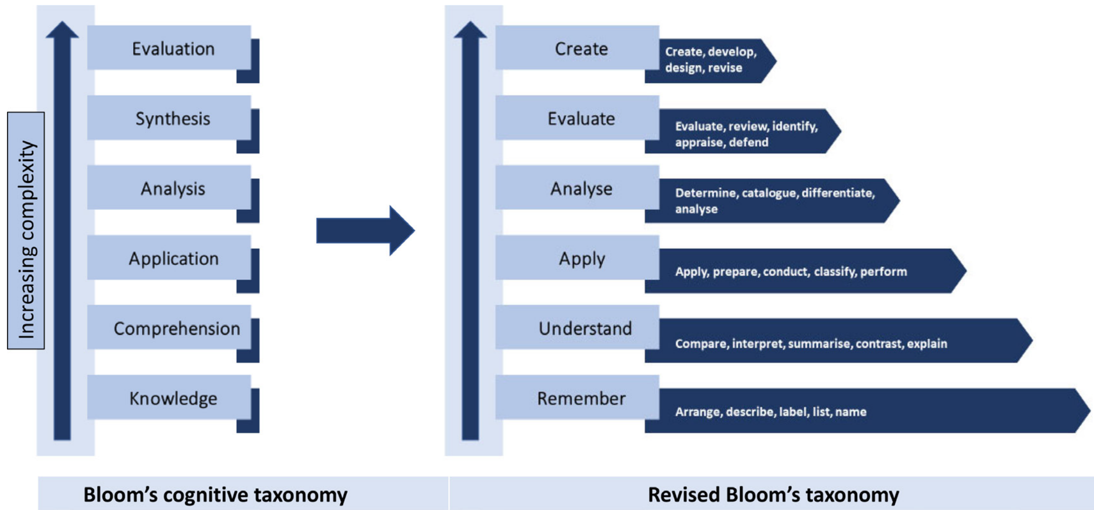

Figure 3 Revised Bloom's taxonomy of cognitive process action verbs informing our dissemination strategy.[36]

adding the mean criterium scores (maximum ranking score per research statement=24).

Dissemination and implementation

To fulfil objective 3 of the Oxford consensus study, we applied the revised Bloom's taxonomy[36] (figure 3) to develop two education events aimed at early dissemination and implementation: *Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series* (online supplemental file 5), and YAHiR Collaborative's *Young Athlete's Hip Symposium and Research Meeting* (22–23 September 2022 at Worcester College in Oxford—online supplemental files 13a and 13b). The revised Bloom's taxonomy, a tool to create education that encourages critical thinking, emphasises verbs—the basis of the cognitive process.[36]

RESULTS

Of the 73 experts invited to participate in this study, 65 completed rounds 1 and 2 of the Delphi exercise. The Delphi panel from 18 countries represented six stakeholder groups—26 were female (table 2). The Delphi panel scored 85 statements (12 definition, 19 terminology, 4 taxonomy, 12 imaging outcome and 38 research statements) and reached consensus on 43 of 85 (51%) statements in round 1, and 53 of 85 (62%) statements in round 2. Results of the Delphi rounds for the definition, terminology, taxonomy and imaging outcomes domains (domains 1 to 4 of the Delphi method; objective 1) are reported in a linked paper (Oxford consensus study, part 1).

Here, we report the results of our strategy working towards agreement on a set of research priorities on conditions affecting the young person's hip, focusing on primary cam morphology and its natural history (objective 2; Delphi domain 5 and ENHR ranking strategy). This results section includes three key elements: (1) quantitative results (online supplemental files 7, 8a and 8b), (2) qualitative analysis supported by quotations of panellists' feedback selected from across the Delphi database (online supplemental file 10) and (3) dissent analysis (online supplemental file 9). Through this comprehensive approach to results, we illuminate the quantitative and qualitative strengths of the Delphi method. To facilitate readability, we colour-coded tables 3 and 4 and crafted a separate infographic paper summarising the 18 prioritised research statements in seven research domains.

The results of the Interacting Group Process discussions are summarised in box 1 and online supplemental file 12. We also report two education events to engage stakeholders and disseminate research results (objective 3).

The Delphi panel reached consensus to prioritise 14 of 38 research statements in Delphi round 1 and 18 in round 2 (table 3). Twenty research statements were not prioritised (table 4). Panellists listed reasons for score boundary changes between rounds 1 and 2 for each statement (online supplemental file 7); statement 56 (table 3) did not reach stability. The four highest ranked research statements following the Delphi rounds described studies to investigate primary cam morphology aetiology and prognosis (statements 49, 48, 50 and 54; >90% Delphi panellists agreed that these statements were 'critical' and 0% that it was 'not important'). This changed after the online Interacting Group Process discussion (six mixed stakeholder groups (n=41) of five to eight panellists each) and the ENHR ranking exercise (three ENHR strategy surveys: n=49; n=44; n=42). We present the average criterium question scores for 18 prioritised statements in online supplemental files 9 and 11. Figure 4 presents the median, IQR, minimum, maximum and outlier statements for the eight criteria used to rank research statements.

The 18 prioritised and ranked research statements, highlighted in green in table 3, outlined seven research domains: (1) best practice physiotherapy, (2) rehabilitation progression and RTS, (3) exercise intervention and load management, (4) primary cam morphology aetiology and prognosis, (5) FAI syndrome aetiology and prognosis, (6) diagnostic criteria, and (7) screening. These are medium-term to long-term research priorities (figure 5). A related infographic paper presents the prioritised research domains in the context of primary cam morphology's natural history.

The Delphi panel prioritised research on best practice physiotherapy, including (1) what it is (statement 68); (2) prognosis after best practice physiotherapy and/or arthroscopic hip surgery in patients with FAI syndrome (statement 67) (however, current methods to capture outcomes are 'controversial'), and (3) trials comparing best practice physiotherapy with arthroscopic hip surgery and sham surgery in patients with FAI syndrome (statement 66). Acknowledging the fact that 'we already have three trials', the panel commented on the 'need to establish what best practice physiotherapy is' before comparing it with

Table 2 Demographic characteristics of Delphi panel and Essential National Health Research (ENHR) ranking exercise participants

	Delphi exercise	ENHR ranking exercise (Oxford consensus study, part 2)		
	Round 1 and round 2 (n=65)	Survey 1* (n=49)	Survey 2† (n=44)	Survey 3‡ (n=42)
Sex				
Male	39	No sex data collected		
Female	26			
Stakeholder group: n=6				
Orthopaedic surgeons	11	7	4	4
Patient and public involvement group	10	7	6	6
Physical therapists	17	17	16	16
Physicians	13	8	8	7
Radiologists	6	4	4	4
Researchers	8	6	6	5
Country of residence				
Australia	8	No country of residence data collected		
Belgium	1			
Brazil	1			
Canada	5			
Denmark	4			
Germany	1			
Ireland	2			
Netherlands	5			
Norway	2			
Portugal	1			
Qatar	7			
South Africa	3			
Spain	1			
Sweden	1			
Switzerland	2			
Turkey	1			
UK	7			
USA	8			

*Survey 1: Statements 48 to 54.
†Survey 2: Statements 55 to 59.
‡Survey 3: Statements 64 to 69.

other interventions. What best practice physiotherapy is, is also important for athlete-patients: 'my experience of physiotherapy as an elite athlete was very mixed—some good, some poor'.

An ex-elite athlete panel member contextualised the importance of studying 'best criteria for rehabilitation progression and Return to Sport (RTS) following management of hip-related pain', (statement 69): 'worries about RTS caused major anxiety for me' as 'sport was my living'.

The panel recognised the size and cost of RCTs to investigate how exercise intervention influences the development and prognosis of primary cam morphology (statements 57 and 58) and FAI syndrome in cohorts with variable loading demands (statement 65). To address these challenges, they emphasised 'pooling of resources/skills', and 'to start with one sport/cohort and do this well before extending outwards'. In addition, it is 'very hard to get people to change behaviour regarding sports activities'. Although prioritised, there are at least four challenges to plan and do 'cohort studies to investigate how exercise intervention influences the development and prognosis of primary cam morphology in cohorts with variable loading demands' (statement 57). First, to date, exercise interventions 'are ill-defined'. Second, cohort studies might not be the best study design 'to study the effects of interventions'. Third, 'variable-loading demands' may be 'difficult to determine' in some sports. Finally, it is necessary to 'consider load outside of the structured sporting environment'.

The Delphi panel prioritised prospective cohort studies to investigate primary cam morphology and FAI syndrome risk factors (aetiological and prognostic). Acknowledging the importance of prospective research on aetiological risk factors for primary cam morphology (statements 48 and 53), the panel also prioritised cohort studies on how the morphology develops in different sex/gender (statement 50), race/ethnic (statement 52) and variable load demand cohorts (statement 49), including parasport (statement 51), especially 'multicentre studies that would really improve knowledge and patient care'.

Primary cam morphology prognosis studies (statements 48 and 54) are 'vitally important'; however, panellists acknowledged four challenges. First, these studies are 'really difficult' to plan and execute. Second, 'funding is always an issue'. Third, these are long studies and, therefore, have a 'lower chance of success'. Finally, scientific evidence is lacking 'for interventions to modify disease trajectory'.

While prioritising 'studies to develop and validate diagnostic and prognostic models for primary cam morphology in young (maturing) athletes' (statement 56), panellists commented that 'the field is not ready' yet and that 'identification of risk factors (eg, explanatory analyses)' should be prioritised. Another panellist, 'considering agreement on cam morphology being a finding and not a diagnosis', suggested rephrasing the statement to 'develop and validate measurement methods and prognostic models'.

Panellists emphasised two important considerations for 'prospective cohort studies investigating risk factors for the development and prognosis of femoroacetabular impingement (FAI) syndrome in different cohorts' (statement 64): 'the impact on stakeholders and their involvement', and whether agencies/governments will 'see this as a priority for funding'.

The panel emphasised five important considerations for primary cam morphology and FAI syndrome risk factor research. First, it is crucial, 'to ensure there is more research in this space around females given the lack of current data'. Second, race/ethnicity is a 'hot topic right now' and 'a difficult construct, especially when treated categorically'. Resources are required 'to adequately sample diverse populations'. Third, research on variable loading demands is challenging. It should focus on 'the effect of different loading patterns as it may be possible to modify loading in specific athletic populations'. However, it is difficult 'to accurately capture' training loads and 'tough' to get stakeholder 'buy-in'. For example, there is 'no way' to convince disciplines such as dance 'to change something in terms of load to prevent the development of health problems'. Fourth, parasport, although 'incredibly important', is a 'difficult population to study because infrastructure to support is not as strong', and large enough sample sizes is a 'big challenge'. Finally, it is crucial to consider available data for example, Generation R Study in the Netherlands, 'a prospective general population study in children on which we have prospective follow-up imaging data of the hip of around 3000 children at ages 9, 13 and 17 years (the latter is ongoing)'.

Research to determine diagnostic criteria for cam and pincer morphology, including diagnostic accuracy (statement 55), although prioritised by the panel, 'may focus too much on a dichotomous view' rather than 'degrees (literally) of risk'.

Table 3 Results of two Delphi survey rounds and ENHR* ranking exercise showing the level of agreement and ranking of 18 prioritised research priority statements on conditions affecting the young person's hip†

Statement		Round 1		Round 2		ICC‡	ICC 95% CI		ENHR*
		Not important/ disagree	Critical/ agree	Not important/ disagree	Critical/ agree		Lower bound	Upper bound	Rank (score)§
No	Research priorities								
48	Prospective cohort studies to investigate risk factors (aetiological and prognostic) of primary cam morphology in different cohorts	0%	87.3%	0%	95.3%	0.85	0.74	0.91	13 (17.4)
49	Prospective cohort studies that investigate how primary cam morphology develops in cohorts with variable loading demands (eg, different sports/dance/physical activity level cohorts and sedentary cohorts) (causal inference approach to investigate load as a risk factor for primary cam morphology)	0%	90.3%	0%	98.4%	0.77	0.63	0.86	14 (17.2)
50	Prospective cohort studies that investigate how primary cam morphology develops in different sex/gender cohorts, specifically women cohorts (causal inference approach to investigate gender as a risk factor for primary cam morphology)	0%	88.9%	0%	93.8%	0.75	0.60	0.84	7 (18.5)
51	Prospective cohort studies that investigate how primary cam morphology develops in different parasport cohorts (causal inference approach to investigate load as a risk factor for primary cam morphology)	3.2%	64.5%	1.6%	71.4%	0.87	0.80	0.92	18 (16.2)
52	Prospective cohort studies that investigate how primary cam morphology develops in different race/ethnic cohorts (causal inference approach to investigate race/ethnicity as a risk factor for primary cam morphology)	1.6%	66.7%	0%	78.1%	0.81	0.70	0.88	16 (16.9)
53	Prospective cohort studies that investigate other potential risk factors for primary cam morphology (causal inference approach to investigate the following risk factors: anatomical spine, acetabulum, femur, kinetic and kinematic risk factors, mechanical and biomechanical, other possible risk factors that might emerge over time)	1.6%	75.8%	0%	84.1%	0.80	0.69	0.88	17 (16.3)
54	Prospective cohort studies that investigate prognosis (consequences) of primary cam morphology in different cohorts	0%	85.5%	0%	93.8%	0.83	0.71	0.90	4 (18.5)
55	Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for cam and pincer morphology	3.2%	76.2%	0%	84.6%	0.78	0.65	0.86	11 (17.8)
56	Studies to develop and validate diagnostic and prognostic models for primary cam morphology in young (maturing) athletes	1.6%	82.5%	0%	90.6%	0.65	0.47	0.80	12 (17.4)
57	Prospective cohort studies to investigate how exercise intervention influences the development and prognosis of primary cam morphology in cohorts with variable loading demands	4.8%	74.6%	3.1%	82.8%	0.84	0.74	0.90	10 (18.3)
58	Randomised controlled clinical trials to investigate how exercise intervention (load management) influences the development and prognosis of primary cam morphology in different demographic (eg, sex/gender, race/ethnicity) and load (variable loading demands—for example, different sports, dance and physical activity level) cohorts	3.3%	72.1%	1.6%	79.4%	0.93	0.88	0.96	6 (18.5)
59	Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes	3.2%	66.7%	0%	71.9%	0.84	0.75	0.90	15 (17)
64	Prospective cohort studies to investigate risk factors for the development and prognosis of femoroacetabular impingement (FAI) syndrome in different cohorts	0%	76.2%	0%	83.1%	0.86	0.77	0.91	9 (18.37)
65	Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of FAI syndrome in cohorts with variable loading demands	3.2%	77.8%	1.5%	80.0%	0.93	0.89	0.96	3 (18.9)
66	Randomised controlled clinical trials to investigate best practice physiotherapy versus arthroscopic hip surgery versus sham surgery in cohorts with variable loading demands diagnosed with FAI syndrome	6.5%	82.3%	4.6%	87.7%	0.90	0.84	0.94	8 (18.4)

Continued

Table 3 Continued

Statement		Round 1		Round 2		ICC‡	ICC 95% CI		ENHR*
		Not important/ disagree	Critical/ agree	Not important/ disagree	Critical/ agree		Lower bound	Upper bound	Rank (score)§
67	Prospective cohort studies to investigate the prognosis after best practice physiotherapy and/or arthroscopic hip surgery in different sport/dance/physical activity level cohorts with FAI syndrome	**4.8%**	**68.3%**	**1.5%**	**73.8%**	0.89	0.83	0.94	5 (18.5)
68	Randomised controlled clinical trials to investigate what best practice physiotherapy is (eg, in different populations and settings; presurgery and postsurgery)	**1.6%**	**79.4%**	**0%**	**78.1%**	0.96	0.93	0.98	1 (19.9)
69	Studies to determine the best criteria for rehabilitation progression and return-to-sport following the management of hip-related pain	**0%**	**71.4%**	**0%**	**73.4%**	0.86	0.78	0.91	2 (19.3)

Green (high agreement on 'consensus in'): statement scored as critical (Likert Scale 7 to 9) by ≥70% of panel members and not important (Likert Scale 1 to 3) by <15% of panel members.
Red (high agreement on 'consensus out'): scored as not important (Likert Scale 1 to 3) by ≥70% of panel members and critical (Likert Scale 7 to 9) by <15% of panel members.
Yellow (non-consensus): neither of the 'consensus in' or 'consensus out' criteria were met.
*Essential National Health Research ranking exercise.
†We reported the results of statements 1 to 47 in a linked paper (Oxford consensus study—Part 1).
‡ICC, intraclass correlation coefficient; type A ICCs using an absolute agreement definition; two-way mixed effects model where people effects are random and measures effects are fixed. ICC is an indication of the level of agreement—stability (within-subject variation and between-subject variance of individual statement scores between Round 1 and Round 2.) We used the lower bound 95% CI of the ICC estimate as the basis to evaluate the level of reliability (stability) using the following general guideline: values <0.5 were classified as poor reliability ICC values, 0.5 to 0.75 indicated moderate reliability, 0.75 to 0.9 indicated good reliability and >0.9 indicated excellent reliability.
§Average ENHR ranking score (maximum score=24, representing the sum of average scores for four ranking categories, each with a maximum score of 6).
ENHR, Essential National Health Research.

While agreeing 'consensus is needed regarding a gold standard diagnostic tool if possible', this research needs to be 'carefully developed/investigated' to focus on 'imaging outcomes' that are 'correlated with clinical outcomes'. A panellist questioned whether 'a set of very clear diagnostic criteria' is possible 'as FAI syndrome is a complex 3D dynamic problem'.

Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes (statement 59) 'isn't as important as some of the other research priorities'; however, this research 'should be taken very seriously and involve all stakeholders'.

Dissent analysis (online supplemental file 11). *Outlier analysis:* 2 outliers for 16 of 38 research priority statements did not influence group consensus or non-consensus. *Bipolarity analysis:* There was no bimodal distribution in the overall scoring of research priority statements. *Stakeholder group analysis*: The average round 2 scores were significantly different for the physical therapist stakeholder group compared with the radiologist stakeholder group for statements 61, 74 and 75; for the physical therapist stakeholder group compared with researcher stakeholder group for statements 58, 61, 65, 68, and 74, and physician stakeholder group compared with radiologist stakeholder group for statements 61 and 74.

Results of the online Interacting Group Process are summarised in box 1 and online supplemental file 12.

Dissemination and implementation

This study informed the design of two educational events to engage stakeholders, disseminate the latest evidence and stimulate debate: the *Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series* (online supplemental file 5) and the YAHiR Collaborative's *Young Athlete's Hip Symposium and Research Meeting* (online supplemental file 13a and 13b) a 2-day event at Worcester College, Oxford (22–23 September 2022). The Symposium on 22 September focused on dissemination and discussion of the Oxford Delphi consensus studies, while the Research Meeting on 23 September 2022 discussed plans and strategies to implement and evaluate the impact of the prioritised research agenda.

DISCUSSION

An international Delphi panel of expert clinicians, athletes, patients and their representatives, and researchers—representing the YAHiR Collaborative—agreed on set of research priorities on conditions affecting the young person's hip focusing on primary cam morphology and its natural history, reported here following REPRISE guidelines.[7] They outlined seven research domains: (1) best practice physiotherapy, (2) rehabilitation progression and RTS, (3) exercise intervention and load management, (4) primary cam morphology aetiology and prognosis, (5) FAI syndrome aetiology and prognosis, (6) diagnostic criteria, and (7) screening. This consensus serves as a roadmap for researchers, policy-makers and funders to prioritise research dedicated to reducing the cost and burden of conditions affecting the young person's hip, including hip disease related to primary cam morphology.

In what follows, we discuss the Delphi panel's opinions on a prioritised research agenda and summarise how agreement and areas of tension and dissent might inform future work—a more rigorous, inclusive and evidence-based approach to research on primary cam morphology and its natural history. This consensus builds on recent consensus statements[6 18 19 21–24] and a primary cam morphology concept analysis[5] and consensus (Oxford consensus study, part 1).

Best practice physiotherapy is central to the treatment of hip-related pain in active adults, crucial to the understanding of effective treatment options for FAI syndrome, yet elusive and contested. The panel recommended research to (1) clarify what best practice physiotherapy is, (2) illuminate how it influences FAI syndrome prognosis and (3) reinvestigate its position as an effective treatment option compared with hip arthroscopy in patients with hip-related pain. First, practitioners and patients

Table 4 Results of two Delphi survey rounds showing the level of agreement on 20 non-prioritised research priority statements on conditions affecting the young person's hip*

Statement		Round 1		Round 2		ICC†	ICC 95% CI	
		Not important/ disagree	Critical/agree	Not important/ disagree	Critical/ agree		Lower bound	Upper bound
No	Research priorities							
60	Studies involving economic evaluation to determine the cost-effectiveness of different diagnostic, prognostic and therapeutic approaches to primary cam morphology	6.3%	55.6%	3.1%	62.5%	0.84	0.74	0.90
61	Qualitative/mixed-methods studies to investigate the perspectives/preferences/attitudes/concerns/experiences of primary cam morphology stakeholders (eg, but not limited to: athletes/parents/coaches/patients with hip disease/clinicians/researchers)	4.8%	52.4%	3.1%	53.1%	0.91	0.85	0.94
62	Prospective cohort studies that investigate how pincer morphology develops in different cohorts	0.0%	45.3%	0%	46.2%	0.87	0.80	0.92
63	Prospective cohort studies that investigate pincer morphology prognosis in different cohorts	1.6%	45.3%	1.5%	47.7%	0.94	0.90	0.96
70	Studies to investigate; report and improve the psychometric properties of tests of: (1) range of motion, (2) muscle strength, (3) functional performance, (4) quality of life and other psychological outcomes for studies on aetiology, diagnosis, treatment and prognosis	4.9%	60.7%	3.2%	57.1%	0.95	0.92	0.97
71	Studies to investigate the relationship among movement-related parameters (biomechanics; muscle function), symptoms, function, quality of life and imaging and intra-articular hip findings in individuals with hip-related pain	6.6%	54.1%	3.2%	52.4%	0.96	0.94	0.98
72	Studies (randomised controlled clinical trials, cohort studies, cross-sectional studies, qualitative studies) to investigate the clinical effectiveness of other treatments used in people with hip-related pain (hip joint intra-articular injections; analgesic and anti-inflammatory medications; manual therapy adjunctive techniques, such as taping, bracing and orthotics)	1.6%	57.1%	1.6%	62.5%	0.91	0.85	0.95
73	Studies to investigate the cost-effectiveness of different diagnostic, prognostic and therapeutic approaches to femoroacetabular impingement (FAI) syndrome and primary cam morphology	3.1%	51.6%	1.5%	58.5%	0.92	0.87	0.95
74	Qualitative studies to investigate the perspectives/preferences/attitudes/concerns/experiences of FAI syndrome (including FAI syndrome and primary cam morphology) stakeholders (eg, but not limited to: athletes/parents/coaches/patients with hip disease/clinicians/researchers)	6.6%	54.1%	3.1%	58.5%	0.93	0.88	0.96
75	Education intervention studies (pilot studies; randomised controlled trials) in individuals with hip-related pain to assess the specific effect of patient education (in addition to other interventions, eg, exercise intervention) on predefined patient-related outcomes. For education intervention, consider content, modes of delivery and the use of innovative technologies to enhance education benefits	6.5%	51.6%	1.5%	53.8%	0.95	0.91	0.97
76	Studies to investigate the performance of the diagnostic criteria for hip disease presenting with hip-related pain in young and active adults	1.6%	65.1%	0%	66.2%	0.87	0.79	0.92
77	Core outcome set development studies for each of the conditions related to hip disease/hip-related pain in young and active adults	1.6%	61.3%	0%	61.3%	0.88	0.81	0.93
78	Research studies into the utility of HAGOS and iHOT instruments in a non-surgical treatment context	0%	60.0%	0%	58.7%	0.93	0.88	0.96
79	Studies to analyse content and structural validity, and the relationship between individual measurement error and the minimal clinically important change for the recommended PROMs	4.8%	54.8%	1.6%	51.6%	0.85	0.77	0.91
80	Studies to investigate the impact of the diagnostic components of a specific hip condition on diagnostic or prognostic thinking (eg, stratifying patients into high and low risk) in young and active adults	1.6%	55.6%	0.0%	56.3%	0.92	0.87	0.95

Continued

Table 4 Continued

Statement		Round 1		Round 2		ICC†	ICC 95% CI	
		Not important/ disagree	Critical/agree	Not important/ disagree	Critical/ agree		Lower bound	Upper bound
81	Studies to develop and validate diagnostic and prognostic models for the different hip diseases presenting with hip-related pain in young persons	**4.8%**	**63.5%**	**1.5%**	**64.6%**	0.88	0.80	0.92
82	Studies to investigate the additional benefit of advanced imaging (eg, MRI and/ or CT scan) for diagnosis of hip disease presenting with hip-related pain in young and active adults	**7.9%**	**50.8%**	**1.5%**	**49.2%**	0.88	0.82	0.93
83	Studies to investigate the additional benefit of advanced imaging (eg, MRI and/ or CT scan) for agreeing on an appropriate treatment strategy for hip disease presenting with hip-related pain in young and active adults	**8.1%**	**56.5%**	**1.6%**	**54.7%**	0.84	0.75	0.90
84	Studies to investigate the additional benefit of advanced imaging (eg, MRI and/or CT scan) for the prognosis of hip disease presenting with hip-related pain in young and active adults	**6.3%**	**52.4%**	**0.0%**	**53.8%**	0.79	0.68	0.87
85	Studies to investigate the cost-effectiveness of different diagnostic and therapeutic approaches in conditions affecting the young person's hip.	**7.9%**	**49.2%**	**6.2%**	**53.8%**	0.91	0.85	0.94

Green (high agreement on 'consensus in'): statement scored as critical (Likert Scale 7 to 9) by ≥70% of panel members and not important (Likert Scale 1 to 3) by <15% of panel members.
Red (high agreement on 'consensus out'): scored as not important (Likert Scale 1 to 3) by ≥70% of panel members and critical (Likert Scale 7 to 9) by <15% of panel members.
Yellow (non-consensus): neither of the 'consensus in' or 'consensus out' criteria were met.
*We reported the results of statements 1 to 47 in a linked paper (Oxford consensus study—Part 1).
†ICC, intraclass correlation coefficient; type A ICCs using an absolute agreement definition; two-way mixed effects model where people effects are random and measures effects are fixed. ICC is an indication of the level of agreement—stability (within-subject variation and between-subject variance of individual statement scores between Round 1 and Round 2.) We used the lower bound 95% CI of the ICC estimate as the basis to evaluate the level of reliability (stability) using the following general guideline: values <0.5 were classified as poor reliability, ICC values 0.5 to 0.75 indicated moderate reliability, 0.75 to 0.9 indicated good reliability and ICC values >0.9 indicated excellent reliability.
HAGOS, Copenhagen Hip and Groin Outcome Score; iHOT, International Hip Outcome Tool; PROMs, Patient-Reported Outcome Measures.

are confused by an elusive definition for best practice physiotherapy. A recent consensus on physiotherapist-led treatment for young to middle-aged active adults with hip-related pain recommended treatments that are exercise-based of at least 3 months duration and recommended further research to investigate optimal frequency, intensity, time, type, volume and progression of exercise therapy.[18] Second, heterogeneous physiotherapist-led interventions might improve pain and function when compared with other non-surgical treatments or sham treatments in young and middle-aged adults with hip-related pain (including FAI syndrome); however, no high-quality trials exist to cement its superiority.[37] Finally, the only three RCTs comparing hip arthroscopy with prescribed physiotherapy[38–40] were compromised by out-of-date exercise therapy programmes.[41] New trials should do better.

The panel prioritised studies to determine best criteria for rehabilitation progression and RTS following management of hip-related pain. Such a study recently investigated RTS after criteria-based rehabilitation for acute adductor injuries.[42] RTS is complex, sport-specific, multifactorial (depending, eg, on the intervention) and an exercise in risk management.[43–49] The Delphi panel emphasised six considerations for rehabilitation and RTS studies, including (1) athlete expectations, (2) intervention quality, (3) career stage, (4) type of sport, (5) athlete contract status, and (6) athlete support structures.

The panel prioritised studies to investigate the role of exercise intervention (load management) on the development and prognosis of (1) FAI syndrome and (2) primary cam morphology. This should involve different demographic and load cohorts and include studies to develop and validate diagnostic and prognostic models for primary cam morphology in young athletes. While these studies should involve different sport, dance and physical activity cohorts, the panel highlighted the importance of prioritising prospective research in girls'/women's sport. To date, few prospective cohort studies investigated how [primary] cam morphology develops in athletes. However, none involved girls/women athletes, and only one involved a control group.[50–54] Finally, load intervention studies involving maturing athletes are easier said than done; they 'may be unwilling to reduce participation in their preferred sport'.

Diagnostic criteria for cam and pincer morphology are contested. The results of a recent systematic review to determine the diagnostic accuracy of clinical tests for cam or pincer morphology in individuals with suspected FAI syndrome were inconclusive due to high risk of bias and low statistical precision of included studies.[55] There is to date no agreement on a radiographic definition of cam or pincer morphology. This Delphi panel agreed that an alpha angle threshold of ≥60 degrees to classify cam morphology (Oxford consensus study, part 1), recently proposed in a systematic review[56] and another consensus,[22] is appropriate; however, further research should verify this.

Screening for primary cam morphology is contentious. The panel acknowledged the risk of harm—overdiagnosis and overtreatment—of 'a normal finding', prevalent in many athletes. Screening might benefit 'a small percentage of those with primary cam morphology who go on to develop significant hip problems later in life', offering them 'preventative support at an earlier stage'. The WHO's Wilson-Junger criteria should inform whether screening is appropriate or not.[57]

Although the Delphi panel did not prioritise qualitative or mixed-methods studies to 'explore perspectives/preferences/attitudes/concerns/experiences of primary cam morphology and FAI syndrome stakeholders' (statements 61 and 74), mixed stakeholder groups highlighted the importance of 'understanding a

Box 1 Interacting Group Process: mixed stakeholder group discussion summary—research priority domain

While prospective cohort studies on primary cam morphology aetiology and prognosis are already prioritised, *authentic collaboration* on large multicentre studies, using similar methods to allow data sharing, should (1) 'involve patient and the public in everything', (2) focus on 'agreeing a standard set of variables' (outcomes, interventions, assessments), and (3) 'ask very specific questions' using 'clear methods'. Discussion groups raised *six challenges to authentic collaboration* (with possible solutions for some). First, authorship position, when publishing results, is often contested. Second, it is difficult to getting started with data sharing—larger/established research groups should lead. Third, early career researchers, especially from low/middle-income countries or resource poor settings, are sometimes not taken seriously enough. Fourth, equitable approach to funding division, although important, is difficult, especially dividing financial support across countries. Fifth, standardising of processes can be difficult for lower income countries or institutions. Last, funders should target grants to support collaborative projects.

The panel agreed that *primary cam morphology screening* as part of research to inform our knowledge 'is fine, but screening as part of routine clinical practice is likely not fine and may lead to overmedicalisation'. *Risks of screening* for primary cam morphology include 'overtreatment in a condition that we know is often asymptomatic'. The panel questioned the need to screen 'for a condition that we have already agreed is a 'normal physiological response'. A biostatistician panel member commented on the importance of the WHO's *Wilson-Junger criteria* to inform whether screening is appropriate or not. Warning that *screening in younger cohorts* (8 to 18 years) should 'be carefully managed from an ethical perspective', the panel recommended 'qualitative studies' to investigate 'the potential nocebo impact of any diagnostic labelling'. It is also important to note the lack of scientific evidence to support 'advising younger individuals that they should limit participation in certain sports based on screening results'. Screening results might provide a basis 'to offer preventative support at an earlier stage to a small percentage of those with cam [morphology] who go on to develop significant hip problems later in life'.

Stakeholder groups discussed *eight factors that will facilitate* athlete/*participant compliance* in long-term follow-up studies: (1) involve stakeholders in study designs; (2) focus on language—'let's figure out how to keep your hip healthy'; (3) address a large qualitative research void with respect to compliance in prevention/cohort studies; (4) recruit full teams not individuals; (5) demonstrate [to athletes, coaches and managers] that performance improves—focus on performance development over hip health to get better buy-in from athletes, coaches, and parents; (6) foster wider organisational buy-in and involve policy-makers in priority setting; (7) consider how much is asked from participants—balance how much we measure to reduce the burden, and (8) create a core outcome set for these areas to support streamlined research studies and participant burden.

Discussing the *feasibility of load management studies* during growth, discussion groups stressed the importance of involving 'methodology experts' (eg, study design and training-load monitoring) and the target group in the development of any research. Load management studies on primary cam morphology development during growth may not be the right priority for new research. Patient buy-in is likely to be low—'elite sports children

Continued

Box 1 Continued

may be unwilling to reduce participation in their preferred sport' and more attention needs to be given to context: 'optimal study designs may not be generalisable to suboptimal context'.

Warning 'not to focus on cam morphology as a problem', stakeholder groups mentioned seven *critical elements of effective physiotherapy/rehabilitation* (best practice physiotherapy) for patients with FAI syndrome: clinicians should (1) apply a 'holistic approach to rehabilitation' that uses the 'same language'; (2) deal with 'patient expectations, especially time: lifelong'; (3) address 'fear of movement'; (4) modify 'what the patient do'; (5) consider 'who the advocate for the athlete/patient should be'; (6) deliver 'treatment programmes' of 'at least 6 months in duration', and (7) develop treatment programmes with 'exercise interventions' as the 'foundation, with potential room for manual therapy'. Finally, the field 'needs individual participant data studies with subgroup analysis to inform this [best practice physiotherapy], as much of the therapy approaches that "work" has been mixed methods so likely needs to be teased out as to which factors offer the greatest benefit'.

An ex-elite athlete panellist spotlighted *Return-to-Sport challenges* mentioning 'major anxiety' as a result of 'worries about Return-to-Sport (RTS) (which was my living)'.

A patient–clinician panel member commented on their '*lived experience* as a patient with FAI/labral tear', emphasising that 'all healthcare providers have to be on the same page when it comes to expectations and treatments'. Patients 'struggle with learning how to ultimately keep their hip happy'. This panel member emphasised *three RTS aspects from a patient's perspective* and relevant to a *multidisciplinary team approach*. Clinicians should encourage and support patients to (1) work with a strength and conditioning coach 'who helped me really get over the fear that loading my hip would make it worse'; (2) work with a sports psychologist 'to work through catastrophising thoughts I had about my hip imaging results', and (3) identify 'all lifestyle factors and training factors that will impact the hip: frequency of sport/running, duration, intensity, sleeping, nutrition, strength training'.

Stakeholder groups commented on *six additional factors that may influence RTS*: (1) 'Athlete expectations: what has the athlete been told about their condition and their potential prognosis by a healthcare practitioner. Does the athlete expect or feel that X intervention is the "only way" to allow them to RTS? Are we honest with athletes about the potential that they may not return to their previous playing levels due to the current status of their injury/pain/hip? (2) Quality of intervention: we still do not have a "best practice" method/guide for hip interventions in cam morphology and FAI syndrome. The treatment that an athlete receives, surgical or non-surgical, may have a large influence on them returning to sport; (3) Stage of career: as indicated in an earlier comment—considering the stage of the athlete's career may influence RTS. Older athlete towards the end of their career may not "want to return to sport" to preserve long-term health and quality of life; (4) Sport type: individual versus team. Knowledge of an individual's sport may have a large influence on their RTS. Often team sport athletes may be able to gradually RTS or have their load managed. In individual sports this may not be possible and there may be more pressure to RTS when they are not necessarily ready; (5) Contract status: in professional athletes, an athlete's contract status or endorsements may influence their RTS timeframe; (6) Support

Continued

Box 1 Continued

structures: the support structures and expertise available may influence an athlete's RTS'.

While there is a 'need for clarity around the *definition of "return to sport"*—as return to sport is often very different than return to performance', stakeholder groups warned that 'the current binary (yes or no) method of outlining RTS may not be fit for purpose'. They suggested the possibility of 'a sliding scale or some type of Likert Scale that assesses athletes' confidence/happiness with playing status pre/postintervention'.

Finally, stakeholder groups emphasised 'the need for qualitative research in the area to ascertain players' perspectives about RTS'.

The importance of *qualitative research* was spotlighted by a patient-panellist's Delphi round 1 recommendation to add a research priority statement 'on how diagnosis, rehab, return to sport impacted the *mental health of young athletes* (and others)'. Stakeholder groups emphasised 'considering all the aspects in anything that is labelled and how the label may impact growth and bias later'. Differentiating between primary and secondary cam morphology is therefore important 'as an aid for better definition and intervention as the science evolves'. It is 'super important in this population to understand a patient's journey from diagnosis through treatment'. Athlete-patients are interested in what primary cam morphology and/or FAI syndrome means for their hip 'long term': 'Can we rehab or is surgery required?'; 'How it will impact my career, life, both and do I need it fixed or not?' Stakeholder groups suggested researchers should 'embed what is important to patients or those with the morphology', 'work in coproduction' on 'experience videos' and 'frameworks, maybe starting with safeguarding or prevention'. In addition, stakeholder groups recommended 'peer focus groups with young people, explaining the science and giving them the problems to 'solve for science' along with scenarios, risk communication, discuss pre-emptive or interventional screening and explain differences noting prostate, breast, lung screenings and costs'.

The groups highlighted *involving parents and coaches* as 'it is difficult for athlete-patients to rest/commit to physiotherapy especially when being pushed by parents/coaches'. It is also difficult to motivate patient-athletes to continue with exercise-based rehabilitation after 3–4 months especially with 'regional differences between effective physio/rehab/surgery' and systems, for example 'pay for service and how that affects treatment decisions'.

patient's journey'. They emphasised the importance of involving stakeholders in coproduction—especially athletes, parents and coaches. Stakeholder discussions underscored the fertile ground for coproducing qualitative research, especially with minoritised populations, to address pertinent questions.[58] Taking an evidence-based research approach, these studies should build on the results of systematic reviews and qualitative evidence synthesis relevant to the specific question.[59]

How agreement on a prioritised research agenda advances research on primary cam morphology and its natural history?

Strong consensus on primary cam morphology's conceptual and operational definitions, taxonomy and terminology reported and discussed in a linked paper (Oxford consensus study, part 1) empowers researchers and their patient and public partners to do more rigorous research—research that is more credible, consistent, replicable, valid, and of higher quality.[8 60 61] Combining rigorous research with consensus on a prioritised research agenda catalyses focused, high-quality research that is systematic in its inquiry, employs appropriate design and asks challenging questions that matters.[62] This consensus informs future research priorities, illuminating challenging questions that are relevant to the minoritised, including athletes and athlete-patients. It also invites authentic collaboration, setting the scene for a more inclusive approach to research.

Inclusive primary cam morphology research, adapting Walmsley and Johnson's (2003, p. 16) core criteria for inclusive research, should 'address issues which really matter … and which ultimately leads to improved lives for them', 'access and represent' the patient's views and experiences and reflect that patients 'need to be treated with respect by the research community'.[63] Research on primary cam morphology and its natural history continue to minoritise important patient-athlete populations—women, children and parents, para-athletes and athletes from the Global South. Patient partners are to a large extent absent from the research process. It is worth emphasising the difference between doing inclusive research, 'a thing with criteria that define it' and 'doing research inclusively'.[64] The latter emphasises *doing*—a fluent and developmental *process*. Doing primary cam morphology research inclusively means the minoritised, including athletes and athlete-patients are not merely 'involved' at every stage of research, but in charge as partners with power—exerting some control over all decisions. This is doing research that aims for the top rungs of Arnstein's ladder of citizen participation—partnership, power and control.[65 66] Mere involvement of patients risks non-participation (eg, manipulation as members of 'advisory boards') or tokenism[67] (being assigned but informed, or consulted and informed, or placated—pacified by the veneer of involvement). Practically, this means the minoritised should be involved in *and* in charge of the *process* of research on primary cam morphology and its consequences, including crafting and disseminating new knowledge—a process that demedicalises and empowers. This inclusive partnership provides a powerful foundation for evidence-based research.

Evidence-based research uses 'prior research in a systematic and transparent way to inform a new study so that it is answering questions that matter in a valid, efficient and accessible manner', minimising clinical health research that is unnecessary, irrelevant, unscientific, wasteful and unethical.[68–70] However, Anjum *et al* (2020) appealed to the Evidence Based Medicine community to expand their notion of 'evidence'. First, as 'evidence is typically evidence of causation', evidence-based researchers 'need to tackle the problem of causation head on' to better understand 'what is meant by "evidence," what is the "best available evidence" and how to apply it in the context of medicine'. Second, researchers should appreciate that multiple methods are needed to establish causation—not only the statistical approaches of randomised controlled trials and systematic reviews of trials. Third, researchers should use different types of evidence (eg, case studies and case reports) to inform 'causal evidence'. Last, researchers should use patient narratives and phenomenological approaches as tools to look beyond evidence such as symptoms and outcomes.[71] Researchers should also specify their causal intent, when relevant, and use language consistent with that intent when reporting their studies.[72] Consensus on a prioritised research agenda on conditions affecting the young person's hip, underpinned by an evidence-based approach to research, applying a more inclusive lens to the notion of 'evidence' (and knowledge coproduction), is a strong foundation for higher

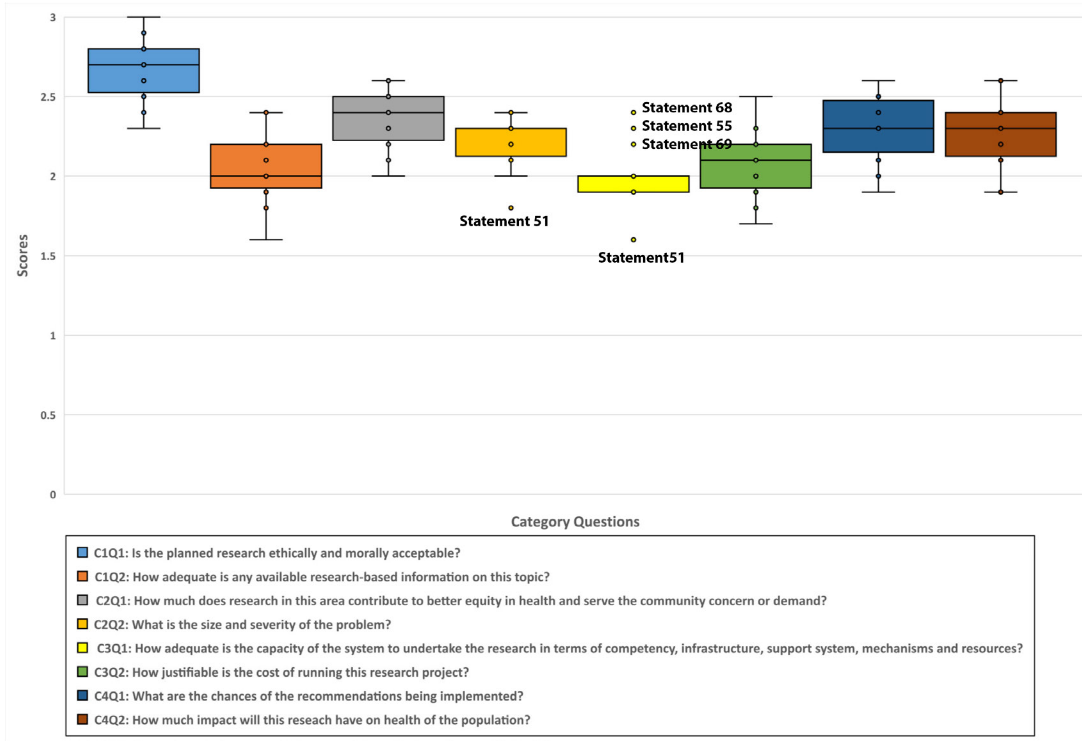

Figure 4 Box plots of pooled Essential National Health Research (ENHR) strategy for research priority setting ranking data (18 prioritised statements) for each category question showing the third quartile (Q3) and first quartile (Q1), median, range and outliers. Statement 51 (mean score 1.8) was the only outlier in category 2 (Relevancy), criterium question 2 (C2Q2). Category 3 (the chance of success), criterium question 1 (C3Q1) had four outliers: the mean scores were high for statement 68 (mean score 2.4), statement 55 (mean score 2.3) and statement 69 (mean score 2.2) and low for statement 51 (mean score 1.6). C1Q1 and C1Q2: Category 1 Questions 1 and 2; C2Q1 and C2Q2: Category 2 Questions 1 and 2; C3Q1 and C3Q2: Category 3 Questions 1 and 2; C4Q1 and C4Q2: Category 4 Questions 1 and 2.

research value and less research waste. However, an important step is effective dissemination and implementation of the prioritised research agenda.

The YAHiR Collaborative values transparent and reproducible research, central to the aim of this study to inform a more rigorous, inclusive and evidence-based approach to research on primary cam morphology and its natural history. We invite scrutiny and critique, foster equal opportunities and share study data as open access published manuscripts and supplementary files (Oxford consensus studies, parts 1 and 2) or documents associated with an Open Science Framework–registered study project. We invite readers to engage with the material, participate in the dissemination and collaborate to cocreate knowledge that matters. Open science aims to make scientific knowledge (in different languages) openly available, accessible and reusable for everyone. Our approach reinforces quality and integrity, collective benefit, equity and fairness, diversity and inclusiveness—the core values of open science.[73]

Dissemination and implementation

Collaborative work to disseminate and implement the findings of this study was essential, not only to the ethical conduct of future research but also to coproduce new knowledge.[74]

Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series

This Delphi study was a catalyst for authentic involvement of Patient and Public partners. We codesigned and codelivered, with members of the Patient and Public Involvement Group, Webinar 9 of the *Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series*. The process emphasised collaborative and inclusive work beyond 'involvement'—PPI colleagues took charge. We disseminated the early study results in Webinar 10 (agreement on primary cam morphology definition, terminology, taxonomy and imaging outcomes) and Webinar 11 (prioritised research agenda). These webinars were recorded and online access were provided to registered webinar participants, and the Oxford Delphi consensus panel.

Young Athlete's Hip Research Collaborative Symposium and Research Meeting

The YAHiR Collaborative's 2-day Symposium and Research Meeting (22-23 September 2022) built on the webinar series. The focus of the meeting was to disseminate and discuss the results of the Oxford Consensus Study among all stakeholders (athletes, patients, parents and coaches, clinicians and researchers), deliberate areas of ongoing tension and dissent and collaborate to implement the consensus by developing and curating resources, as well as sharing and aggregating large datasets. The results of the Research Meeting will be reported in a seperate paper.

Strengths and limitations

We discussed strengths and limitations to the Delphi method in a linked paper (Oxford consensus study, part 1). We anticipated survey fatigue—not completing the survey or reluctance to participate when faced with extensive and complicated surveys—as a possible major limitation.[75] The Delphi and ENHR ranking exercise surveys were long and potentially complicated. We introduced four measures to mitigate participant fatigue. First, we structured the Delphi survey in five domains. Second, we

Prioritised research domain 1: Best practice physiotherapy

- What is **best practice physiotherapy** (e.g. in different populations and settings; pre- and post-surgery) (**Statement 68**, ranked 1)
- Prognosis after **best practice physiotherapy** and/ or arthroscopic hip surgery in different sport/ dance/ physical activity level cohorts with femoroacetabular impingement syndrome (**Statement 67**, ranked 5)
- Randomised controlled clinical trials to investigate **best practice physiotherapy** vs arthroscopic hip surgery vs sham surgery in cohorts with variable loading demands diagnosed with femoroacetabular impingement syndrome (**Statement 66**, ranked 8)

Prioritised research domain 2: Rehabilitation progression and return to sport (RTS)

- Studies to determine the best criteria for rehabilitation progression and return to sport (RTS) following management of hip-related pain (**Statement 69**, ranked 2)

Prioritised research domain 3: Exercise intervention (load management)

- Studies to investigate how **exercise intervention** influences the **development and prognosis of femoroacetabular impingement syndrome** in cohorts with variable loading demands (**Statement 65**, ranked 3)
- Studies to investigate how **exercise intervention** (load management) influences the **development and prognosis of primary cam morphology** in different demographic (e.g. sex/ gender; race/ ethnicity) and load (variable loading demands - e.g. different sports, dance, and physical activity level) cohorts (**Statement 58**, ranked 6)
- Studies to investigate how **exercise intervention** influences the **development and prognosis of primary cam morphology** in cohorts with variable loading demands (**Statement 57**, ranked 10)

Prioritised research domain 4: Primary cam morphology prognosis & aetiology

- Studies investigating **prognosis** (consequences) of primary cam morphology in different cohorts (**Statement 54**, ranked 4)
- Studies to develop and validate diagnostic and **prognostic models** for primary cam morphology in young (maturing) athletes (**Statement 56**, ranked 12)
- Studies to investigate risk factors (aetiological and **prognostic**) of primary cam morphology in different cohorts (**Statement 48**, ranked 13)
- Studies to investigate how primary cam morphology develops in different **sex/ gender** cohorts, specifically women cohorts (causal inference approach to investigate gender as a risk factor for primary cam morphology) (**Statement 50**, ranked 7)
- Studies to develop and validate **diagnostic** and prognostic **models** for primary cam morphology in young (maturing) athletes (**Statement 56**, ranked 12)
- Studies to Investigate risk factors (**aetiological** & prognostic) of primary cam morphology in different cohorts (**Statement 48**, ranked 13)
- Studies to investigate how primary cam morphology develops in cohorts with variable loading demands (e.g. difference sports/ dance/ physical activity level cohorts and sedentary cohorts) (causal inference approach to investigate **load as a risk factor** for primary cam morphology) (**Statement 49**, ranked 14)
- **Race/ ethnicity** (genetics) as risk factor – **Statement 52**, ranked 16; **Other risk factors** (e.g., anatomical) – **Statement 53**, ranked 17; **Parasport** (**Statement 51**, ranked 18)

Prioritised research domain 5: FAI syndrome prognosis & aetiology

- Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of **femoroacetabular impingement syndrome** in cohorts with variable loading demands (**Statement 65** ranked 9)
- Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology (**Statement 55** ranked 11)

Prioritised research domain 6: Diagnostic criteria (& accuracy) for primary cam morphology & pincer morphology

- Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology (**Statement 55** ranked 11)

Prioritised research domain 7: Screening for primary cam morphology (benefits & harm)

- Investigate the potential **benefits & harms of screening** for primary cam morphology in young athletes (**Statement 59** ranked 15)

Figure 5 Research priorities on conditions affecting the young person's hip, focusing primarily on primary cam morphology and its natural history (18 statements in seven domains prioritised following two Delphi rounds and further ranked according to the Council on Health Research for Development's Essential National Health Research (ENHR) strategy for research priority setting).

invested time to optimise statement wording and kept the statements and survey structure the same for both Delphi rounds. Third, we authentically engaged participants, including PPI group members, through a webinar series described above, and additional online information and discussion sessions. Last, we divided the 18 research statements for the ENHR ranking strategy between three surveys of five to seven statements per survey. All 65 participants completed the two Delphi rounds and more than 40 the three ENHR surveys. A major strength is the large, international panel representing six stakeholder groups, including a PPI group. Although some statements (and domains, eg, imaging outcomes) required technical knowledge, potentially limiting some panellists' ability to answer, we invested time to share relevant knowledge and allowed the option 'not able to score'. Acknowledging that a spectrum of expertise is key to inform a group's opinion, we applied the more inclusive 'closeness continuum' to expertise.[32]

Research priorities are based on this diverse international Delphi panel's opinion. Despite progress on diversity, equity and inclusion, including actively involving a PPI stakeholder group (also as coauthors), we acknowledge that more could be done. Another panel, more representative of communities that are not widely represented in the hip-and-groin research field (our Delphi panel only involved three participants from Africa, all from the same country), might have different opinions. Although all panel members completed the two Delphi rounds, panel attrition resulted in an ENHR ranking exercise panel dominated by physical therapists. This might have skewed ranking results towards research questions important to this stakeholder group.

Finally, many research statements included a method clause and referred to 'physiotherapy' as treatment. Panellists might have scored research topic/question-specific statements without referring to method (eg, RCT, cohort study) differently. We acknowledge our implicit bias that only physiotherapists could deliver 'physiotherapy' or 'personalised hip therapy'. This is not the experience for everyone. 'Clinician-led progressive exercise rehabilitation' might have been a better phrase than 'best practice physiotherapy'. Equally, 'physiotherapist-led treatment' might have been a better phrase to reflect contemporary physiotherapy practice. This is an important topic for further scrutiny with clinicians, researchers and patient partners.

CONCLUSION

Building a more rigorous, inclusive and evidence-based research ecosystem is essential, but it is also a deliberate, disruptive and daunting task. A diverse Delphi panel of 65 stakeholders representing six stakeholder groups agreed on the first ranked set of research priorities on conditions affecting the young person's hip, focusing on primary cam morphology and its natural history. Although the 18 research priorities identified signal possible gaps in the current evidence base, researchers, PPI partners and clinicians should spotlight these gaps through an evidence-based approach to future research. While informing more rigorous, inclusive and evidence-based research, this consensus is a roadmap for researchers, policy-makers and funders to implement research dedicated to reducing the cost and burden of conditions affecting the young person's hip, including hip disease related to primary cam morphology.

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Contributors HPD proposed the idea of a Delphi consensus study on the topic, planned and coordinated the study as part of his DPhil Evidence-Based Health Care studies. TG, MC, JLO, KMK and SG-J supervised the lead author's DPhil studies and provided oversight to the study with other members of the Delphi Study Steering Committee (SMA, CLA, JLK, ABM, AP, PB, AS). All Steering Committee members contributed to, revised and refined the list of Delphi statements. AP co-led the Patient and Public Involvement Group with HPD, and with DPR and RWW facilitated an authentic patient's voice throughout. AF, with oversight by JLO, contributed to the statistical analysis of the study. Although EM and VM contributed to all stages of the Delphi study, their focus was on the imaging and research priorities domains. CLA and KMK cochaired with HPD the Interactive Group Process, while ABM, AP, JLK, SG-J, DPR, SMA, EM, PB, RWW, AS and MC acted as group leads for the six small multistakeholder groups. HPD wrote the first draft of the manuscript; all listed authors contributed to reviewing, editing and revising the manuscript and have read and agreed to the submitted version of the manuscript. The Young Athlete's Hip Research (YAHiR) Collaborative listed as 'Collaborators' were all Delphi panel members and contributed to the online Interactive Group Process and the ENHR ranking exercise.

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Competing interests HPD is an associate editor for *BJSM*; CLA is Editor-in-Chief for Journal of Orthopaedic & Sports Physical Therapy (JOSPT); JK is an editor for *BJSM*; ABM is a *BJSM* deputy editor; AP is an editor at BMJ; KMK was editor-in-chief for *BJSM* from 2008 to 2020 but holds no position with *BJSM* or BMJ Group at present (June 2022). SM, PB, DR, AF, AS, EM, VM, RWW, JLO, SG-J, MC and TG declare no competing interests. Young Athlete's Hip Research (YAHiR) Collaborative collaborators: Jane Thornton (JT) and NM are *BJSM* editors; KT and FW are *BJSM* deputy editors; LE is *BJSM* IPHP editor; Johannes Tol (JT), CJvR, SK, and AW are *BJSM* associate editors.

Ethics approval This study involves human participants and was approved by the University of Oxford's Medical Sciences Interdivisional Research Ethics Committee (MS IDREC)—R73576/RE001. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Author note Equity, diversity and inclusion: The Oxford consensus steering committee (HPD, SMA, CLA, JLK, ABM, AP, PB, AS, JLO, KMK, SG-J, MK, TG), 5 women and 8 men were English-speaking (as a first or second language) white academics (11 with PhDs); 4 were physicians, 6 allied healthcare practitioners and 3 health researchers. AP represented the Young Athlete's Hip Research (YAHiR) Collaborative's Patient and Public Involvement Group. One resided in the Global South. Interpreting 'diversity' as more than representation of certain demographic groups, the steering committee ensured a diverse and informed Delphi panel, representing six multiprofession stakeholder groups, including previously minoritised groups relevant to this research field (eg, women, athletes, patients and the community, participants from the Global South). This study's online Delphi method, with a specific focus on anonymity and access to adequate topic-specific resources, supported a more equitable and inclusive process. First, the study's online Delphi method was more equitable (as opposed to an in-person meeting) as traditionally under-represented groups had similar opportunities to participate—levelling the playing field (they did not need to travel and could share their opinion in a 'safe space'). Second, the study's online Delphi method was more inclusive (referring to a positive and supportive experience) as our efforts included online meetings to share and discuss study resources and topic-specific information and giving patient and public involvement partners leading roles in all aspects of the study (including steering committee membership, active involvement in study design, leading roles in online discussions and coauthorship of study reports, including peer-reviewed papers). Finally, in addition to the steering committee members, the main authors included a biostatistician (AF), two radiologists (EM, VM) and two additional members of the

YAHiR Collaborative's Patient and Public Involvement Group (DPR and RWW). The 18 main authors include 6 women (including the senior author, TG). Richard de Villiers is deceased

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SUPPLEMENTARY FILE 1
Oxford consensus on primary cam morphology and femoroacetabular impingement syndrome. Part 1 and 2 methods

Contents

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METHODS

We held a sequential, two-round online Delphi survey and two synchronous online mixed stakeholder group meetings (Interacting Group Process) to explore the level of agreement amongst a panel of experts, on primary cam morphology definitions, terminology, taxonomy, and imaging outcome measures for research, and work towards agreement on a set of research priorities on conditions affecting the young person's hip. The prioritised research statements were further ranked according to the Council on Health Research for Development's Essential National Health Research (ENHR) ranking method. The Delphi and ENHR exercises allowed panel members to participate anonymously to reduce the influence of dominant individuals. [1] Reporting followed the 31-item REporting guideline for PRIority SEtting of health (REPRISE) [2], and the Conducting and REporting DElphi Studies (CREDES) [3].

This comprehensive Methods document combines and extend the methods sections of the two Oxford Delphi consensus papers (Part 1 and 2).

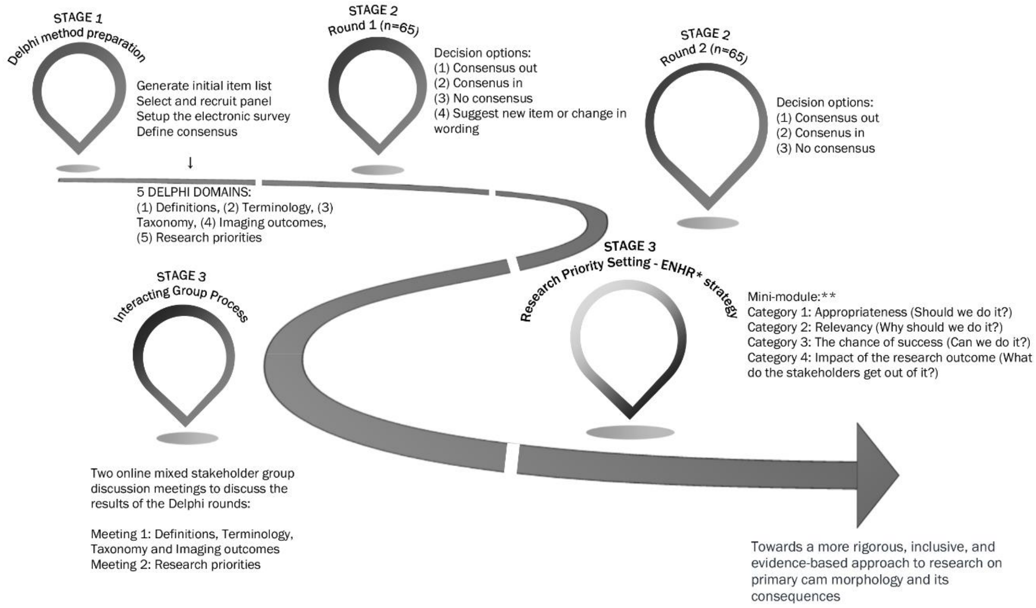

Figure SF1-1 Oxford Consensus Study flow chart. Stage 1: prepare for Delphi method; Stage 2: Delphi method online rounds; Stage 3: virtual discussion meetings and ENHR strategy for research priority setting. *Essential National Health Research; **Mini-module adapted from [4]

Methodology

The Delphi method, especially its qualitative elements, has roots in the philosophical traditions that emphasise the importance of opinions and perceptions of groups of people. [5] This is important, alongside other sources of empirical data, when exploring the nature of reality or informing decision making. [6] This study applied the Delphi method as a pragmatic tool for working towards consensus and for mapping the level of, and reasons for, any residual disagreement. Many studies applying the Delphi method suffice with statistical consensus or non-consensus. We went further.

By embracing the pragmatic qualities of the Delphi method, this study dealt with tension and dissent in a meaningful way. While some argued that the Delphi method "rises above the paradigmatic divide"—it includes elements of qualitative and quantitative approaches, and of constructivism and positivism—others, including Brady (2015), have argued its alignment with a pragmatic philosophy. [6] We agree with Brady (2015) and Skulmoski and Hartman (2007): The Delphi method is flexible, favouring diversity over statistical representativeness in sampling, relatively low-resource, and user-friendly. [6,7] It is therefore a good tool for community-based and community engaged research, working towards consensus and surfacing tension and dissent in a meaningful way.

> "…methods are the tools of the trade. Methodology is the philosophy that guides how and when you deploy those tools." [8]

Relevant to the primary cam morphology research field, community-engaged research empowers the potentially marginalised and minoritised voices of patients, children, parents, women, citizens of the global south, para-athletes and non-physicians. Community-engaged research, characterised by inclusion, collaboration, and participation, builds upon the principles of reciprocity, relationship building, and translational learning between communities and professional researchers. [9] It provides a less hierarchical and more ethical approach to conducting research, combining, in our study context, transformative and knowledge co-production lenses underpinned by pragmatism as the philosophical paradigm. [6]

Given the focus on (research) transformation and knowledge co-production, it is important to reflect on our positionality and identities (racial/ethnic, sex/gender). The steering committee members (HPD, SMA, CLA, JLK, ABM, AP, PB, AS, JO, KMK, SGJ, MK, TG), 5 women and 8 men, were English-speaking (as a first- or second language) white academics (11 with PhDs); 4 were physicians, 6 allied healthcare practitioners, and 3 health researchers. AP represented the Young Athlete's Hip Research Collaborative's Patient and Public Involvement Group. One resided in the Global South.

Not only did we combine multiple methodologies to accomplish this study's aim, but also multiple research methods, and reflexive quantitative and qualitative analyses. Combining multiple methodologies and methods is not new; qualitative scholars use the term "methodological bricolage"—"an eclectic critical, multi-perspectival, multi-theoretical and multi-methodological approach to enquiry". [10,11] Here we combined the online Delphi method, Interacting Group Process for mixed stakeholder group discussions [12], Essential National Health Research (ENHR) research strategy to rank the prioritised research statements, and revised Bloom's Taxonomy, a tool to create education that encourages critical thinking, to develop two education events aimed at early dissemination and implementation.

Study design – Delphi method and Research Priority Setting process

Delphi method: For this 3-stage Oxford Consensus Study (Figure SF1-1), we modified the classical Delphi method slightly by replacing an open qualitative first round with a pre-selected list of statements based on a review of existing literature and a synthesis of the knowledge of steering group members. [13–15] The Delphi method assesses consensus through an iterative multistage process of controlled online questionnaires, feedback, reflection, and discussion, documenting both agreements and the nature and extent of residual disagreement. [16–18] Multiple rounds allow panel members to work towards consensus as members are invited to amend their response in the light of the group average. [19,20] The Delphi method allows panel members to participate anonymously to reduce the influence of dominant individuals.[1] Reporting followed CREDES ('Conducting and REporting DElphi Studies') [3]. We report in a linked paper (Oxford Delphi consensus, Part 2) how the prioritised research statements were further ranked according to the Council on Health Research for Development's Essential National Health Research (ENHR) ranking method.[4]

The essence of the Delphi method, initially developed by the Rand Corporation for technological forecasting and named after the famous oracle at Delphi, is to generate discussion on a topic of interest amongst experts. [21,16] The Delphi method has four important methodological features: (1) a panel made up of various kinds of expert, (2) an anonymous process, (3) iterative rounds of enquiry, (4) subsequent rounds informed by a summary of the group response of the previous round. [3,13,22] While celebrating the Delphi method's strengths, it is important to acknowledge and deal with its challenges.

Although challenging, an *online* consensus development process is more likely to improve than jeopardise the process and outcome, especially during covid-19-related restrictions on travel and indoor face-to-face meetings. There are many empirical examples of successful online Delphi studies in health care involving geographically dispersed panel members. [23–25] The online consensus development process is reliable [26] while asynchronous online communication has well-established benefits in promoting reflection and knowledge construction. [27] Therefore, the quality of any Delphi study depends on the underlying design and rigour, and not the medium of the research process. [15] However, ensuring a high-quality Delphi study is easier said than done as no standard quality parameters exist to evaluate Delphi studies in healthcare. [28]

Many Delphi method quality criteria have been proposed. Nine criteria were used to assess the quality of 52 Delphi studies on coronavirus disease 2019 (covid-19). [28] In sum, this study assessed how Delphi studies (1) documented the process followed to identify the problem area; (2) selected panel members based on objective and predefined criteria; (3) maintained strict anonymity of panel members and their responses; (4) provided controlled feedback between rounds; (5) managed iterative rounds of discussions and feedback; (6) defined consensus criteria a priori; (7) analysed consensus in a transparent way; (8) identified criteria for stopping the Delphi rounds; (9) analysed stability of responses. Although comprehensive, this list is arguably not complete. For example, how Delphi researchers performed and reported qualitative analysis of panellists' responses, and treated dissent and ambiguity are equally important 'quality criteria'. [17,29,30]

Research Priority Setting – ENHR strategy: The problem of largely investigator-driven health research agendas, marginalising the voices of key stakeholders including patients, caregivers and the community, has fuelled a mismatch between the interests of patients and researchers, and a possible misdirected allocation of limited resources. [2,31,32] This spotlighted the need for transparent research priority setting with stakeholders. [2,33–40] Research priority setting—a range of "interpersonal" activities amongst stakeholders to identify, prioritise and achieve consensus on the key questions or research topics—can be small or broad. Small research priority setting projects, often the scope of a specific group or organization, focus on a health condition, while broader priority setting projects inform national or international health research strategies. [2,41–43] Ensuring transparency of the research priority setting process, and to "strengthen legitimacy and credibility for influencing the research agenda", we applied the 31-item REporting guideline for PRIority SEtting of health (REPRISE). [2] To add rigour and transparency, we plan to register this research priority setting project on the Ludwig Biltzmann Gesellschaft Open Innovation in Science Center's worldwide Priority Setting Database of research priority setting projects. This database inspires future priority setting projects serves as a research tool "for unanswered research questions and under-researched topics". [44] The *Early Hip and Knee Osteoarthritis Priority Setting Partnership* and *Too Fit To Fracture: a consensus on future research priorities in osteoporosis and exercise*, are examples of priority setting projects registered on this database. [45,46]

We adapted the ENHR "mini-module" [4], asking the Delphi Panel to apply a 0 to 3 Likert Scale score to category 1 criteria, and 1 to 3 Likert Scale for the remaining 6 criteria. A maximum 3 points per criterium resulted in an equal weighting of 6 points for each of the four categories (Figure SF1-2). We shared and discussed the ENHR ranking strategy results with Delphi panel members during optional online meetings.

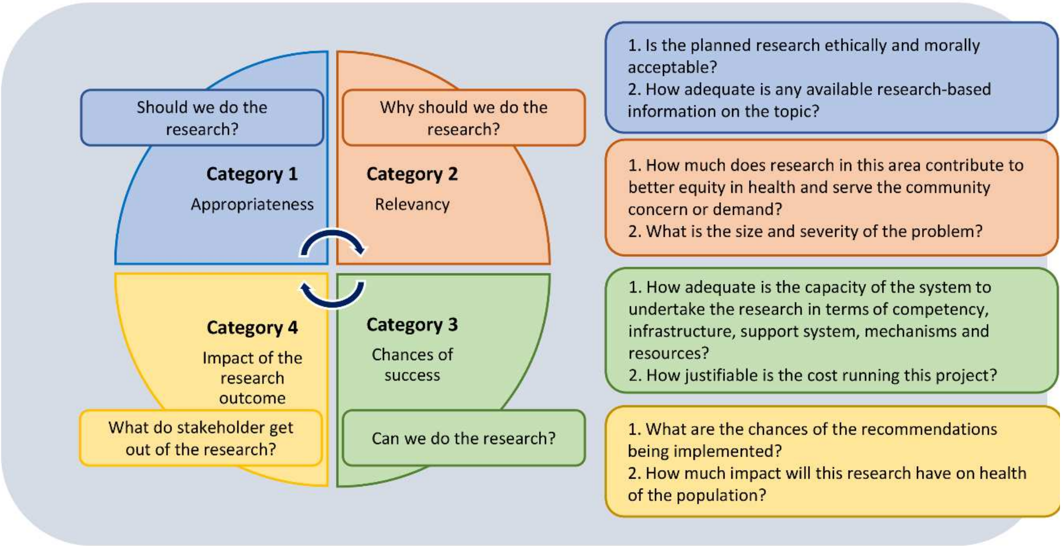

Figure SF1-2 Four categories (and 2 criteria for each) of the Essential National Health Research ranking strategy [4]

Stage 1: Planning

Steering committee: The study steering committee included members of the YAHiR Collaborative. Avoiding the "GOBSAT" (good old boys sat around a table) approach [47] the steering committee ensured a representative Delphi panel, and a robust Delphi method and ENHR ranking process. Interpreting 'diversity' as more than representation of certain demographic groups, the steering committee ensured a diverse and informed Delphi panel, representing six multi-profession stakeholder groups, including previously minoritised groups relevant to this research field (e.g., women, athletes, patients and the community, participants from the Global South). This study's online Delphi method, with a specific focus on anonymity and access to adequate topic-specific resources, supported a more equitable and inclusive process.

More equitable (as opposed to an in-person meeting) as traditionally underrepresented groups had similar opportunities to participate—levelling the playing field (they didn't need to travel and could share their opinion in a 'safe space'). Our efforts to promote a more inclusive Delphi study (referring to a positive and supportive experience) included online meetings to share and discuss study resources and topic-specific information, and giving patient and public involvement partners leading roles in all aspects of the study (including steering committee membership, active involvement in study design, leading roles in online discussions, and co-authorship of study reports, including peer reviewed papers). (We provided the Primary Cam Morphology Delphi Study Steering Committee Terms of Reference as a Supplementary File).

Delphi and ENHR ranking panel: The concept of 'expert' is contested. According to Christiansen-Ruffman and Stuart (1978), cited by Needham and de Loë (1990:136) expertise is restricted "to people with specialized training, such as architects, academics, medical doctors and scientists." [48] Cantril et al (1996:69) argued that an 'expert' is "any individual with relevant knowledge and experience of a particular topic". [49] However, the narrow definition of expertise is unfortunate and "excludes individuals who derive expertise, not from specialised training, but real or first-hand experience, or familiarity", and "more recognition must be given to a variety of experts who exist along a closeness continuum". [48]

The closeness continuum represents an inclusive expert population of individuals with subjective, mandated, and objective closeness to the topic of interest. Experts with subjective closeness have deep experiential knowledge or real-life experiences. Experts with mandated closeness are those with professional and/or legal (ethical) responsibility while experts with objective closeness are those who study the topic, exploring and inquiring without preconceived bias. [48,50]

We adapted and applied the "closeness continuum" to purposively recruit 73 experts for this study representing multiple stakeholder groups with relevant experience and expertise (Figure SF1-3 and Table SF1-1). Participants were not reimbursed.

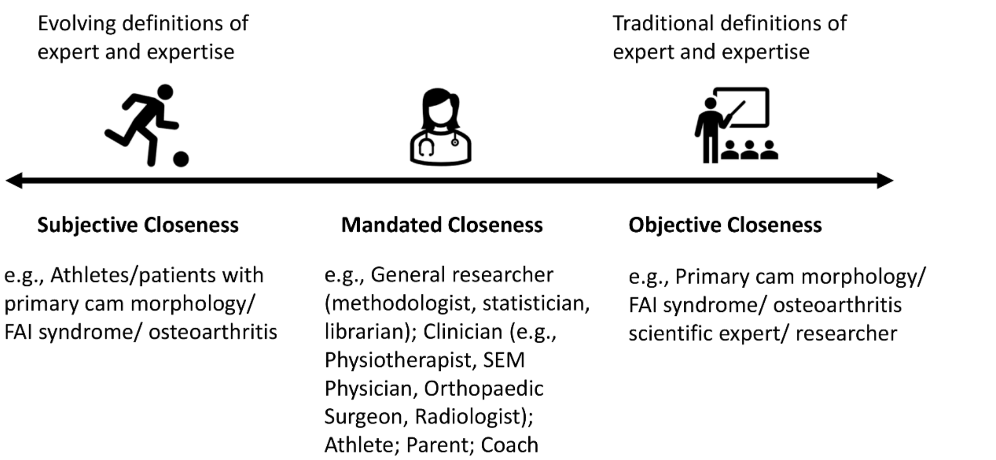

Figure SF1-3 Adapted closeness continuum of experts applied to the Oxford Consensus Study [48]

Table SF1-1 Delphi panel recruitment criteria

Identification of Delphi panel	Panel members were identified through (1) expert knowledge of the steering committee and colleagues; (2) International Olympic Committee's 11 research centres for the prevention of injury and protection of athlete health; (3) International Hip Pain Research Network Consensus Group; (4) a list of authors (lead/corresponding authors) with a track record of peer-review publications in sports medicine and science, preferably in the field of cam morphology/FAI syndrome over the past 15-20 years (2000 to 2021).

	We oversampled to compensate for possible attrition at a rate of 25% per round.
Researchers	Statisticians, methodologists, librarians, and sport scientists
Clinicians and clinician-researchers	Clinicians who treat patients with hip-related conditions and clinician-researchers with a peer reviewed publication record in the field (cam morphology and/or femoroacetabular impingement aetiology, prognosis, treatment), including orthopaedic surgeons, physicians (including sports medicine physicians, physical medicine and rehabilitation physician, rheumatologist, family medicine), radiologists, physical therapists
Patient and Public Involvement (PPI) representatives	➢ adult patients: a purposive sample of adults diagnosed with femoroacetabular impingement and cam morphology or hip osteoarthritis and cam morphology or hip arthroplasty and cam morphology or any other joint condition (e.g., inflammatory arthritis or osteoarthritis), or have a history of recreational or competitive high-load sports participation during adolescence or later ➢ parents of young adolescents regularly participating in competitive high-load sport, irrespective of a personal history of cam morphology or FAI syndrome ➢ sports coaches (defined as coaches of early adolescents regularly participating in high-load sports) or athletes (competitive, recreational, or retired), irrespective of a personal history of cam morphology or FAI syndrome ➢ individuals with experience in patient and public involvement, or unique perspectives on, health equity, health ethics, racial, ethnic, and minority groups in sports medicine (e.g., healthcare professionals involved in adolescent sports medicine screening (periodic health assessment) and patient / athlete education)
Journal editors, representatives of research funding bodies and policymakers	Journal editors (e.g., BJSM and JOSPT); Sports organisations/federations e.g. FIFA, IOC, IAAF

Sample size*:* We oversampled to compensate for possible attrition over rounds (at a rate of 25% per round). Consensus is normally achieved in an average of three rounds [51]; the steering committee, therefore, aimed to recruit a starting sample of 50 to 100 panel members. The study was fully anonymised and panel members did not know who the other panel members were during the Delphi survey rounds.

Patient and public involvement (PPI): We involved patient and public partners in the planning, delivery, and dissemination phases of the Delphi study through the YAHiR Collaborative's PPI group. The latter group was represented in the Delphi study steering committee. We supplied all members of the PPI group with a glossary, mentored them on definition use and content (during online individual and PPI Group meetings), and invited them to weigh in on each Delphi round. [52] They had access to the recordings of the *Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series,* providing a good knowledge base including the current evidence, and issues, allowing an informed assessment. Members of the PPI Group lead and actively participated in the mixed stakeholder group discussions following the Delphi rounds (Stage 3 below).

Delphi software: We used DelphiManager®, "a web-based system designed to facilitate the building and management of Delphi surveys" for the Delphi rounds and Microsoft Forms for the ENHR research ranking exercise. [53]

Ethical considerations: Research participants provided informed online consent for the study as part of the DelphiManager® surveys. Participants did not meet face-to-face during the online Delphi rounds. The University of Oxford's Medical Sciences Interdivisional Research Ethics Committee (MS IDREC) provided ethics approval for the study - R73576/RE001.

Statement preparation: The Delphi study steering committee created an extensive list of statements and conceptual framework of all the potential definitions, terminology, taxonomy, and a set of research priorities on conditions affecting the young person's hip focussing on primary cam morphology and its natural history. We based the initial statement list on a concept analysis of primary cam morphology [54], the early results of a qualitative study to explore stakeholder perspectives on factors contributing to high-quality research on how primary cam morphology develops, and the Lisbon Agreement on Femoroacetabular Imaging. [55–57]. In addition, the list of possible research recommendations was informed by recent (since January 2016) consensus recommendations on research in the field. [55–62] Members of the Delphi study steering committee independently reviewed the statements, followed by an iterative, asynchronous online process to review, discuss, modify and approve the final statements. The steering committee provided additional descriptive information ("Help Text") where appropriate, and asked stakeholders, including members of the Patient and Public Involvement group, to provide feedback on the draft Delphi survey. Stakeholders examined the survey's face validity (e.g., comprehensibility and acceptability) and refined language, formatting, and layout.

Panel information pack: All panel members had access from the outset of the project and throughout the Delphi process, to the course material, including recorded presentations, of the first 9 Webinars of the *Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series* (Appendix 2). (Webinar 1: *What is primary cam morphology? Taxonomy, terminology, and definitions,* and Webinar 2: *Imaging strategies for primary cam morphology and FAI syndrome*, were particularly relevant to this Delphi study). Panel members had full-text access to 5 recent consensus statements [58–62], and a summary of their research recommendations, to support scoring Domain 5 of the Delphi study on research priorities. We refer the reader to the relevant Supplementary Files (Oxford Delphi consensus study Part 1 and Part 2). Completion of the webinars and/or reading of the consensus statements was not required.

Consensus definition: The steering committee agreed on a consensus definition prior to the Delphi rounds (Table SF1-2).

Table SF1-2 Definition of consensus

Category	Definition	Action
Consensus in (high agreement)	Scored as very important (7 to 9) by ≥70% of panel members *and* not important (1 to 3) by <15% of panel members	Item retained for the next survey round/consensus meeting
Consensus out (low agreement)	Scored as not important (1 to 3) by ≥70% of panel members *and* very important (7 to 9) by <15% of panel members	Item discarded after round 2 (to be ratified at the face-to-face consensus meeting)
No consensus	Neither criteria above are met	Item retained for the next survey round/consensus meeting
Suggest rewording	Scored as important but must be reworded.	Provide the opportunity for panel members to suggest rewording. The study steering committee will consider retaining a reworded item for the next survey round.

Stage 2: Online Delphi Rounds

The consensus process involved a sequential, two-round Delphi survey and synchronous online consensus meetings to establish multi-stakeholder agreement and surface disagreement.

Round 1: Participants provided informed consent and registered for the Delphi study in one of 6 stakeholder groups. The statements were presented in a sensible and logical order in 5 questionnaire domains (definitions, terminology, taxonomy, imaging outcomes, and research priorities).

Panel members scored each statement using a 9-point Likert scale ranging from 1 (“not important/ disagree”) to 9 (“critical/ agree”), based on the Grading of Recommendations Assessment, Development and Evaluation scale for scoring the importance of including the item in the final list of statements. [63] Round 1 survey included free text sections to allow participants to propose new or modified statements and provide general study feedback. The Delphi study steering committee reviewed the proposed new statements or statement modifications suggested by participants in round 1, discussed and considered all the agreed new or modified survey statements for a subsequent round(s), and resolved any uncertainties.

Round 2: Participants had access to the distribution of round 1 scores for each statement stratified by stakeholder group. Judgements after feedback, including aggregated group feedback, are less exposed to cognitive and personal biases, and panellists are more confident in their decisions. [64–66] Panel members saw their score and then re-scored each statement on a scale of 1 to 9 (or not if they chose to defend their outlying score) based on the average scores of the group. We documented changes in score from round to round, and panel members could provide reasons when their score boundaries changed between rounds 1 and 2, defending their outlying score(s).

The steering committee and Delphi panellists explored and discussed reasons for outlying scores, disagreement and dissent (including statements with overall consensus) during the online Interacting Group Process (stage 3 of the Delphi study). Multiple rounds can cause ‘group-think’ amongst participants via pressure to comply.[67] We did not wish to force agreement amongst participants and chose to limit the Delphi process to a maximum of 3 rounds. However, two Delphi rounds resulted in high consensus and surfaced important disagreements and areas of dissent to focus on in online discussions. A third voting round was therefore not required. Following Delphi round 2, we included all statements voted 'consensus in/ agree' and 'consensus out/disagree' in the final list of consensus statements.[68,69].

Stage 3: Online Interacting Group Process and Research Priority Setting using the ENHR ranking exercise

Interacting Group Process - online mixed stakeholder group discussion meetings: Delphi panellists discussed all discordant items as well as areas of tension and dissent, during two online mixed stakeholder group meetings, based on the Interacting Group Process. Interacting Group Processes stimulate participants to look at problems and solutions from different perspectives. [12,70] While Nominal Group Processes are better for generating ideas or solutions, interacting groups are better for sharing and evaluating information. [12] Acknowledging the importance of areas of dissensus or disagreement substantial time and effort were allocated to exploring these. To create a safe space for panellists to share their views, the steering committee facilitated discussions in small zoom breakout rooms (6-8 panellists representing different stakeholder groups); the discussions were not recorded. Group leads documented discussions in a field diary, and maintained speaker anonymity.

The first meeting discussed the results of the Delphi rounds, including ongoing areas of disagreement and dissent, and ratified the primary cam morphology definitions, terminology, taxonomy, and imaging outcome measures. The second meeting discussed the prioritised list YAHiR Collaborative research statements on conditions affecting the young person's hip, focussing on primary cam morphology and its consequences in athletes.

Research Priority Setting – ENHR strategy: An online Microsoft Forms survey process followed to further rank the prioritised statements according to the ENHR strategy for research priority setting as described earlier. [4]

Feedback: Following the ENHR ranking exercise, panellists were able to attend one of six optional, time-zone friendly online feedback-and-discuss-meetings. Although these were not recorded, the lead investigator took field notes that provided an additional context for analysis. Field notes aided in constructing thick, rich descriptions of the context and discussions of these (and other) encounters. [71]

Data analysis

We entered and stored all data using the DelphiManager® electronic software tool and created Excel spreadsheets. [53] We calculated descriptive statistics for each statement and stakeholder group e.g., summary scores, ranges, percentage scoring for each statement "not important/ disagree" (score 1 to 3), "important but not critical/ neutral" (score 4 to 6) and "critical/ agree" (score 7 to 9). Specifically, we reported, per stakeholder group, the median and interquartile range (IQR) for each statement between each round. This central tendency and measure of distribution served to estimate the consistency of responses between successive rounds of the Delphi study. Stability of response is an indication of whether agreement (or continuous dissensus or disagreement) is present throughout and whether it develops between rounds. [72,73] The stability of group response between rounds 1 and 2 was calculated using the Intraclass Correlation Coefficient (ICC) type A, and an absolute agreement definition. [74,75] ICC estimates and their 95% confidence intervals were calculated using SPSS statistical package version 23 (SPSS Inc, Chicago, IL) based on 2-way mixed-effects model. [76] The lower bound 95% confidence interval of the ICC estimate was used as the basis to evaluate the level of reliability using the following general guideline: ICC values <0.5 (poor stability), ICC values 0.5 to 0.75 (moderate stability), 0.75 to 0.9 indicated (good stability) and ICC values >0.9 (excellent stability). [76]

Table SF1-2 represents the prior consensus definition for categorising the statements in all five Delphi domains. The Delphi study steering committee retained all statements between rounds 1 and 2 to enable participants to re-score every statement after considering feedback from round 1. This likely reduced participant burden in potential subsequent rounds and at the consensus discussion meetings. [1] Acknowledging that certain statements might be more relevant to some panel members than others, stakeholders were given the choice not to score a specific statement. We did, however, analyse the data of different stakeholder groups separately in each round. [68]

In addition to the quantitative consensus definition in table 2, the Delphi study steering committee reflected carefully on the findings, drawing on clinical wisdom and experience, encouraging, facilitating and documenting further deliberation during two synchronous online discussion meetings.

Dissent analysis: Although the main aim of the Delphi method is to structure a group communication process that might lead to consensus, we were also interested in panel dissent. To explore possible dissent, we applied *dissent analysis* including outlier analysis, bipolarity analysis, and stakeholder group analysis. [77,78]

- Outlier analysis: Outliers can have a substantial effect on variables (e.g., Interquartile range), and statistical consensus. The existence of outliers is therefore an important potential explanation for dissent. We identified low outliers (data points that fall more than 1.5 times the Interquartile range below the first quartile) and high outliers (data points that fall more than 1.5 times the Interquartile range above the third quartile). In addition, we visually inspected histograms of round 2 stakeholder group scoring for outliers. We re-analysed consensus after eliminating outliers for all statements with marginal non-consensus to test if these had an impact on the group's consensus.

- Bipolarity analysis: Opposing groups of experts with an important and insoluble cleft of opinion, might result in non-consensus. Bimodal data distribution is therefore a possible explanation for dissent. To test for bipolarity, we investigated potential bimodal distribution (two or more answer options had the same mode frequency) and visually inspected histograms for round 2 scores of each statement. [77]
- Stakeholder group analysis: Stakeholder group analysis, a classical dissent analysis, is important to identify opposing views. To compare the scores from round 2 between the six stakeholder groups, we performed Kruskal-Wallis tests. To account for multiple post hoc comparisons, we adjusted the statistical significance threshold p-value to 0.0033 according to Bonferroni method. We are conscious of the limitations of 'statistical significance' [79]; therefore, substantial stakeholder group differences ($p<0.0033$) prompted us to further scrutinise individual- and group opinions for the specific statement.

Qualitative analysis: The lead investigator (HPD) immersed himself in the details of participants' comments provided during Delphi rounds, Interacting Group Process, and ENHR ranking exercise.[80] After developing a framework based on recurrent and important themes, the free text comments were grouped into categories, iteratively discussed between the lead investigator and second author (SM). The lead authors (HPD and SM) then undertook thematic analysis to identify, group and agree on common threads within these categories, further refining themes and subthemes.[81,82] We provided summarised feedback of quantitative and qualitative open responses to panel members during Webinars 10 and 11 of the *Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series.* The webinars preceded the online synchronous mixed stakeholder group discussions on 22 and 23 September 2021 (Stage 3).

Dissemination

Considerable time lags—up to an average of 17 years—exist in the health research (knowledge) translation process. [83–85] On the other hand, rapid knowledge translation and implementation into policy and practice, as evident in the early covid-19 pandemic days, served and savaged communities—scientific-, health and care-, and patient communities. [86–88] We created opportunities for the community of researchers, clinicians, athletes and athlete-patients, to responsibly disseminate and effectively implement the findings of this study, not only to amplify the ethical conduct of future research, but also to foster authentic co-production of new knowledge. [89] Dissemination of new knowledge, an active process of spreading or sharing evidence to a target population, is most effective "when it starts early, galvanizes support, uses champions and brokers, considers contextual factors, is timely, relevant, and accessible, and knows the players and process." [90,91]

To fulfil objective 3 of the Oxford consensus, we applied the revised Bloom's taxonomy (Figure SF 1-4). [92], a tool to create education that encourages critical thinking, to develop two education events aimed at early dissemination and implementation: *Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series* (Supplementary File 4), and *YAHiR Collaborative's Young Athlete's Hip Symposium and Research Meeting* (22-23 September 2022, Worcester College, Oxford).

Bloom and co-workers developed a taxonomy of learning domains, which was divided into cognitive (knowledge and mental skills), psychomotor (physical movement, coordination, and use of motor skills), and affective (how individuals deal with things emotionally – feelings, values, attitudes). While the original Taxonomy provided a hierarchy of six different levels of objectives in the cognitive domain, each entailing more intricate thinking than the previous one, the revised Bloom's taxonomy emphasised verbs— the basis of the cognitive process: "what is to be done with or to the subject matter content." (Figure 4) [92]

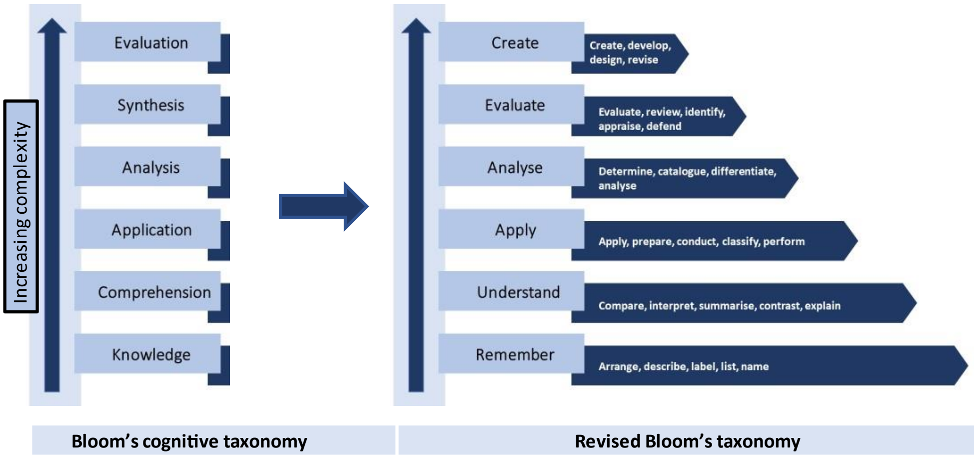

Figure SF1-4 Bloom's revised taxonomy of cognitive process action verbs

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SUPPLEMENTARY FILE 2: Research priorities on conditions affecting the young person's hip focussing on primary cam morphology and its consequences in athletes mapped against REporting guideline for PRIority Setting of health (REPRISE) framework

Contents

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No	Item	Descriptor	Text in write-up and Section
A	**Context and scope**		
1	Define geographical scope	Global, regional, national, city, local area, institutional/organizational level, health service	**Global** **INTRODUCTION** "…an international group of clinicians, athletes, patients, and researchers—representing the **Y**oung **A**thlete's **Hi**p **R**esearch (YAHiR) Collaborative...' **Objective 2**: "…work towards agreement…" **Stage 1: Planning** "Steering committee: The study steering committee included members of the YAHiR Collaborative and aimed for a robust Delphi method and ENHR ranking process. Interpreting 'diversity' as more than representation of certain demographic groups, the steering committee ensured a diverse (e.g., sex/gender, country of residence, profession), informed (knowledgeable about primary cam morphology and its natural history), and representative of previously minoritised groups relevant to this research field (e.g., participants from the Global South, patient and public representatives, and women) international Delphi panel. By prioritising anonymity and access to adequate topic-specific resources, the online Delphi method and ENHR ranking strategy supported a more equitable and inclusive process. (Supplementary File 4: Primary Cam Morphology Delphi Study Steering Committee Terms of Reference)" Table 2 in the manuscript outlines the demographic characteristics of the Delphi and ENHR participants
2	Define health area, field, focus	Disease or condition specific, interventions, healthcare delivery, health system	**Conditions affecting the young person's hip** **INTRODUCTION:** Objective (2) "work towards agreement (and highlight residual disagreements) on a set of research priorities on conditions affecting the young person's hip, focussing primarily on primary cam morphology and its natural history"

3	Define intended beneficiaries	This may include the general population or a specific population based on demographic (age, gender), clinical (disease, condition), or other characteristics who may benefit from the research	**Athletes, patients, researchers, clinicians and funders** **INTRODUCTION**: "Research partnerships with athletes, patients, researchers and clinicians should agree on a prioritised research agenda for this field." **DISCUSSSION:** "While informing more rigorous, inclusive and evidence-based research, this consensus is a roadmap for researchers, policy makers and funders to implement research dedicated to reducing the cost and burden of hip disease related to primary cam morphology."
4	Define the target audience of the priorities	Policy makers, funders, researchers, industry or others who have the potential to implement the priorities identified	**Policy makers, funders, researchers, clinicians, patients** **ABSTRACT and CONCLUSION:** 'While informing more rigorous, inclusive and evidence-based research, this agreement is a roadmap for researchers, policy makers and funders to implement research dedicated to reducing the cost and burden of hip disease related to primary cam morphology.'
5	Identify the research area	Public health, health services research, clinical research, basic science	**Clinical research** **INTRODUCTION:** "…conditions affecting the young person's hip focussing on primary cam morphology and its natural history."
6	Identify the type of research questions	Etiology, diagnosis, prevention, treatment (interventions), prognosis, health services, psychosocial, behavioral and social science, economic evaluation, implementation; this may not be pre-defined	**Multiple research questions (methodologies)** **Table 2 and Figure 5:** Etiology, diagnosis, prevention, treatment, prognosis, screening of primary cam morphology and its natural history (FAI syndrome and hip Osteoarthritis), and the lived experiences of patients living with these conditions.
7	Define the time frame	Interim, short-term, long-term priorities, plans to revise and update	**Medium- to long-term priorities** **RESULTS**: "The 18 prioritised and ranked research statements (Figure 5), highlighted in green in Table 4, outlined 7 research domains including (1) best practice physiotherapy, (2) rehabilitation progression and return to sport, (3) exercise intervention and load management, (4) primary cam morphology aetiology and prognosis, (5) FAI syndrome aetiology and prognosis, (6) diagnostic criteria, and (7) screening (Supplementary File 9). These are medium- to long-term research priorities."

B	**Governance and team**		
8	Describe the selection and structure of the leadership and management team	Those responsible for initiating, developing, and guiding the process for priority setting, and examples of structures include; Steering Committee, Advisory Group, Technical Experts	YAHiR Collaborative steering committee **Stage 1: Planning:** “Steering committee: The study steering committee included members of the YAHiR Collaborative and aimed for a robust Delphi method and ENHR ranking process. Interpreting ‘diversity’ as more than representation of certain demographic groups, the steering committee ensured a diverse (e.g., sex/gender, country of residence, profession), informed (knowledgeable about primary cam morphology and its natural history), and representative of previously minoritised groups relevant to this research field (e.g., participants from the Global South, patient and public representatives, and women) international Delphi panel. By prioritising anonymity and access to adequate topic-specific resources, the online Delphi method and ENHR ranking strategy supported a more equitable and inclusive process. (Supplementary File 4: Primary Cam Morphology Delphi Study Steering Committee Terms of Reference)”
9	Describe the characteristics of the team	Stakeholder group or role, institutional affiliations, country or region, demographics (e.g. age sex), discipline, experience, expertise	**Stage 1: Planning** “Delphi and ENHR ranking panel: We describe in a linked paper (Oxford Delphi consensus study, Part 1 – Figure 3 and Table 1) and Supplementary File 1, how the ‘closeness continuum’ was adapted and applied to purposively recruit 73 experts for this study” **Table 2**: Demographic characteristics of the Delphi and ENHR participants
10	Describe any training or experience relevant to conducting priority setting	Consultants or advisors, members with experience or skills relevant to the conducting priority-setting e.g. qualitative methods, surveys, facilitation	**Panel information pack and training** **Stage 1: Planning** “Panel information pack and training: All panel members had access from the outset of the project and throughout the Delphi process, to the course material, including recorded presentations, of the first 8 Webinars of the Oxford-Aspetar-La Trobe Young Athlete’s Hip Webinar Series (Supplementary File 5). Panel members had full-text access to 5 recent consensus statements, and a summary of their research recommendations (Supplementary File 6). Completion of the webinars and/or reading of the consensus statements was not required.”
C	**Framework for priority setting**		

11	State the framework used (if any)	James Lind Alliance, COHRED, CHNRI, Dialogue Model, no framework (general research priority setting)	**Essential National Health Research (ENHR) strategy** **Study design – Delphi method and Research Priority Setting process** "A two-round Delphi method was used to prioritise the research statements (Domain 5 of the Oxford Consensus Study). We modified the classical Delphi method slightly by replacing an open qualitative first round with a pre-selected list of statements based on a literature review and synthesis of steering group members' knowledge. Three online Microsoft Forms surveys followed to further rank the prioritised statements according to the Council on Health Research for Development (COHRED) Essential National Health Research (ENHR) strategy for research priority setting."

D	Stakeholders or participants		
12	Define the inclusion criteria for stakeholders involved in priority setting	Patients, caregivers, general community, health professionals, researchers, policy makers, nongovernmental organizations, government, industry; specific groups including vulnerable and marginalized populations	**Researchers, clinicians, patients** **Stage 1: Planning** "Delphi and ENHR ranking panel: We describe in a linked paper (Oxford Delphi consensus study, Part 1 – Figure 3 and Table 1) and Supplementary File 1, how the 'closeness continuum' was adapted and applied to purposively recruit 73 experts for this study." "Patient and public involvement (PPI): We involved patient and public partners in the planning, delivery, and dissemination phases of the Oxford consensus through the YAHiR Collaborative's PPI group. The latter group was represented in the Delphi study steering committee. We supplied all members of the PPI group with a glossary, mentored them on definition use and content (during individual and one PPI group online meetings), and invited them to weigh in on each Delphi round as well as the ENHR ranking surveys.[33] They had access to the recordings of the Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series, providing a good knowledge base including the current evidence, and issues, allowing an informed assessment. Members of the PPI group lead and actively participated in the mixed stakeholder group discussions following the Delphi rounds (Stage 3 below)."
13	State the strategy or method for identifying and engaging stakeholders	Partnership with organizations, social media, recruitment through hospitals	**Closeness continuum** **Stage 1: Planning** "Delphi and ENHR ranking panel: We describe in a linked paper (Oxford Delphi consensus study, Part 1 – Figure 3 and Table 1) and Supplementary File 1, how the 'closeness continuum' was adapted and applied to purposively recruit 73 experts for this study."
14	Indicate the number of participants and/or organizations involved	Number of individuals and organizations, include number by stakeholder group	**Full details of the number of participants and/or organizations involved is outlined in table 2**
15	Describe the characteristics of stakeholders	Stakeholder group, demographic characteristics, areas of interest and expertise, discipline, affiliations	**Full details of the number of participants and/or organizations involved is outlined in table 2**

16	State if reimbursement for participants was provided	Cash, vouchers, certificates, acknowledgement; what purpose e.g. travel, accommodation, honorarium	**Participants were not reimbursed for eengaing in thee research project** **Stage 1:** Planning: “Participants were not reimbursed.”
E	**Identification and collection of research priorities**		
17	Describe methods for collecting initial priorities	Methods e.g. Delphi survey, surveys, nominal group technique, interviews, focus groups, meetings, workshops; prioritization e.g. voting, ranking; mode e.g. face-to-face, online; may be informed by evidence e.g. systematic reviews, reviews of guidelines/other documents, health technology assessment	**Stage 1: Planning** “Statement preparation: The steering committee created an extensive list of statements and conceptual framework of all the potential future research priorities for primary cam morphology and its consequences. We based the initial statement list on a concept analysis of primary cam morphology[5], the early results of a qualitative study to explore stakeholder perspectives on factors contributing to high-quality research on how primary cam morphology develops, the Lisbon Agreement on Femoroacetabular Imaging[22–24], and the research recommendations of recent (since January 2016) consensus recommendations on research in the field.[18–24,35]”
18	Describe methods for collating and categorising priorities	Taxonomy or other framework used to organize, summarise, and aggregate topics or questions	**Stage 1: Planning:** “Members of the Delphi study steering committee independently reviewed the statements, followed by an iterative, asynchronous online process to review, discuss, modify and approve the final statements. The steering committee provided additional descriptive information (“Help Text”) where appropriate, and asked stakeholders, including members of the PPI group, to provide feedback on the draft Delphi survey. They examined the survey’s face validity (e.g., comprehensibility and acceptability) and refined language, formatting, and layout.”
19	Describe methods and reasons for modifying (removing, adding, reframing) priorities	Based on scope, clarity, definition, duplication, other criteria	**Stage 1: Planning** “Members of the Delphi study steering committee independently reviewed the statements, followed by an iterative, asynchronous online process to review, discuss, modify and approve the final statements. The steering committee provided additional descriptive information (“Help Text”) where appropriate, and asked stakeholders, including members of the PPI group, to provide feedback on the draft Delphi survey. They examined the survey’s face validity (e.g., comprehensibility and acceptability) and refined language, formatting, and layout.”

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20	Describe methods for refining or translating priorities into research topics or questions	Reviewed by Steering Committee or project team	**Stage 1: Planning** "Members of the Delphi study steering committee independently reviewed the statements, followed by an iterative, asynchronous online process to review, discuss, modify and approve the final statements. The steering committee provided additional descriptive information ("Help Text") where appropriate, and asked stakeholders, including members of the PPI group, to provide feedback on the draft Delphi survey. They examined the survey's face validity (e.g., comprehensibility and acceptability) and refined language, formatting, and layout."
21	Describe methods for checking whether research questions or topics have been answered	Systematic reviews, evidence mapping, consultation with experts	**Stage 1: Planning** "Members of the Delphi study steering committee independently reviewed the statements, followed by an iterative, asynchronous online process to review, discuss, modify and approve the final statements. The steering committee provided additional descriptive information ("Help Text") where appropriate, and asked stakeholders, including members of the PPI group, to provide feedback on the draft Delphi survey. They examined the survey's face validity (e.g., comprehensibility and acceptability) and refined language, formatting, and layout."
22	Describe number of research questions or topics	Number of priorities at each stage of the process	**Full details are outlined in table 3**
F	**Prioritisation of research topics/questions**		
23	Describe methods and criteria for prioritising research topics or questions	Methods e.g. Delphi survey, surveys, nominal group technique, interviews, focus groups, meetings, workshops; Prioritization e.g. voting, ranking; Mode e.g. face-to-face, online; Criteria e.g. need, feasibility, novelty, equity	**Study design – Delphi method and Research Priority Setting process** "A two-round Delphi method was used to prioritise the research statements (Domain 5 of the Oxford Consensus Study). We modified the classical Delphi method slightly by replacing an open qualitative first round with a pre-selected list of statements based on a literature review and synthesis of steering group members' knowledge. Three online Microsoft Forms surveys followed to further rank the prioritised statements according to the Council on Health Research for Development (COHRED) Essential National Health Research (ENHR) strategy for research priority setting."
24	State the method or threshold for excluding research topics/questions	Thresholds for ranking scores, proportions, votes; other criteria	**Delphi consensus method: table 1** **Stage 1:** Planning "The steering committee agreed on a consensus definition prior to the Delphi rounds (Table 1)." - Table 1

G	**Output**		
25	State the approach to formulating the research priorities	Area, topic, questions, PICO (population, intervention, comparator, outcome)	The research priorities were formulated and reported in 7 domains
H	**Evaluation and feedback**		
26	Describe how the process of prioritisation was evaluated	Survey, workshop	**Stage 3: Online Interacting Group Process and Research Priority Setting using the ENHR ranking exercise** "Feedback: Following the ENHR ranking exercise, panellists were able to attend one of six optional, time-zone friendly online feedback-and-discuss-meetings."
27	Describe how priorities were fed back to stakeholders and/or the public, and how feedback (if received) was addressed and integrated	Public meetings or workshop, newsletters, website, email, online presentations	**Stage 3: Online Interacting Group Process and Research Priority Setting using the ENHR ranking exercise** "Interacting Group Process - online mixed stakeholder group discussion meetings: Facilitated by Delphi steering committee and PPI group members, Delphi panellists discussed all discordant items as well as areas of tension and dissent, during two online mixed stakeholder group meetings, based on the Interacting Group Process. The second meeting, reported in this paper, discussed research statements prioritised after the two Delphi rounds. The first meeting discussed the Delphi round results for the first 4 domains: definitions, terminology, taxonomy and imaging outcomes (Oxford Delphi consensus study, Part 1). To create a safe space for panellists to share their views, the steering committee facilitated discussions in small zoom breakout rooms that were not recorded. Group leads documented the discussions in a field diary, and maintained speaker anonymity." "Feedback: Following the ENHR ranking exercise, panellists were able to attend one of six optional, time-zone friendly online feedback-and-discuss-meetings."
I	**Implementation**		
28	Outline the strategy or action plans for implementing priorities	Communication with target audience, via policies and funding	Webinar Series, and YAHiR Collaborative Symposium and Research Meeting **Dissemination and implementation:** "To fulfil Objective 3 of the Oxford Delphi consensus, we applied the revised Bloom's taxonomy[37] (Figure 3) to develop two education events aimed at early dissemination and implementation: Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series (Supplementary File 5),

			and YAHiR Collaborative's Young Athlete's Hip Symposium and Research Meeting (22-23 September 2022 at Worcester College in Oxford – Supplementary File 13). The revised Bloom's taxonomy, a tool to create education that encourages critical thinking, emphasises verbs—the basis of the cognitive process.[37]"
29	Describe plans, strategies, or suggestions to evaluate impact	Integration in decision-making, funding allocation, review of relevant documents	**Dissemination and implementation** "The YAHiR Research Meeting on 23 September 2022 discussed plans and strategies to implement and evaluate the impact of the prioritised research agenda."
J	**Funding and conflict of interest**		
30	State sources of funding	Name sources of funding for the priority-setting exercise; if relevant include the budget and/or cost	**Acknowledgement and funding:** The lead author received a Kellogg College, Oxford Research Support Grant to the value of £1000
31	Declare any conflicts or competing interests	State any conflicts of interest that may be at an individual level and/or at a contextual level (e.g. political issues, controversies) that may affect the process, output or implementation	**Full details outlined in the competing interests section**

SUPPLEMENTARY FILE 2
Recommendations for the Conducting and REporting of DElphi Studies (CREDES) and how these will inform the primary cam morphology (PCM) Delphi Study

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Recommendations for the Conducting and REporting of DElphi Studies (CREDES) and how these will inform the primary cam morphology (PCM) Delphi Study

Recommendation

Rationale for choosing the Delphi technique

1. Justification.
“It is important to justify the choice of the Delphi technique as a method of systematically collating expert consultation and building consensus. It is also important to keep its constructivist nature in mind.”

PCM Delphi Study: we justified the choice of the Delphi technique in the study protocol document.

Planning and design

2. Planning and process.
“The Delphi technique is a flexible method. It can be adjusted to the respective research aims and purposes. Any modifications should be justified and be applied systematically and rigorously.”

PCM Delphi Study: we explain the three stages of the PCM Delphi Study in the study protocol document.

3. Definition of consensus.
“Define an a priori criterion for consensus (unless not reasonable due to the explorative nature of the study). This includes a clear and transparent guide for action on (a) how to proceed with certain items or topics in the next survey round, (b) the required threshold to terminate the Delphi process and, (c) procedures to be followed when consensus is (not) reached after one or more iterations.”

PCM Delphi study: we define an a-priori criterion for consensus (Table 4 and data analysis section of the study protocol document), including how to proceed with certain items in the next survey round, and facilitate discussion (stage 3) relevant to areas of tension and dissent.

Study conduct

4. Informational input.
“Carefully review all material provided to the expert panel at the outset of the project and throughout the Delphi process; pilot the process in advance in order to examine the effect on experts’ judgements and to prevent bias.”

PCM Delphi Study: we provide information on all material provided to the expert Delphi panel (recruitment section of the study protocol document).

5. Prevention of bias.
“Researchers need to take measures to avoid directly or indirectly influencing the experts’ judgements. Consider to entrust an independent researcher with the main coordination of the Delphi study if one or more members of the research team have a conflict of interest.”

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

PCM Delphi Study: the Delphi Study Steering Committee will provide oversight to this Delphi study. *'The study steering committee included members of the YAHiR Collaborative. Avoiding the "GOBSAT" ("good old boys sat around a table") approach[22] the steering committee ensured a representative Delphi panel, and a robust Delphi study process. Interpreting 'diversity' as more than representation of certain demographic groups, the steering committee ensured a diverse and informed Delphi panel, representing six multi-profession stakeholder groups, including previously minoritised groups relevant to this research field (e.g., women, athletes, patients and the community, participants from the Global South). This study's online Delphi method, with a specific focus on anonymity and access to adequate topic-specific resources, supported a more equitable and inclusive process.'* (Supplementary File 3: Steering Committee Terms of Reference).

6. Interpretation and processing of results.
"Consensus does not necessarily imply the 'correct' answer or judgement; (non)consensus and stable disagreement provide informative insights and highlight differences in perspectives concerning the topic in question."

PCM Delphi Study: the Delphi Study Steering Committee provide oversight to the planning and conduct of the Delphi exercise, including the final synchronous (online) discussion of the Delphi Rounds' results with careful attention to dissent and ambiguity. We also performed and reported: (1) a thematic analysis of individual and group feedback; (2) Intraclass Correlation Coefficient and its 95% Confidence Interval for each statement as an indication of stability; (3) dissent analysis (bipolarity of group opinion, outlier analysis, and stakeholder group analysis)

7. External validation.
"Consider an external board or authority to review and approve the final Delphi study results (e.g., draft of the resulting guidance) before it is published and disseminated."

PCM Delphi Study: we state in the dissemination section of the study protocol document that "we will ask international professional bodies (e.g. International Society for Hip Arthroscopy; British Association of Sport and Exercise Medicine; International Federation of Sports Physical Therapy) to participate in and endorse the consensus". Furthermore, the Young Athlete's Hip Research Collaborative's members are from many international organisations.

Reporting

8. Purpose and rationale.
"Define the purpose of the study and demonstrate the appropriateness of the use of the Delphi technique as a method to achieve the research aim. Provide a rationale for the choice of the Delphi technique as the most suitable method."

PCM Delphi Study: we discuss the aim and objectives of this Delphi Study and the appropriateness of the use of the Delphi technique in the study protocol document.

9. Expert panel.
"Report the selection criteria for expert panellists and provide transparent information on recruitment of the expert panel, sociodemographic details, including information on

expertise regarding the topic in question, (non)response and response rates over the ongoing iterations."

PCM Delphi Study: we report the selection criteria of expert panellists in the study protocol document. We report and provide transparent information on recruitment of the expert panel, sociodemographic details, including information on expertise regarding the topic in question, (non)response and response rates over the ongoing iterations.

10. Description of the methods.
"The methods employed need to be comprehensible; this includes information on preparatory steps (How was available evidence on the topic in question synthesised?), piloting of material and survey instruments, design of the survey instrument(s), the number and design of survey rounds, methods of data analysis, processing and synthesis of experts' responses to inform the subsequent survey round and methodological decisions taken by the research team throughout the process."

PCM Delphi Study: we describe the Delphi Study methods in detail in the study methods (Supplementary File 1)

11. Procedure.
"Provide a flow chart to illustrate the stages of the Delphi process, including a preparatory phase, the actual 'Delphi rounds', interim steps of data processing and analysis, and concluding steps"

PCM Delphi Study: Figure 1 illustrates the stages of the Delphi process, including a preparatory phase, the actual Delphi rounds, interim steps of data processing and analysis, and concluding steps

12. Definition and attainment of consensus.
"It needs to be comprehensible to the reader how consensus was achieved throughout the process, including strategies to deal with non-consensus"

PCM Delphi Study: we report how consensus was achieved: a priori consensus definition (Table 2), consensus results (Table 4 and Supplementary File 5). We describe our strategies to deal with non-consensus/dissent in the Methods section and report in the Results section (Qualitative analysis of panellists' comments and feedback, and dissent analysis)

13. Results.
"Reporting of results for each round separately is highly advisable in order to make the evolving of consensus over the rounds transparent. This includes figures showing the average group response, changes between rounds, as well as any modifications of the survey instrument such as deletion, addition or modification of survey items based on previous rounds."

PCM Delphi Study: we report the results of each round separately to make the evolving of consensus (or not) over the rounds transparent (Table 4 and Supplementary File 5). We provided all panellists, using the DelphiManager® software, with figures (Histograms) showing the average stakeholder group response between round 1 and round 2. We did not modify the survey instrument after round 1 (no deletion, addition or modification of survey items based on previous rounds).

14.	Discussion of limitations. “Reporting should include a critical reflection of potential limitations and their impact on the resulting guidance.” *PCM Delphi Study:* we reflect in the discussion section on potential limitations and their impact on the final results
15.	Adequacy of conclusions. “The conclusions should adequately reflect the outcomes of the Delphi study with a view to the scope and applicability of the resulting practice guidance.” *PCM Delphi Study:* the Delphi Study Steering Committee provided oversight to the rigorous reporting of results (to avoid “spinning” when reporting and discussing results) and ensured that conclusions adequately reflect the outcome of the Delphi Study.
16.	Publication and dissemination. The resulting guidance (e.g., on good practice in palliative care) should be clearly identifiable from the publication, including recommendations for transfer into practice and implementation. If the publication does not allow for a detailed presentation of either the resulting practice guidance or the methodological features of the applied Delphi technique, or both, reference to a more detailed presentation elsewhere should be made (e.g. availability of the full guideline from the authors or online; publication of a separate paper reporting on methodological details and particularities of the process (e.g. persistent disagreement and controversy on certain issues)). A dissemination plan should include endorsement of the guidance by professional associations and health care authorities to facilitate implementation” *PCM Delphi Study:* we discuss the extensive dissemination of this Delphi Study’s results (involving the YAHiR Collaborative’s Patient and Public Involvement Group) in the Discussion section of this protocol paper: Webinar 9 to 11 of the *Oxford-Aspetar-La Trobe Young Athlete’s Hip Webinar Series* and the *YAHiR Collaborative’s Symposium and Research Meeting* planned for 22-23 September 2022 in Oxford.

Nuffield Department of Primary Care Health Sciences University of Oxford Radcliffe Primary Care Building Woodstock Rd Oxford OX2 6GG	NDORMS NUFFIELD DEPARTMENT OF ORTHOPAEDICS, RHEUMATOLOGY AND MUSCULOSKELETAL SCIENCES Medical Sciences Division NUFFIELD DEPARTMENT OF PRIMARY CARE HEALTH SCIENCES Medical Sciences Division	UNIVERSITY OF OXFORD
Principal Investigator: Prof Trisha Greenhalgh	**Primary researcher:** Dr Paul Dijkstra (DPhil Evidence-Based Health Care student) Oxford University telephone number: 01865 617835 Oxford University e-mail: hendrik.dijkstra@conted.ox.ac.uk	

Primary Cam Morphology Delphi Study Steering Committee

Terms of Reference

Title	An international Delphi study on a more rigorous, inclusive, and evidence-based approach to research on primary cam morphology
Aim	To inform a more rigorous, inclusive, and evidence-based approach to research on primary cam morphology in athletes
Objectives	The study objectives; to: (1) ascertain level of agreement between experts on primary cam morphology taxonomy, terminology, and definitions, (including imaging outcome measures), (2) work towards agreement on a set of research priorities on conditions affecting the young person's hip (focussing on primary cam morphology and its consequences in athletes), and (3) inform the design of a webinar and symposium to engage stakeholders, disseminate latest evidence, and stimulate debate
Steering Committee Chairperson	Professor Trisha Greenhalgh
Steering Committee Members & Affiliations	H Paul Dijkstra[1 2], Sean Mc Auliffe[3], Andreas Serner[4], Andrea Mosler[5], Joanne Kemp[5], Clare L Ardern[5 6], Amy Price[7], Sally Hopewell[8], Jason Oke[9], Karim M Khan[10], Sion Glyn-Jones[11], Mike Clarke[12], Trisha Greenhalgh[13] **Steering Committee Affiliations** [1] Department of Medical Education, Aspetar, Qatar Orthopaedic and Sports Medicine Hospital, Doha, Qatar [2] Department for Continuing Education, University of Oxford, Oxford, UK [3] Department of Physical Therapy & Rehabilitation Science, College of Health Sciences, Qatar University, Doha, Qatar [4] Aspetar Sports Groin Pain Centre, Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar [5] La Trobe Sport and Exercise Medicine Research Centre, School of Allied Health, Human Services and Sport, La Trobe University, Melbourne, Victoria, Australia [6] Musculoskeletal and Sports Injury Epidemiology Centre, Department of Health Promotion Science, Sophiahemmen University, Stockholm, Sweden

Nuffield Department of Primary Care Health Sciences University of Oxford Radcliffe Primary Care Building Woodstock Rd Oxford OX2 6GG		
Principal Investigator: Prof Trisha Greenhalgh	**Primary researcher:** Dr Paul Dijkstra (DPhil Evidence-Based Health Care student) Oxford University telephone number: 01865 617835 Oxford University e-mail: hendrik.dijkstra@conted.ox.ac.uk	

	[7] Stanford Anesthesia, Informatics and Media Lab, Stanford School of Medicine, Department of Anesthesia, Stanford University [8] Centre for Statistics in Medicine, Oxford Clinical Trials Research Unit, Medical Sciences Division, University of Oxford [9] NIHR Oxford Biomedical Research Centre, Oxford University Hospitals NHS Foundation Trust [10] Department of Family Practice and School of Kinesiology, University of British Columbia, Vancouver, Canada [11] Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford [12] Northern Ireland Methodology Hub, Centre for Public Health, Queen's University Belfast, UK [13] Nuffield Department of Primary Care Health Sciences, University of Oxford, Oxford, UK;

Terms of Reference

The Primary Cam Morphology Delphi Study Steering Committee will:

1. approve and publish the study protocol
2. deliver expertise to the study group
3. provide oversight to all elements of the study towards its overall objectives
4. review study progress at regular intervals
5. ensure compliance with ethical research standards
6. provide oversight to the planning and conduct of the final synchronous (online/in-person) discussion of the Delphi results with careful attention to dissent and ambiguity
7. assist in disseminating findings from the study across their wider networks

Approved: 14th April 2021

Mr Paul Blazey (Centre for Hip Health and Mobility, University of British Columbia, Vancouver, Canada; Department of Physical Therapy, Faculty of Medicine, University of British Columbia, Vancouver, Canada) replaced Professor Sally Hopewell.

The Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series

The Young Athlete's Hip Research (YAHiR) Collaboration

Protecting the young athlete's hip: the frontline of clinical practice and research on primary cam morphology and femoroacetabular impingement (FAI) syndrome

#OxfordHip2021

Date	Title and faculty	CPD 17.5
20th Nov 2020, 5pm GMT	**1. What is primary cam morphology? Taxonomy, terminology and definitions** Clare Ardern, Paul Dijkstra, Siôn Glyn-Jones, Karim Khan	1
11th Dec 2020, 6pm GMT	**2. Imaging strategies for primary cam morphology and FAI syndrome** Paul Dijkstra, Ara Kassarjian, Joanne Kemp, Andrea Mosler, Eugene McNally, Antony Palmer with Bruce Forster and Scott Fernquest	1.5
15th Jan 2021, 7pm GMT	**3. What causes primary cam morphology and FAI syndrome?** Clare Ardern, Joanne Kemp, Paul Dijkstra, Rintje Agricola, Siôn Glyn-Jones, Josh Heerey, Pim van Klij	1.5
5th Feb 2021, 7pm GMT	**4. Screening and prevention of primary cam morphology and its consequences in athletes** Clare Ardern, Joanne Kemp, Paul Dijkstra, Rintje Agricola, Andrea Mosler, Jason Oke	1.5
26th Feb 2021, 7pm GMT	**5. Hip dysplasia, cam morphology and FAI syndrome – is there a link?** Julie Jacobsen, Inger Mechlenburg, Siôn Glyn-Jones, Clare Ardern, Joanne Kemp, Paul Dijkstra	1.5
26th March 2021, 7pm GMT	**6. What are the consequences of primary cam morphology?** Andrea Mosler, Josh Heerey, Siôn Glyn-Jones, Rintje Agricola, Clare Ardern, Joanne Kemp, Paul Dijkstra	1.5
30th April 2021, 7pm BST	**7. Treatment and prognosis of primary cam morphology and FAI syndrome in young athletes** Joanne Kemp, Mo Gimpel, Per Hölmich, Siôn Glyn-Jones, Marc Philippon, Clare Ardern, Paul Dijkstra	2
Saturday 29th May 2021, 12.00 BST	**8. Young Athlete's Hip Research (YAHiR) collaboration** Sean Mc Auliffe, Paul Dijkstra, Femi Ayeni, Scott Fernquest, Antony Palmer, Sheree Bekker, Lauren Pierpoint, Clare Ardern	2
23rd June 2021, 8pm BST	**9. Involving patients and the public in developing, performing, and reporting research and education on FAI syndrome and primary cam morphology** Amy Price, Dawn Richards, Lindsey Plass, Rich Willy, Andrea Mosler, Clare Ardern, Joanne Kemp, Paul Dijkstra	1.5
22nd Sept 2021, 12pm BST	**10. Sharing results of the YAHiR Collaboration's Delphi exercise on primary cam morphology terminology, definitions and imaging outcome measures** Clare Ardern, Paul Dijkstra, Eugene McNally, Siôn Glyn-Jones, Joanne Kemp	1.5
23rd Sept 2021, 12pm BST	**11. Young Athlete's Hip Research Collaboration: Prioritising rigorous, inclusive, and evidence-based research on conditions affecting the young person's hip (focussing on primary cam morphology and its consequences in athletes)** Mike Clarke, Andrea Mosler, Stephanie Kliethermes, Trish Greenhalgh, Siôn Glyn-Jones, Karim Khan, Joanne Kemp, Clare Ardern, Paul Dijkstra	2.5

Version: 30 August 2020 (14)

Scientific Planning & Organising Committee	Paul Dijkstra (Chair), Siôn Glyn-Jones (Co-Chair), Mike Clarke (Co-Chair), Joanne Kemp (Co-Chair), Karim Khan, Trisha Greenhalgh, Jason Oke, Clare Ardern, Andrea Mosler, Louise Strickland, Sofie Nelis, Faten Smiley, Sue King, Tiya Muluzi, Matt Brock, Ruth Davis
Scientific Faculty	Rintje Agricola, Clare Ardern, Femi Ayeni, Sheree Bekker, Paul Dijkstra, Scott Fernquest, Bruce Forster, Mo Gimpel, Siôn Glyn-Jones, Trisha Greenhalgh, Josh Heerey, Per Hölmich, Julie Jacobsen, Ara Kassarjian, Joanne Kemp, Stephanie Kliethermes, Sean Mc Auliffe, Eugene McNally, Inger Mechlenburg, Andrea Mosler, Jason Oke, Antony Palmer, Marc Philippon, Lauren Pierpoint, Lindsey Plass, Amy Price, Dawn Richards, Pim van Klij, Rich Willy
Cost	**£75 for all 11 webinars**
CPD Accreditation	The Royal College of Surgeons of England (17.5 CPD credits) http://accreditation.rcseng.ac.uk/Home/InfoAccredited
Collaborating Institutions	A **collaborative event** between the University of Oxford, Aspetar, Qatar Orthopaedic and Sports Medicine Hospital, and La Trobe University. **Approved by** British Journal of Sports Medicine (BJSM) as "Quality International Education" **Endorsed by**: CIHR Institute of Musculoskeletal Health and Arthritis (CIHR) **Faculty from**: Aarhus University, University of Bath, Copenhagen University, Erasmus University Medical Centre, McMaster University, Philippon Steadman Clinic, Southampton Football Club, Stanford University, Qatar University

Overall Objectives

Following this webinar series participants will be able to:

1. Discuss terminology and definitions for primary cam morphology and femoroacetabular impingement (FAI) syndrome
2. Compare imaging outcome measures in research studies on how primary cam morphology develops, and in clinical practice when treating patients with FAI syndrome
3. List the risk factors for primary cam morphology in athletes, and discuss the definition, measurement and reporting of these
4. Describe potential benefits and harms of screening for primary cam morphology in athletes, including wise treatment strategies, overdiagnosis and overtreatment
5. Describe hip dysplasia and its role in FAI
6. Discuss primary cam morphology prognosis, including who is likely to develop FAI syndrome and hip osteoarthritis
7. Discuss wise clinical management of asymptomatic athletes with primary cam morphology, and those with FAI syndrome
8. Develop a research plan for prospective research on aetiology and prognosis of hip conditions in the young athlete
9. Develop a plan for Patient and Public Involvement (PPI) in hip research
10. Discuss the role of prospective individual participant data meta-analyses in research on primary cam morphology formation and prognosis

The Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series

WEBINAR 1: What is primary cam morphology? Taxonomy, terminology and definitions (1 hour)

Faculty: Clare Ardern, Siôn Glyn-Jones, Paul Dijkstra, Karim Khan

Objectives

Following this webinar participants will be able to:

1. Discuss the current inconsistent use of terminology and definitions for primary cam morphology
2. Describe 3 key elements of concept analysis method
3. Discuss why primary cam morphology in the athlete matters

How do we talk about and define primary cam morphology?		
8 min	Introduction	Paul Dijkstra, Clare Ardern & Karim Khan
12 min	Confusing terminology, definitions and outcome measures make it difficult to protect athletes' health	Clare Ardern
12 min	What is primary cam morphology? A concept analysis	Paul Dijkstra
12 min	Why is primary cam morphology important?	Siôn Glyn-Jones
16 min	Discussion: implications for clinical practice and research	All

WEBINAR 2: Imaging strategies for primary cam morphology and FAI syndrome (1.5 hours)

Faculty: Clare Ardern, Paul Dijkstra, Ara Kassarjian, Joanne Kemp, Andrea Mosler, Eugene McNally, Antony Palmer with Bruce Forster and Scott Fernquest Objectives Following this webinar participants will be able to: 1. Choose wisely the appropriate imaging for studies on how primary cam morphology develops, and for managing femororacetabular impingement syndrome in clinical practice 2. Describe the factors to consider when planning serial scanning for research in adolescent athletes		
How do we diagnose cam morphology and FAI syndrome?		
5 min	Introduction	Clare Ardern, Joanne Kemp & Paul Dijkstra
20 min	What are the imaging modalities and standards for primary cam morphology and its complications in research and clinical practice?	Eugene McNally
20 min	This is how I would do serial hip MRI-scans in research on how primary cam morphology develops	Ara Kassarjian
20 min	Should the imaging core outcomes for primary cam morphology **research** be different to that used when managing FAI syndrome in **clinical practice**?	Antony Palmer
10 min	A parent's perspective: "Will I allow my athlete-child to participate in a research project involving regular scanning?"	Andrea Mosler
15 min	Discussion: implications for primary cam morphology research	With Bruce Forster and Scott Fernquest

WEBINAR 3: What causes primary cam morphology and FAI syndrome? (1.5 hours)

Faculty: Clare Ardern, Joanne Kemp, Paul Dijkstra, Rintje Agricola, Siôn Glyn-Jones, Josh Heerey, Pim van Klij

Objectives

Following this session participants will be able to:

1. Describe the possible causes of primary cam morphology
2. List the risk factors for primary cam morphology
3. Discuss the causes of FAI syndrome

What causes primary cam morphology & femoroacetabular impingement (FAI) syndrome?		
5 min	Introduction	Clare Ardern, Joanne Kemp & Paul Dijkstra
20 min	Do we know yet what causes primary cam morphology in athletes? The role of the femoral capital growth plate	Siôn Glyn-Jones
15 min	Modelling load—what is it about load in sport that might cause primary cam morphology?	Rintje Agricola
15 min	What are the possible risk factors for primary cam morphology?	Pim van Klij
20 min	What causes FAI syndrome?	Josh Heerey
15 min	Panel discussion	All

WEBINAR 4: Screening and prevention of primary cam morphology and its consequences in athletes (1.5 hours)

Faculty: Clare Ardern, Joanne Kemp, Paul Dijkstra, Rintje Agricola, Andrea Mosler, Jason Oke Objectives Following this session participants will be able to 1. Implement wise decisions on screening for primary cam morphology in athletes 2. Explain overdiagnosis and overtreatment in the context of primary cam morphology 3. Summarise the current evidence for primary cam morphology prevention		
Should we screen for cam morphology to prevent FAI syndrome?		
5 min	Introduction	Clare Ardern, Joanne Kemp & Paul Dijkstra
20 min	Screening the young and older athlete for cam morphology – why, how, who and when?	Andrea Mosler
20 min	Is overdiagnosis and overtreatment a reasonable concern when screening young athletes for primary cam morphology?	Jason Oke
20 min	Is it possible (yet) to prevent primary cam morphology in young athletes?	Rintje Agricola
25 min	Panel discussion	All

WEBINAR 5: Hip dysplasia, cam morphology and femoroacetabular impingement (FAI) syndrome – is there a link? (1.5 hours)

Faculty: Julie Jacobsen, Inger Mechlenburg, Siôn Glyn-Jones, Clare Ardern, Joanne Kemp, Paul Dijkstra

Objectives

Following this session participants will be able to:

1. Define hip dysplasia
2. Explain the role for physiotherapy training in managing hip dysplasia
3. Describe the current evidence for dysplasia in femoroacetabular impingement and primary cam morphology
4. Develop a management plan for an athlete with hip dysplasia

Is hip dysplasia associated with primary cam morphology and FAI syndrome?		
5 min	Introduction	Clare Ardern, Joanne Kemp & Paul Dijkstra
20 min	What is hip dysplasia and is there a role for physiotherapy training in managing the condition?	Julie Jacobsen
20 min	Hip dysplasia, cam morphology and FAI syndrome – is there a link?	Inger Mechlenburg
20 min	How do we manage hip dysplasia in the athlete? When is surgery indicated and what types of surgery should we consider?	Siôn Glyn-Jones
25 min	Panel discussion	All

WEBINAR 6: What are the consequences of primary cam morphology? (1.5 hours)

Faculty: Andrea Mosler, Josh Heerey, Siôn Glyn-Jones, Rintje Agricola, Clare Ardern, Joanne Kemp, Paul Dijkstra

Objectives

Following this session participants will be able to:

1. Explain the possible consequences of primary cam morphology
2. Describe the relationship between primary cam morphology, hip pain, and early osteoarthritis
3. Discuss primary cam morphology in athletes as a risk factor for hip osteoarthritis
4. Design a patient information leaflet to help patients/athletes to understand their risk of developing osteoarthritis associated with different sizes of primary cam morphology

Consequences of primary cam morphology in the athlete		
5 min	Introduction	Clare Ardern, Joanne Kemp & Paul Dijkstra
15 min	Will athletes with primary cam morphology develop groin pain?	Andrea Mosler
15 min	What is the relationship between primary cam morphology, hip pain and early OA?	Josh Heerey
15 min	Who will develop osteoarthritis?	Siôn Glyn-Jones
15 min	Can we prevent athletes with large primary cam morphologies from developing osteoarthritis?	Rintje Agricola
25 min	Panel discussion	All

WEBINAR 7: Treatment and prognosis of primary cam morphology and femoroacetabular impingement in young athletes (2 hours)

Faculty: Joanne Kemp, Mo Gimpel, Per Hölmich, Siôn Glyn-Jones, Marc Philippon, Clare Ardern, Paul Dijkstra

Objectives

Following this session participants will be able to:

1. Construct an effective physiotherapy program for athletes with FAI syndrome and primary cam morphology
2. Explain the indications for surgery in athletes with FAI syndrome and primary cam morphology
3. Create a wise treatment plan for the athlete with asymptomatic primary cam morphology or FAI syndrome and primary cam morphology
4. Summarise the current evidence for physiotherapy vs hip arthroscopy when managing athletes with FAI syndrome

Treatment and Prognosis of primary cam morphology and FAI syndrome in athletes		
5 min	Introduction	Clare Ardern & Paul Dijkstra
20 min	What is best practice physiotherapy for the athlete with primary cam morphology and early FAI syndrome?	Joanne Kemp
20 min	Clinical pearls in managing early primary cam morphology – the Southampton Football Club experience	Mo Gimpel
20 min	What are the indications for surgery for the athlete with primary cam morphology and early FAI syndrome?	Per Hölmich
20 min	Physiotherapy vs hip arthroscopy for athletes with FAI syndrome – current evidence	Siôn Glyn-Jones
20 min	What are the best surgical options for the athlete with debilitating FAI syndrome?	Marc Philippon
15 min	Panel Discussion	All

WEBINAR 8: Young Athlete's Hip Research (YAHiR) Collaboration (2 hours)

Faculty: Sean Mc Auliffe, Paul Dijkstra, Femi Ayeni, Antony Palmer, Scott Fernquest, Sheree Bekker, Lauren Pierpoint, Clare Ardern

Objectives

Following this session participants will be able to:

1. Apply a framework for high quality clinical research
2. List the factors contributing to complexity in research
3. Discuss the importance of hip research collaboration

High quality research and collaboration		
10 min	Introduction	Clare Ardern & Paul Dijkstra
15 min	What is high quality research? Stakeholder perspectives on factors contributing to high quality research on how primary cam morphology develops in athletes - a qualitative interview study	Sean Mc Auliffe & Paul Dijkstra
15 min	Planning collaborative research on primary cam morphology formation – top tips.	Femi Ayeni
20 min	Lessons from the FAIM study	Antony Palmer & Scott Fernquest
15 min	Why is clinical research so complex?	Sheree Bekker
15 min	Why is it important to collaborate and share data in hip research?	Lauren Pierpoint
30 min	Panel Discussion	All

WEBINAR 9: Involving patients and the public in developing, performing, and reporting research and education on FAI syndrome and primary cam morphology (1.5 hours)

Faculty: Amy Price, Dawn Richards, Lindsey Plass, Rich Willy, Andrea Mosler, Clare Ardern, Joanne Kemp, Paul Dijkstra

Objectives

Following this session participants will be able to:

1. Describe patient and public involvement (PPI) in planning, performing, and reporting research
2. Develop a PPI plan for research on primary cam morphology and FAI syndrome
3. Summarise a parent's perspective on the risk of their child developing primary cam morphology in adolescent sport
4. Consider the importance of the patient's voice when discussing FAI syndrome treatment options

Patient and public involvement in research and education		
5 min	Introduction	Clare Ardern, Jo Kemp & Paul Dijkstra
20 min	Patient and public involvement (PPI) in research – what is it and why is this so important? Essential components of a plan for PPI in research	Amy Price and Dawn Richards
15 min	Thriving with FAI syndrome	Lindsey Plass
15 min	Involving patients in developing patient reported outcome measures in hip research/How can we make research more inclusive?	Rich Willy
5 min	A parent's perspective: my child is a young competitive football player at risk of developing primary cam morphology - should I worry?	Andrea Mosler
30 min	Research and Collaboration Panel Discussion	All with Dawn Richards

WEBINAR 10: Sharing results of the YAHiR Collaboration's Delphi exercise on primary cam morphology terminology, definitions, and imaging outcome measures (1.5 hours)

Faculty: Clare Ardern, Paul Dijkstra, Eugene McNally, Siôn Glyn-Jones, Joanne Kemp Objectives Following this session participants will be able to: 1. Apply a standard taxonomy, terminology, and definition for primary cam morphology and femoroacetabular syndrome 2. Discuss the consensus on imaging outcomes for studies on how primary cam morphology develops 3. Consider the benefits to stakeholders of applying consistent terminology and definitions for primary cam morphology		
10 min	Introduction – Delphi study on primary cam morphology	Joanne Kemp, Clare Ardern and Paul Dijkstra
15 min	Consensus definition for primary cam morphology – results of the Delphi study	Paul Dijkstra
15 min	Consensus taxonomy and terminology for primary cam morphology and femoroacetabular impingement syndrome	Clare Ardern
20 min	Consensus on imaging outcomes for studies on how primary cam morphology develops	Eugene McNally
30 min	Research and Collaboration Panel Discussion	All with Siôn Glyn-Jones

WEBINAR 11: Young Athlete's Hip Research Collaboration: Prioritising rigorous, inclusive, and evidence-based research on conditions affecting the young person's hip (focussing on primary cam morphology and its consequences in athletes) (2.5 hours)

Faculty: Mike Clarke, Andrea Mosler, Stephanie Kliethermes, Trisha Greenhalgh, Karim Khan, Siôn Glyn-Jones, Clare Ardern, Joanne Kemp, Paul Dijkstra Objectives Following this session participants will be able to: 1. Summarise the key elements of study design to investigate how primary cam morphology develops 2. Review measures to avoid selection bias in research on how primary cam morphology develops 3. Discuss examples of high-quality research on how primary cam morphology develops (focussing on how to define, measure and report risk factors) 4. Discuss some of the important questions only qualitative research can answer		
10 min	Introduction	Clare Ardern, Joanne Kemp and Paul Dijkstra
15 min	What are the best populations to investigate how primary cam morphology develops? (Including top 5 tips to avoid selection bias)	Andrea Mosler
15 min	What is an Individual Participant Data (IPD) Meta-analysis?	Mike Clarke
20 min	Cohort study planning, conducting and data sharing for future IPD meta-analyses – is it possible?	Stephanie Kliethermes
25 min	We should go beyond numbers and meta-analyses; there are important questions that only qualitative research can answer	Trisha Greenhalgh
5 min	Short break	
20 min	Summary of the Delphi exercise to agree on a prioritised research agenda for conditions affecting the young person's hip	Paul Dijkstra
40 min	Research and Collaboration Panel Discussion	All with Karim Khan and Siôn Glyn-Jones

Prioritised Research: Primary Cam Morphology (and FAI syndrome) development, treatment and prognosis; other hip conditions affecting the young person's hip

We will use DelphiManager - a web based system designed to facilitate the building and management of Delphi surveys. The Delphi survey will have 5 domains: (1) definitions (2) terminology (3) taxonomy (4) imaging outcomes (5) **research priorities.**

The aim of this document is to provide more context and information to the 38 "future research" statements (and DelphiManager "help text"). You will be asked to rate these studies (or groups of studies) as "not important", "important but not critical" or "critical" using a 9-point Likert scale using the DelphiManager software. It will take approximately 1 hour to review this document and another 30-60 minutes to complete the research priorities domain of the Delphi study on primary cam morphology (in DelphiManager). "Help text" will provide Delphi Study panellists with additional information relevant to the statement.

Relevant sections from the Warwick Agreement (Griffin et al, 2016) and the 4 consensus papers by the International Hip-related Pain Research Network (IHiPRN) are provided for further context (Reiman et al; Mosler et al; Kemp et al; Impellizzeri et al)

1. The Warwick Agreement on femoroacetabular impingement syndrome (FAI syndrome): an international consensus statement

Griffin et al (2016)

http://bjsm.bmj.com/lookup/doi/10.1136/bjsports-2016-096743

What future research needs to be conducted?

The delegates at Sports Hip 2016 proposed 118 research questions about the diagnosis and management of FAI syndrome. During the consensus exercise, we identified 23 substantially different questions, which were ranked in order of priority by the panel (see online supplementary file B). The panel grouped the questions into four categories: aetiology, diagnosis, prognosis and effect of treatment. Regarding aetiology, there was considerable interest in how cam and pincer morphologies develop, whether sporting activity in childhood may influence this, and why some patients develop symptoms and others do not. For diagnosis, we agreed that diagnostic criteria are imprecise and need to be improved, and that the utility of those we have is unclear. We would benefit considerably from better information on the long-term natural history of FAI syndrome, though the panel recognised that significant resources are needed to perform the necessary long-term prospective studies. Finally, there is an urgent need to compare the effectiveness of conservative, rehabilitation and surgical treatment strategies. Fortunately, several such studies are in progress (see table 2), and results will begin to appear in the next few years.

SUPPLEMENTARY FILE B

Consensus by Question

	MEAN	RANK
In those with FAI morphology, can we predict who will become symptomatic?	5.6	1
Is surgery or conservative management more effective for improving short- and long-term outcomes?	6.5	2
What is the outcome of conservative treatment?	8.8	3
Is FAI surgery more effective than sham surgery?	9.6	4
How do we define FAI syndrome?	9.7	5
What is the natural history of FAI morphology?	9.9	6
Which patients respond best to conservative management?	10.3	7
What is the most effective conservative management program?	10.5	8
Do changes to training in adolescent athletes decrease Cam formation?	10.7	9
What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms?	10.9	10
Can rehabilitation prevent FAI pain and if so, how?	11.0	11
What are the diagnostic criteria for Cam and Pincer morphology?	11.3	12
What is the source of pain in FAI?	11.8	13
Does operating on asymptomatic hips lead to long-term benefits in terms of reducing OA?	13.0	14
What is the incidence and prevalence of FAI syndrome?	13.0	15
What are the best outcome measures to show change following treatment?	13.1	16
What is the role of structural features in FAI syndrome eg. Femoral anteversion, capsular tightness?	13.3	17
What is the optimal post operative rehabilitation program?	14.7	18
What is the optimal method to treat labral pathology?	15.3	19
Which factors affect surgical outcomes eg. pre-and post-op alpha angle, fem retroversion, age, sex, OA?	15.6	20
Does pre-operative rehabilitation improve post-operative outcomes?	16.4	21
What are the return to sport criteria following FAI surgery?	17.2	22
Does capsule closure lead to improved patient outcomes?	17.8	23

Question Themes

- Effect of treatment
- Aetiology
- Diagnosis
- Prognosis

2

Griffin DR, et al. Br J Sports Med 2016;50:1169-1176.

2. **Consensus recommendations on the classification, definition and diagnostic criteria of hip-related pain in young and middle-aged active adults from the International Hip-related Pain Research Network, Zurich 2018**

Reiman et al (2019)

https://bjsm.bmj.com/content/early/2020/01/20/bjsports-2019-101453

CR1: Hip-related pain may be further categorised after imaging into: (1) femoroacetabularimpingement (FAI) syndrome, (2) acetabular dysplasia and/or hip instability and (3) other conditions causing hip-related pain. This last category could include soft-tissue conditions without specific bony morphology.

R1: Measures of bony morphology should be reported in detail. We recommend that bony morphology outcome measures (such as the alpha angle or centre-edge angle) should be clearly defined, measured and reported (eg, detailed methodological description, blinding, per hip/per person reporting with statistical correction as appropriate, reliability measures)

R2 Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.)

3. **Standardised measurement of physical capacity in young and middle-aged active adults with hip-related pain: recommendations from the first International Hip-related Pain Research Network (IHiPRN) meeting, Zurich, 2018**

Mosler et al (2019)

https://bjsm.bmj.com/content/early/2019/12/24/bjsports-2019-101457

CLINICAL MEASURES

Research recommendation 1: Further research should investigate, report and improve the measurement properties of tests of range of motion, muscle strength and functional performance.

Discussion among International Hip-related Pain Research Network (IHiPRN) participants raised multiple areas of uncertainty regarding measurement of hip range of motion. These areas included: the use of active versus passive movements, examination of only pain-free range, optimal stabilisation methods, and whether mechanical devices, such as the hip internal rotation examination chair, (50) are required to improve accuracy and reliability. The IHiPRN participants also discussed whether side-to- side comparisons in symptomatic individuals were acceptable for research purposes or comparisons be limited *to asymptomatic individuals, as the clinical interpretation of differences between symptomatic and asymptomatic limbs is currently unclear. High-quality studies that follow the minimal reporting standards for clinical research are required to clarify these areas of uncertainty.(7) Specifically, clear diagnostic inclusion criteria for the participants of the study should be reported, and a detailed description provided of all measurement methods (including clinometric properties) and instruments used in the study.*

The literature review provided clearer guidance for standardised methods of measurement of hip muscle strength in people with hip-related

pain.(19 20) However, reporting of intertester reliability and measurement error is currently lacking. Therefore, high-quality studies are needed to examine and report the clinometric properties of measurement methods for hip muscle strength and investigate the validity of strength testing in symptomatic populations.

There was considerable discussion of methods measuring functional performance to be recommended for clinical and research purposes. Since people with hip-related pain demonstrate reduced squat depth and have impaired performance on single-leg balance tasks and the SEBT, these tests are recommended to be included in clinical research in this area. There is limited and conflicting evidence that hopping performance is impaired in this patient population, and further high-quality studies are required to resolve this uncertainty. (22) Furthermore, the IHiPRN participants also discussed that the methods of assessment of functional performance should be adapted to the population of interest. For example, the examination of running technique may be important for a football player, but less so for a swimmer.

BIOMECHANICS AND MUSCLE FUNCTION

Research recommendation 2: Future research is needed to investigate the relationship among movement-related parameters (biomechanics, muscle function), symptoms, function, quality of life, and imaging and intra-articular findings. Evidence suggests that hip biomechanics are altered in multiple planes in individuals with hip-related pain when compared with asymptomatic controls. (24 51) Individuals with FAI syndrome walk with a lower peak hip extension angle, peak internal rotation angle, and external rotation joint torque, and squat to a lesser depth despite no difference in peak hip flexion angle compared with individuals without hip-related pain. (24) Individuals with developmental hip dysplasia walk with a lower peak hip extension angle than individuals without pain. (51) However, the relationship between these movement-related parameters and other measures of hip-related pain (symptoms, function, quality of life, imaging and intra-articular findings) is unknown. The evidence is limited, and conflicting, regarding differences in muscle activity between young and middle-aged active adults with hip-related pain and individuals without pain (online supplementary appendix). The evidence is also limited, and inconsistent, regarding differences in muscle size and adiposity of individual muscles in people with hip-related pain compared with those without (online supplementary appendix). To understand how movement-related parameters, including biomechanics and muscle function, may contribute to or result from symptoms, function, quality of life, imaging and intra-articular findings, future research should include measures of each of these parameters to identify the inter-relationships. The method of obtaining and grading imaging and intra-articular findings should be reported in future research on hip-related pain (Reiman et al, 2019).

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Research recommendation 3: Established minimum reporting standards for movement-related parameters (eg, biomechanics, muscle function) should be followed, or determined as appropriate.

The optimal methods for biomechanical and muscle function measurements are currently not established for individuals with hip-related pain, but this aim was beyond the scope of the current consensus meeting. We instead focused on the reporting of these measurements in the literature and found that the lack of consistent reporting limited the ability to critically appraise and reproduce previous studies, which also impeded their inclusion in meta-analyses (online supplementary appendix). Currently, there are no reporting standards for biomechanical measures, although there are recommendations for methods of data collection. (52) Despite established reporting standards for electromyographic data, (53–55) reporting across studies remains poor (online supplementary appendix). For measurement of muscle size and adiposity, there are no reporting standards and the methods of measurement are inconsistent (online supplementary appendix). Thus, it is important that reporting standards should be followed (when available) and should be developed (when not available).

MEASURES OF PHYSICAL ACTIVITY AND RTS

Research recommendation 4: The patient's goals, expectations, physical activity and occupational requirements should be measured using quantitative and qualitative methods.

As discussed previously (clinical recommendation 5), quantifying patient expectations, and their fulfilment, regarding RTS, physical activity and occupational requirements is important to accurately interpret the efficacy of management of hip-related pain. It is equally important that these measures, in addition to patient satisfaction, be included in studies of interventions for hip-related pain. The IHiPRN participants also recommended in clinical recommendation 4 that physical activity be quantified using objective methods of measurement in people with hip-related pain. This recommendation is equally relevant for hip-related pain research as it is for clinical practice.

Research recommendation 5: The Return to Sport (RTS) continuum recommended by the 2016 RTS consensus paper should be used in future research.

Definitions used in studies examining RTS following management of hip-related pain often consider RTS as a dichotomous variable (yes/no) and fail to distinguish between the differing levels of RTS or consider whether the athlete has successfully returned to their preinjury sporting performance. (56) Two recent studies have applied this graded definition, providing a more nuanced picture of RTS expectations for patients following hip arthroscopy. (33 35) The 2016 consensus statement on RTS introduced the concept of RTS being considered a continuum through which an athlete progresses during the rehabilitation process. (34)

Three key elements of the RTS continuum were operationally defined as: 1. Return to participation: patient is able to participate in physical activity, even their preferred sport, but perhaps at a lower level, reduced workload or lower sporting performance. 2. RTS: the patient is able to return to their preferred sport but is not performing at their desired level. 3. Return to performance: the patient has returned to their preferred sport and is at or above their preinjury *level with respect to performance and/or physical ability. These principles of the RTS continuum are equally applicable for a patient with hip-related pain returning to any form of physical activity (including sport and occupational demands). By quantifying the patient's outcomes with respect to RTS, physical activity and/or occupational demands according to these three defined elements, the clinician and researcher can better determine whether management was successful at meeting the patient's expectations and goals. Accurate and detailed reporting of RTS using the continuum outlined in the 2016 RTS consensus paper (34) is therefore recommended for all future hip-related pain research. Specifically, reporting should include information regarding the patient's expectations and goals with respect to returning to physical activity (including sport and occupational demands), and their reasons for either returning to that physical activity or not.*

Research recommendation 6: Future research is required to quantify, and report return to physical activity (including sport and occupation) following management of hip-related pain. Six recent systematic reviews have examined RTS levels following surgical management of hip-related pain. The synthesis of these pooled findings determined that between 86% and 93% of athletes return to sport participation. (49 56–60) However, the actual level of RTS of these athletes is mostly unreported, with only one-third of included studies clearly distinguishing RTS (any level) from RTS at preinjury level. (56) Furthermore, there is limited to moderate evidence that one in four athletes did not return to their previous level of sport participation after surgery for FAI syndrome. (56) Data from recent cross-sectional surveys of athletes after hip arthroscopy suggest that the percentage of athletes returning to their preinjury level of sport with optimal performance could actually be as low as 17%. (33 35) In general, poor outcome reporting on athletic performance after surgery makes it difficult to determine the actual sporting performance these athletes return to. (56) Additionally, RTS following non-surgical management of hip-related pain has only been reported in one study of eight football players, all of whom returned to playing at the same competitive level. (61) The IHiPRN participants recommended that the return to physical activity (including sport and occupational demands) following hip-related pain management be quantified to improve the quality of reporting, and better understand patient outcomes.

Research recommendation 7: Research is recommended to determine the best criteria for rehabilitation progression and RTS following management of hip-related pain. Several studies have reported RTS criteria following hip arthroscopy (online supplementary appendix). (40–42 44–46 48) However, there have been no reports of RTS criteria following non-surgical management of hip-related pain. There is also evidence that clinicians vary considerably in how they weight the importance of various outcome measures that may influence the RTS decision. (62) Readiness to RTS should take into account the individual patient and the physical and psychological demands of the sport. (34) Psychological readiness has rarely been considered in published data on RTS following hip surgery. Clearly, a significant gap exists in the literature with respect to standardised RTS criteria following management of hip-related pain, and this was identified as a future research priority by the IHiPRN participants.

4. Patient-reported outcome measures for hip-related pain: a review of the available evidence and a consensus statement from the International Hip-related Pain Research Network, Zurich 2018

Impellizzeri et al (2020)

https://bjsm.bmj.com/content/early/2020/02/17/bjsports-2019-101456

Recommendation 1: The Hip and Groin Outcome Score (HAGOS) and International Hip Outcome Tool (iHOT) instruments (long and reduced versions) are the most appropriate Patient-reported outcome measures (PROMs) to use in young and middle-aged active adults with hip-related pain.

Recommendation 2: HAGOS and iHOT were developed mainly in surgical context. More research is needed into their utility in a non-surgical treatment context.

The HAGOS and iHOT have only been investigated in a surgical context (patients assessed before and after surgical interventions) or in mixed populations (undergoing both surgical and non-surgical treatments) (see details on population and context in online supplementary appendix 1). The magnitude of the effects following surgical interventions is not necessarily comparable with non-surgical treatment, which can impact the acceptability of measurement error and instrument responsiveness. Since the acceptability of the reproducibility level (instrument noise) depends on the context and the magnitude of changes determined by the interventions (signal), we recommended the HAGOS and iHOT-33 primarily as outcome measures in a surgical setting (which is the main context in which they were investigated), while in non-surgical treatment the aforementioned limitations should be taken into consideration.

Recommendation 3: EQ-5D and SF-36 are generic quality of life measures that can supplement the hip-related measures, HAGOS and iHOT.

Recommendation 4: Future research should include further analysis of content and structural validity, and the relationship between individual measurement error and the minimal clinically important change for the recommended PROMs.

The examination of study quality and measurement properties highlighted inadequate structural validity, meaning that the structural validity of PROMs could not be determined despite us recommending their use. The structure of HAGOS (55) was developed using the HOOS as a template,56 and not with a confirmatory analysis, but the HOOS structure was also not examined, but based on the structure of the Knee Injury and Osteoarthritis Outcome Score (KOOS). (57) Since the KOOS structure was not examined, an SR on the KOOS psychometric properties scored the structural validity as 'poor' (according to the COSMIN). (58) Similarly, the structure of the iHOT was not properly examined or confirmed. Lack of structural validity examination is an important weakness, especially for instruments providing a single score such as the iHOT, as this limits interpretation of the total score. The operational definitions and theoretical framework of the construct reflected by the subscales were also not specified for the HAGOS and iHOT. These limitations are reflected in the content validity score. Despite being rated as sufficient by the reviewers, the content validity was mostly deemed to be inconsistent or indeterminate due to the lack of methodological information. Therefore, future studies should examine the structural validity, clarify the constructs measured and analyse the *content validity of the HAGOS and iHOT. Finally, the measurement error was higher than the minimal clinically important change, thus questioning the use of these PROMs at the individual level (eg, in clinical practice), particularly for the iHOT. While the measurement error may be sufficient to detect change over time at a group level (eg, research studies), further studies are needed to examine the minimal clinical change and its relationship with measurement error at the individual level, especially for the iHOT.*

5. **Physiotherapist-led treatment for young to middle-aged active adults with hip-related pain: consensus recommendations from the International Hip-related Pain Research Network, Zurich 2018**

Kemp et al (2019)

http://bjsm.bmj.com/lookup/doi/10.1136/bjsports-2019-101458

R1. Reporting of exercise programmes. Exercise descriptors such as load magnitude, number of repetitions and sets, duration of whole programme, duration of contractile element of exercise, duration of one repetition, time under tension, rest between repetitions, range of motion through which the exercise is performed and rest between exercise sessions should be considered and reported.

The level of evidence supporting this statement was moderate, where in the systematic review, one high quality RCT,5 one moderate quality RCT4 and two high quality pilot RCTs (12 14) did not report these descriptors adequately. The median (IQR) score was 9 (0) out of a possible 9 points, indicating almost no variability within the opinions of expert group. The primary goal of studies examining physiotherapist-led exercise therapies for hip-related pain is to develop and then test the most effective exercises for the condition. When developing effective and tailored treatment programmes, the mechanistic effect of particular elements of the exercises on the target muscles and surrounding tissues is considered. Toigo and Boutellier (33) described principles to be considered in the development and reporting of exercise programmes. These included load magnitude, number of repetitions and sets, duration of whole programme, duration of contractile element of exercise (ie, how long the concentric, eccentric or isometric component of the repetition should take), duration of one repetition, time under tension (ie, the overall time the muscle is under tension during the set), rest duration between repetitions, ROM through which the exercise is performed and rest duration between exercise sessions. (24 33) When reporting (and developing) exercise-based interventions, we also recommended using the Consensus on Exercise Reporting Template (CERT) (34) and Template for Intervention Description and Replication (TIDieR) checklist. (35) Improved reporting of programmes is critical to move forward in the quality of physiotherapist-led treatments provided to patients with hip-related pain.

R2. Development of high-quality exercise programmes. Research should investigate the optimal frequency, intensity, time, type, volume and progression of exercise therapy

The level of evidence supporting this statement was moderate. One high quality Randomised Controlled Trial (RCT) (5) and one moderate quality RCT (4) did not describe the physiotherapist-led exercise programme adequately. The median (IQR) score was 9 (2) out of a possible 9 points, indicating some variability *within the opinions of expert group. Exercise-based programmes used in clinical research should include patient input in their design and be appropriately constructed to gain maximal improvements in outcomes. In strength-based treatments, exercise programme require adequate load to gain a strength effect. The frequency, intensity, time, type, volume and progression of exercise therapy may need to be manipulated to gain the desired effect. The expert group recommended that guidelines, such as those developed by the American College of Sports Medicine (ACSM), should be used with the development of strength-based treatments. (17) The group also indicated that fidelity and adherence of exercise programmes were often not suitable to gain the desired effect. (36) Studies evaluating the effectiveness of physiotherapist-led exercise programmes should ensure that treatments are developed and reported using these principles.*

R3. Research should examine the effect of patient education in people with hip-related pain

The level of evidence supporting this statement was insufficient and based solely on the opinion of the expert group and the median (IQR) score was 8 (2) out of a possible 9 points, indicating some variability within the opinions of the expert group. To our knowledge, no studies have investigated patient education in people with hip-related pain. We recommended that future studies assess the specific effect of patient education for hip-related pain including content, modes of delivery and the use of innovative technologies to enhance education benefits.

R4. Research should investigate the effect of other treatments used in people with hip-related pain

There was no evidence to our knowledge supporting this statement and so was based solely on the opinion of the expert group, with the median (IQR) score was 8 (1) out of a possible 9 points, indicating small variability within the opinions of the expert group. Hip joint intra-articular injections, (37) analgesic and anti-inflammatory medications, manual therapy adjunctive techniques such as taping, bracing and orthotics might be used by clinicians; however, their rate of use and clinical effectiveness is unknown. Although the group acknowledged that clinical treatment of hip-related pain is generally multimodal, these adjunct therapies should not replace exercise-based treatment. Further research is required to determine the frequency of use and the effectiveness of adjunct therapies used for hip-related pain.

R5. Research should examine the impact of comorbidities and social determinants on treatment effectiveness in people with hip-related pain.

The level of evidence supporting this statement was insufficient and based solely on the opinion of the expert group; however, the median (IQR) score was 9 (0) out of a possible 9 points, indicating almost no variability within the opinions of the expert group. The expert group indicated that comorbidities and social determinants (eg, socioeconomic status, education level) can influence the patient's prognosis as well as the effectiveness of treatment. Comorbidities including chronic pain, insomnia and anxiety increased following hip arthroscopy surgery, although causation was not implied. (38) To date, no studies examining physiotherapist- led treatment for hip-related pain have determined whether comorbidities influence the outcome of treatment or whether they change with treatment. These factors should be examined in future studies exploring physiotherapist-led treatment for hip-related pain.

SUPPLEMENTARY FILE 7: Primary Cam Morphology Delphi – Round 1 and 2 (Domain 5 - Research priorities)

Table of contents

Definition of consensus from protocol paper

Table 4 Definition of consensus

Category	Definition	Action
Consensus in (high agreement)	Statement scored as critical (7 to 9) by ≥70% of panel members *and* not important (1 to 3) by <15% of panel members	Item retained for the next survey round/consensus meeting
Consensus out (low agreement)	Scored as not important (1 to 3) by ≥70% of panel members *and* critical (7 to 9) by <15% of panel members	Item discarded after round 2 (to be ratified at the face-to-face consensus meeting)
No consensus	Neither criteria above are met	Item retained for the next survey round/consensus meeting
Unable to score or provide feedback	Panel member unable to score the statement or provide a score and qualitative feedback	Provide the opportunity for panel members to indicate that they are unable to score the statement and/or to provide feedback (including statement rewording). Steering committee will consider retaining a reworded item for the next survey round.

General Comments after Round 1

- I have no special training in this area (eg medical; physiotherapy; radiology etc) and therefore feel somewhat unqualified to answer some of these questions. I have just done my best as a lay person; using the knowledge from my career as a former elite athlete and now coach; and from webinars 1 and 2.
- Thanks for doing such a thorough job of curating the vast number of research questions that could be answered. I hadn't dreamed that there might be so many.
- Fantastic and important work.----I did not answer some of the technical radiography questions as I feel even with the help text it would be biased of me to answer them without a great depth of knowledge on the techniques involved.
- VERY comprehensive; congratulations!; MB
- I don't think the categorization of the 1-9 as critical; important; but not critical;... were appropriate in terms of agreeing to statements; only for priorities.
- Well designed; good luck.
- Great work!!!!----Really amazing effort
- I think it is really important to come up with a consensus on the terminology and how the health care providers tell patients they have this condition. It is also really important to come up with a consensus on how radiologists should document the findings in the MRI so that this does not cause unnecessary catastrophizing--like it did in my own personal hip journey.----For interventions; it will be helpful to better identify subgroups that will benefit from mobility vs stabilization vs combined interventions to help make PT treatments more targeted. ----It will be helpful to know what the recommendations are for younger people involved in high level sports who are at risk of developing FAI syndrome later in life. Can we do a certain screen once the

athlete stops playing or retires---and what information from this screen would indicate someone is at risk for developing symptomatic FAIs?----

- Instructive questioning. Thanks
- many questions very close to each other; difficult to distinguish...
- I noted a research priority regarding physiotherapy vs surgical outcomes - it would be interesting to look at physical activity interventions and/or non-surgical treatments (eg injections) alongside these;
- Overall it is a very good first round. I found it somewhat difficult to answer some research section statements; specifically when using the term 'studies'; which is quite generic.
- Great work; looking forward to the next steps!----Greetings

General comments after Round 2 (additional to Round 1)

- Fantastic work.
- Excellent presentation of round1 results among stakeholders
- Comments:
    - **Question 1**: I think the statement should remove the word abnormal. It seems that specific types of loading influence the development of a cam morphology. As we do not know details of which loads are key in this regard; the use of normal response to load may not be accurate. I would agree with the statement: “Primary cam morphology develops during skeletal maturation as a physiological response to load” or “Primary cam morphology develops during skeletal maturation as a physiological response to specific types of load”
    - **Question 2**: Same as question 1. I think the statement should remove the word “abnormal”. It seems that specific types of loading influence the development of a cam morphology. As we do not know details of which loads are key in this regard; the use of normal response to load may not be accurate. --as the second part of the question is covered in question one; the statement could be shortened to: “Primary cam morphology is not caused by previous disease; injury or an acute event”. I would agree with this.
    - **Question 3:** I think the word “existing” should be changed to “pre-existing”. I do not think a healed proximal femoral fracture; as in the example; classify as an existing disease; rather a disease existing prior to the cam development therefore “pre-existing” or “prior” or “preceding”. (disclaimer: English is not my first language).
    - **Question 7**: Could the statement possibly be modified to add “known” before history? If there is no history of disease it cannot be proven otherwise, correct? so the statement would be: “Cam morphology that develops in young and active individuals without any symptoms (e.g.; hip-related pain; stiffness) or known history of previous/existing hip disease; is primary cam morphology until proven otherwise.
    - **Questions 12**: I suggest changing “possibly” to “probably” before “due to high-load sporting activity and other unconfirmed risk factors”
    - **Questions 13-31**: Regarding preferred terms; there is probably a difference between preferences for communication between medical professionals (who may need specific terminology) and between

patients (who may benefit from more general terms to understand it better - e.g. “non-rounded” etc). This should be investigated.

  - **Question 40**: I think the imaging should be repeated with even shorter intervals between (around 12 months).

- Thanks for the invite to participate!
- CONGRATS!----Important study!!
- The initial set of questions were not clear to me. None of the statements seemed to describe the terminology adequately; apart from the last one; which is why I initially scored them so low. However; on reviewing the other participants' answers; I realized I misunderstood. My understanding now is that each of these statements are important (in as far as they contain an element of the final definition; which is why I scored them much higher); even if they do not contain the full definition. The only statement to my mind which is less important is that it develops in both hips - whilst this is often the case; it is not always true.----Happy to explain more in person if this is not clear!
- Interesting and well conducted
- On this round I could not found the comment button by the statements.
- Eek. I was trying to enter reasons for the others and hit "enter" instead of tabbing to the next one. --The only big change was from 4 to 7... which now I can't really remember why. Most other changes were 1 point; and where more likely my "regression toward a mean" than anything else.
- Great process! Thanks again for including me.
- I just wonder how the patients can interpret so many technical terms. Regarding the studies; I also considered feasibility and whether there is strong conceptual background knowledge on which to build a reasonable hypothesis. So it is not just a rate on the importance.
- Thank you. It was an interesting exercise to measure my votes against that of colleagues and other disciplines.
- Great work; looking forward to the next round!

Additional Statements proposed by panel

1. Determine which type of study (Prospective cohort; RCT) will best answer a specific research question (as it is listed currently it is very difficult to get you head around the options listed on p.5) regarding aetiology; diagnosis; prognosis and management

RESPONSE

I don't think we need to change any research statement. This can be part of the discussion(s) following the Delphi online rounds

2. (unsure of how to word this but....) a research priority related to how diagnosis; rehab; return to sport impacted the mental health of young athletes (and others)

RESPONSE

Studies exploring how diagnosis, rehabilitation and return to sport potentially impact the mental health of young athletes (and others) – consider this as part of the online stakeholder group discussions

3. In athletes with cam morphology; which movement patterns (prognostic screening) contribute to or reduce the incidence of FAIS?

RESPONSE

Studies to investigate which movement patterns (prognostic screening) contribute to or reduce the incidence of FAI syndrome in athletes with primary cam morphology – consider this as part of the online stakeholder group discussions (part of studies on primary cam morphology prognosis studies)

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Summary: consensus and tension points / areas of dissent

- Consensus on 35 of 47 statements in Domains 1 to 4
- Consensus to further prioritise (using the ENHR method) 18 of 38 Research Statements (Domain 5)

Domain	Statements and expert panel opinions	Areas of tension and dissent	Proposed Action & topics for discussion
Definitions	Consensus on 9/12 statements No consensus on 3/12 statements: statements 6,7,9	"unknown origin" Primary cam morphology often occurs in **male athletes in both hips** "I do not agree that the concept of Primary and secondary CAM is commonly agreed and established"	Statement 6: Primary cam morphology **ALSO** includes cam morphology of unknown origin Higher prevalence in males due to lack of research in female cohorts
Terminology	Consensus on 16/19 statements No consensus on 3/19 statements: statements 23,24,25	No consensus: "**Cam-type impingement** is the preferred term to use for hip-related pain due to a bony bump at any location around the femoral head-neck junction" "**Cam femoroacetabular impingement (FAI)** is the preferred term to use for hip-related pain due to a bony bump at any location around the femoral head-neck junction" "**Cam-type femoroacetabular impingement (FAI)** is the preferred term to use for hip-related pain due to a bony bump at any location around the femoral head-neck junction"	Consensus to use: "Cam morphology is the preferred term to use for a bone/cartilage bump at any location around the femoral head-neck junction" "Femoroacetabular impingement (FAI) Syndrome with cam morphology is the preferred term to use for hip-related pain due to a bony bump at any location around the femoral head-neck junction" Consensus to avoid: "lesion"; "deformity"; "abnormality"; "pistol grip deformity"
Taxonomy	Consensus on 3/4 statements	**Statement 34:** We should distinguish between primary and secondary cam morphology in **patients** with femoroacetabular impingement syndrome	Discuss: differences in opinion on importance /

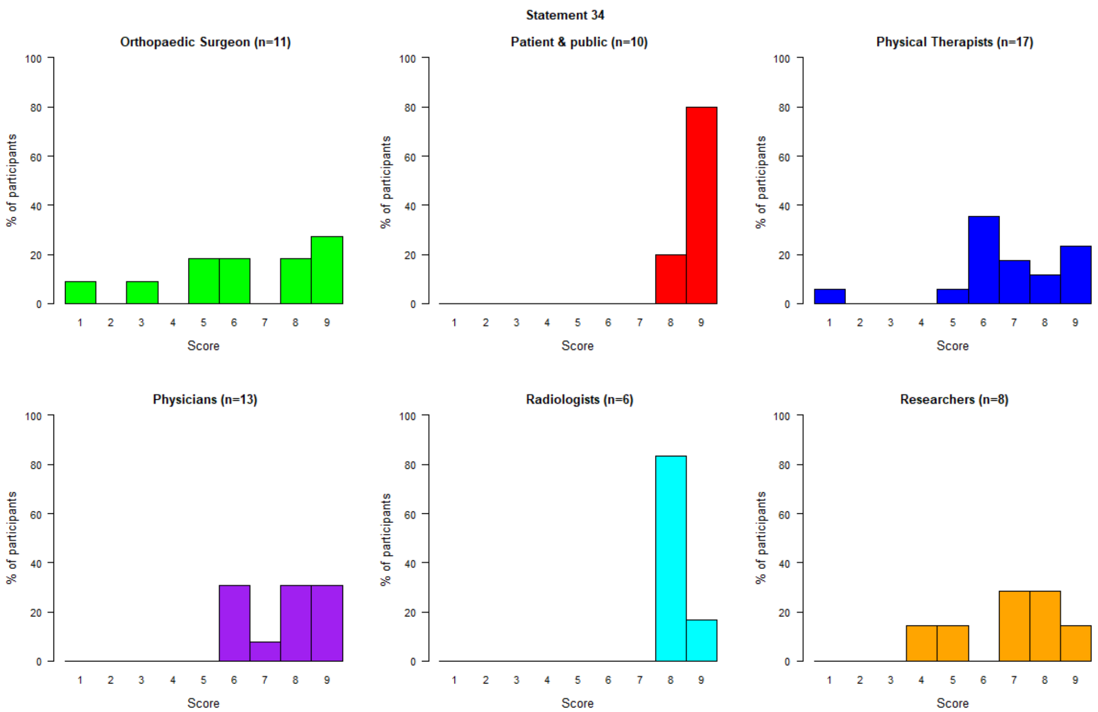
	No consensus on 1 statement: statement 34	Very close to achieving consensus: Percentage panelists that scored the statement as critical: 66.1% (R1) and 68.8% (R2) Percentage panelists that scored the statement as not important: 6.5% (R1) and 4.7% (R2)	difficulty to distinguish between primary and secondary cam morphology in clinical practice when treating patients with femoroacetabular impingement syndrome Consider Round 3 for statement 34
Imaging Outcomes	Consensus on 7/12 statements No consensus on 5/12 statements: statements 40,43, 44,45,46	No consensus (consider Round 3 for 3 statements in bold approaching consensus): Statement 40: "The magnetic resonance (MR) imaging for prospective research on how primary cam morphology develops should be repeated every 18 to 24 months" **Statement 43**: "For research on how primary cam morphology develops it is important to quantify the epiphyseal morphology magnetic resonance (MR) imaging outcome measure using epiphyseal extension" Statement 44: "For research on how primary cam morphology develops the epiphyseal morphology magnetic resonance (MR) imaging outcome measure should also be quantified using epiphyseal tilt" **Statement 45**: "The main imaging modality for longitudinal primary cam morphology prognosis research should be anteroposterior (AP) pelvis and Dunn 45° view radiographs repeated at least every 5 years" **Statement 46**: "The radiographic imaging outcome measure for research on primary cam morphology prognosis should be the alpha angle as a continuous variable reported for anteroposterior (AP) pelvis and Dunn 45° view radiographs."	"I just wonder how the patients can interpret so many technical terms" Consider Round 3 for statements 43, 45,46
Research Priorities	Consensus on 18/38 research statements to prioritise using the ENHR method.	**Statement 74:** Qualitative studies to investigate the perspectives/preferences/attitudes/concerns/experiences of femoroacetabular impingement syndrome (including FAI syndrome and primary cam morphology) stakeholders (e.g., but not limited to: athletes/parents/coaches/patients with hip disease/clinicians/researchers) – see comment: "In principle I am in favour of including these kinds of stakeholders. But in reality some have whacky views (like	Discuss comment Consider Round 3 for statement 76

		anti-vaxxers) which may not helpfully inform clinical progress." Approaching consensus - **Statement 76:** Studies to investigate the performance of the diagnostic criteria for hip disease presenting with hip-related pain in young and active adults	

Statements to consider for Round 3 (5 statements are close to ALL PANELIST or RADIOLOGIST STAKEHOLDER GROUP consensus)

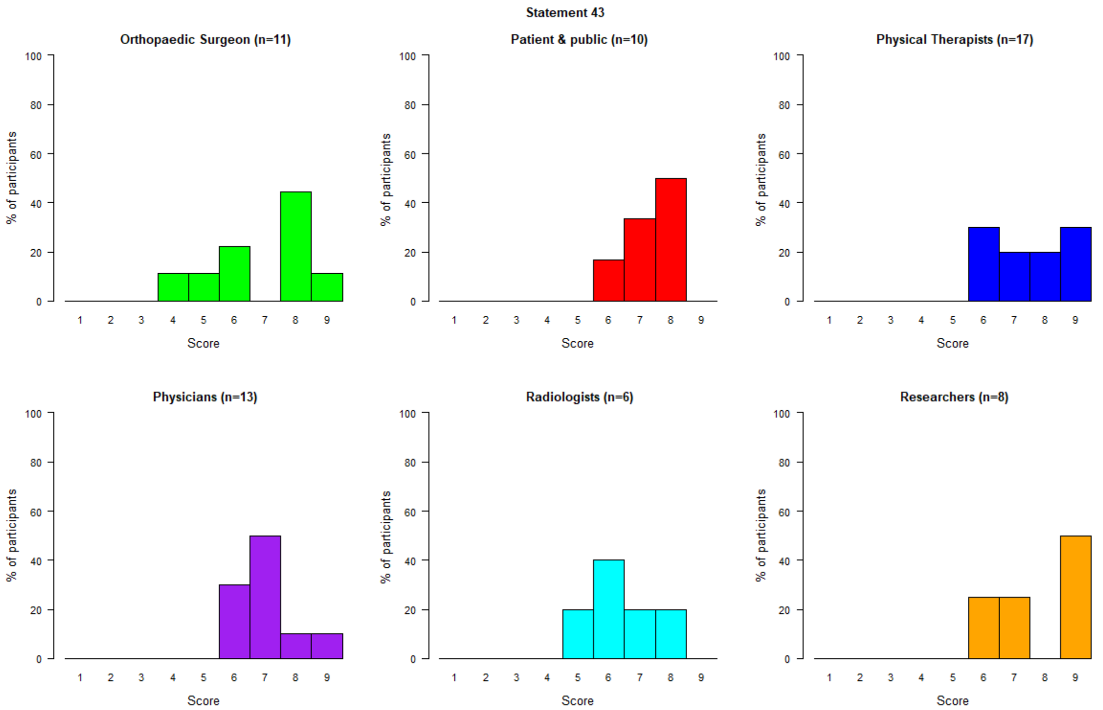
1. **TAXONOMY: Statement 34** We should distinguish between primary and secondary cam morphology in patients with femoroacetabular impingement syndrome

	Round 1	Round 2
Percentage panelists that scored the statement as critical	66.1%	68.8%
Percentage panelists that scored the statement as not important	6.5%	4.7%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**



2. **IMAGING OUTCOME: Statement 43** For research on how primary cam morphology develops it is important to quantify the epiphyseal morphology magnetic resonance (MR) imaging outcome measure using epiphyseal extension

	Round 1	Round 2
Percentage panelists that scored the statement as critical	57.1%	65.9%
Percentage panelists that scored the statement as not important	4.8%	0%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**



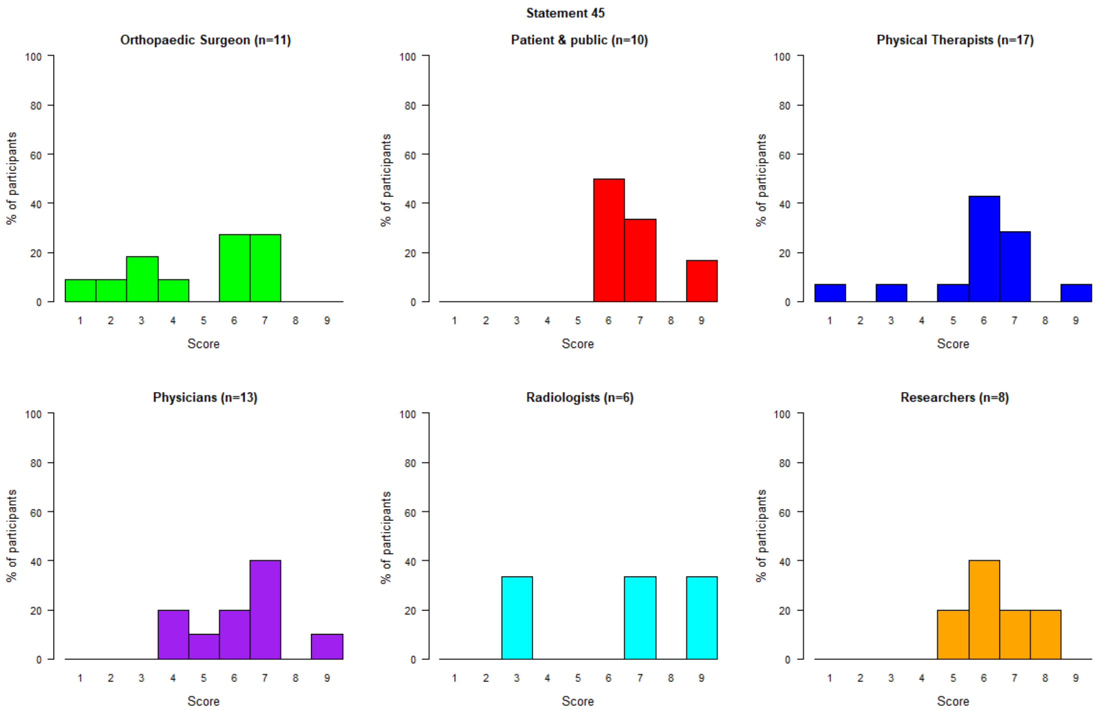
3. **IMAGING OUTCOMES: Statement 45** The main imaging modality for longitudinal primary cam morphology prognosis research should be anteroposterior (AP) pelvis and Dunn 45° view radiographs repeated at least every 5 years

ALL PANELISTS:

	Round 1	Round 2
Percentage panelists that scored the statement as critical	44.9%	42.3%
Percentage panelists that scored the statement as not important	20.4%	15.4%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

RADIOLOGISTS:

	Round 1	Round 2
Percentage panelists that scored the statement as critical	66.7%	66.7%
Percentage panelists that scored the statement as not important	33.3%	33.3%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**



4. **IMAGING OUTCOME: Statement 46** The radiographic imaging outcome measure for research on primary cam morphology prognosis should be the alpha angle as a continuous variable reported for anteroposterior (AP) pelvis and Dunn 45° view radiographs.

ALL PANELISTS:

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	56.9%	67.9%
Percentage panelists that scored the statement as not important	15.7%	11.3%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

RADIOLOGISTS:

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	66.7%	66.7%
Percentage panelists that scored the statement as not important	0%	0%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

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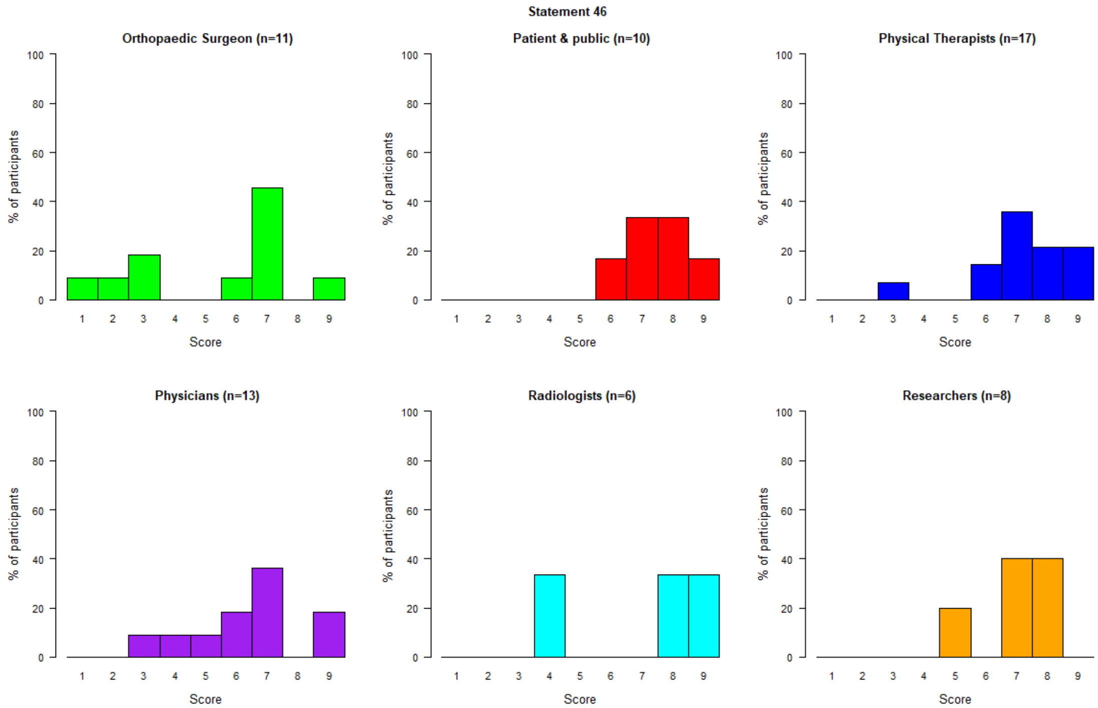
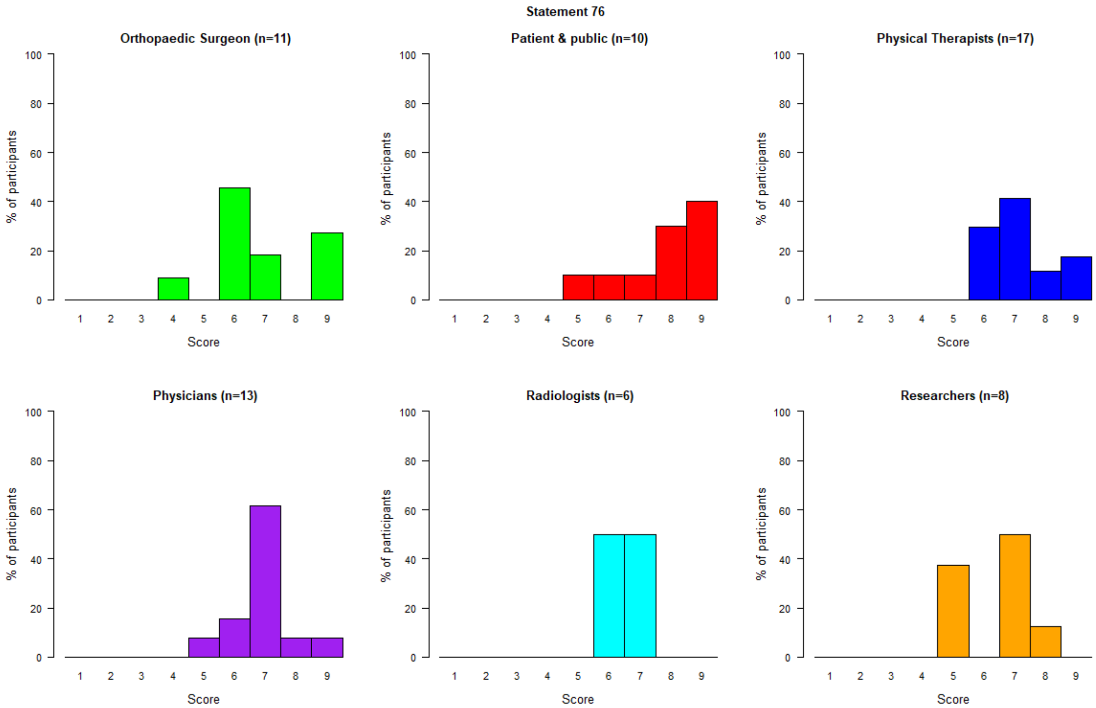


5. **RESEARCH PRIORITIES: Statement 76** Studies to investigate the performance of the diagnostic criteria for hip disease presenting with hip-related pain in young and active adults

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	65.1%	66.2%
Percentage panelists that scored the statement as not important	1.6%	0%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092



Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

RESEARCH PRIORITIES (Consensus on prioritised research statements marked GREEN)

Statement 48: Prospective cohort studies to investigate risk factors (aetiological and prognostic) of primary cam morphology in different cohorts

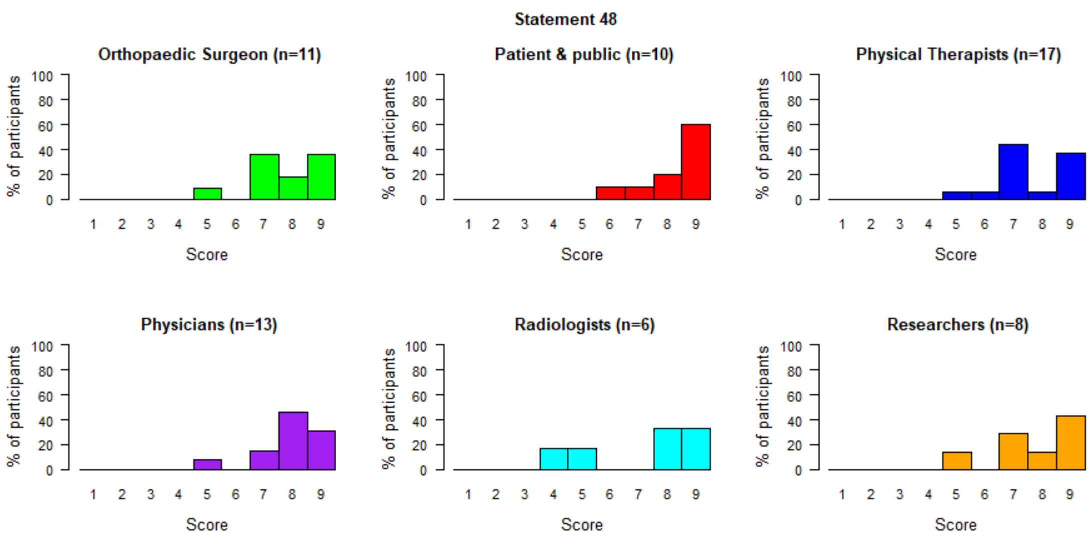
R1: CONSENSUS IN

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms? Warwick agreement: Does operating on asymptomatic hips (with Cam and/or Pincer morphology) lead to long-term benefits in terms of reducing OA? Warwick agreement: What is the incidence and prevalence of FAI syndrome? Warwick agreement: What is the role of structural features in FAI syndrome e.g., Femoral anteversion, capsular tightness? Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.)

RESULTS: ROUND 1

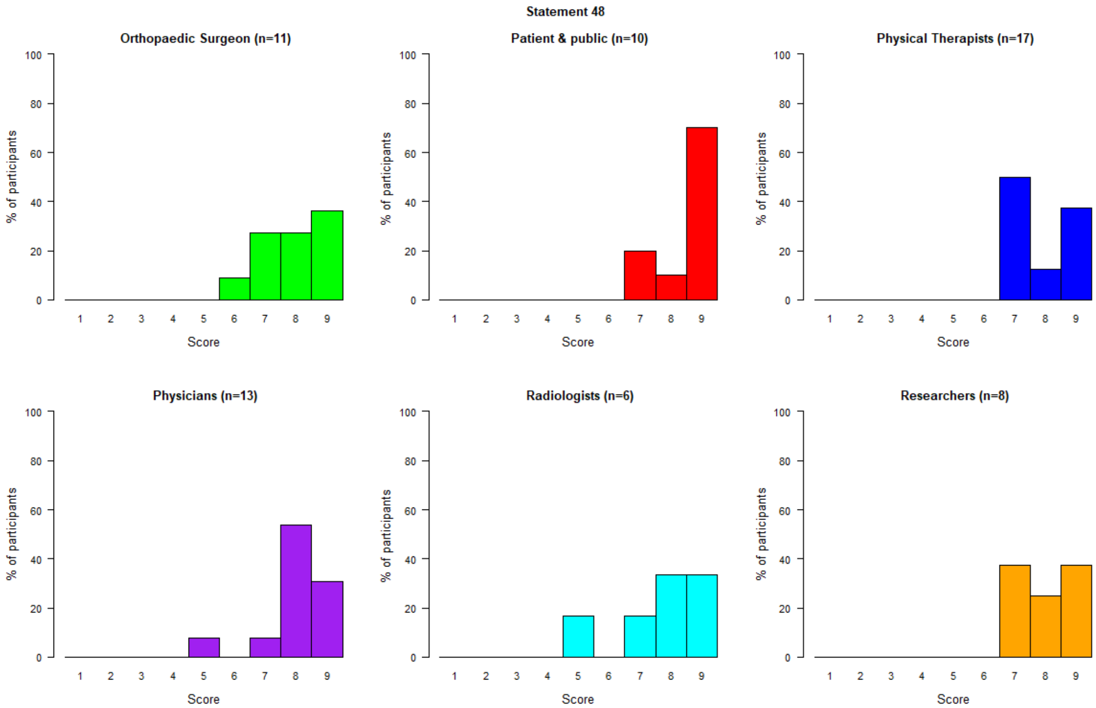
I do not agree that the concept of Primary and secondary CAM is commonly agreed and established



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	8	7	9
Patient & Public In	9	8	9
Physical Therapists	7	7	9
Physicians	8	8	9
Radiologists	8	5	9
Researchers	8	7	9

Percentage panelists that scored the statement as critical	87.3%
Percentage panelists that scored the statement as not important	0%
RESULT	**CONSENSUS IN**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	minor adjustment
5	8	Have since recognised the increased importance in this area
5	7	influenced by scores from other respondents
5	7	agree
6	7	Having followed webinar; I think that it is important.

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	8	7	9	8	7	9

Patient & Public In	9	8	9	9	8	9
Physical Therapists	7	7	9	8	7	9
Physicians	8	8	9	8	8	9
Radiologists	8	5	9	8	7	9
Researchers	8	7	9	8	7	9

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	87.3%	95.3%
Percentage panelists that scored the statement as not important	0%	0%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Statement 49: Prospective cohort studies that investigate how primary cam morphology develops in cohorts with variable loading demands (e.g., difference sports/ dance/ physical activity level cohorts, and sedentary cohorts) (causal inference approach to investigate load as a risk factor for primary cam morphology)

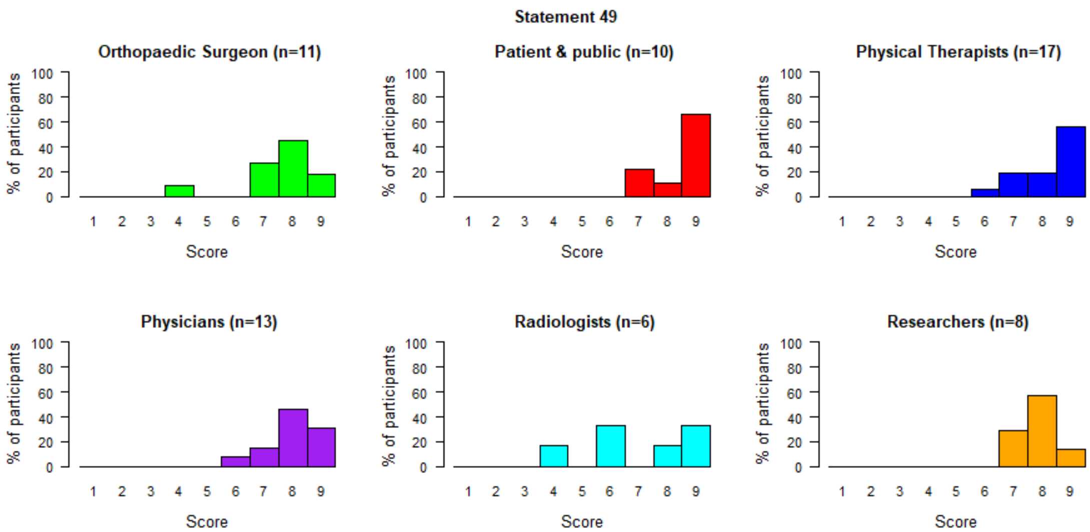
R1: CONSENSUS IN

R2: CONSENEUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms? Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.)

RESULTS: ROUND 1

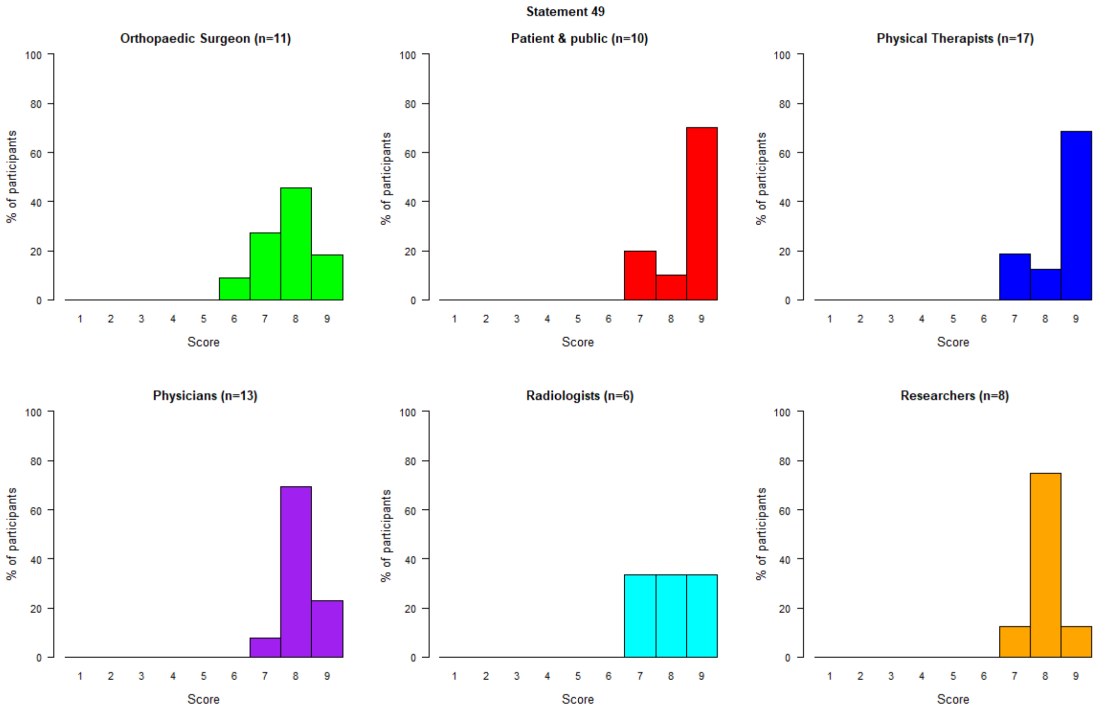
I do not agree that the concept of Primary and secondary CAM is commonly agreed and established



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	8	7	8
Patient & Public In	9	8	9
Physical Therapists	9	8	9
Physicians	8	8	9
Radiologists	7	6	9
Researchers	8	7	8

Percentage panelists that scored the statement as critical	90.3%
Percentage panelists that scored the statement as not important	0%
RESULT	**CONSENSUS IN**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	8	Input from clinical or research opinion
6	7	Agree rather than neutral - more important than I initially graded.
6	7	Several studies suggested the relation between loading and cam morphology development; but which loading threshold exactly triggers this is unknown. Therefore I changed it to 7 (critical).
4	7	Initial misunderstanding of the content of the statement

Median, IQR

	ROUND 1			ROUND 2		
	Median	**Percentile 25**	**Percentile 75**	**Median**	**Percentile 25**	**Percentile 75**

Orthopaedic Surgeon	8	7	8	8	7	8
Patient & Public In	9	8	9	9	8	9
Physical Therapists	9	8	9	9	8	9
Physicians	8	8	9	8	8	8
Radiologists	7	6	9	8	7	9
Researchers	8	7	8	8	8	8

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	90.3%	98.4%
Percentage panelists that scored the statement as not important	0%	0%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Statement 50: Prospective cohort studies that investigate how primary cam morphology develops in different sex/ gender cohorts, specifically women cohorts (causal inference approach to investigate gender as a risk factor for primary cam morphology)

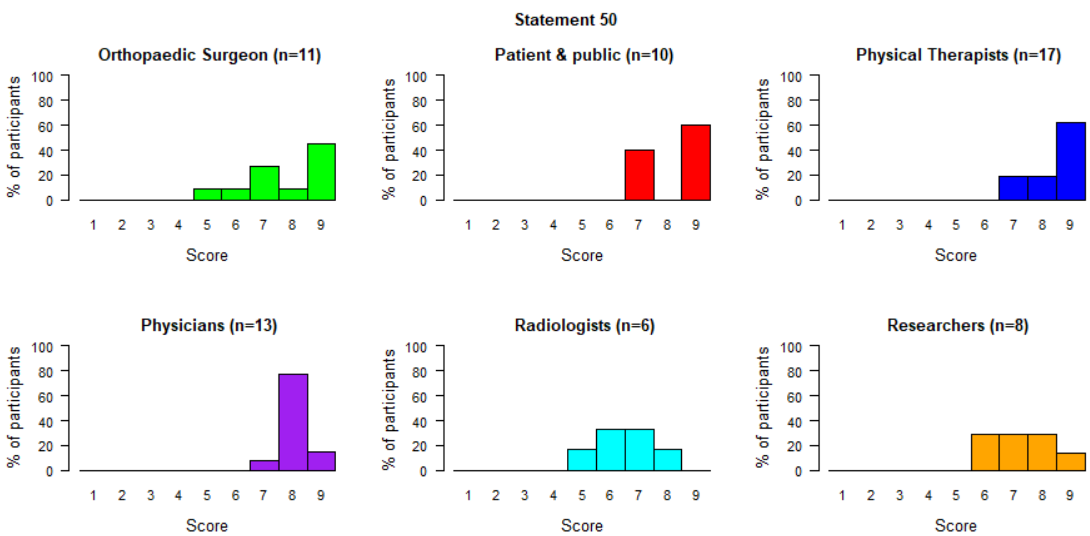
R1: CONSENSUS IN

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms? Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.) Research Priorities

RESULTS: ROUND 1

I do not agree that the concept of Primary and secondary CAM is commonly agreed and established

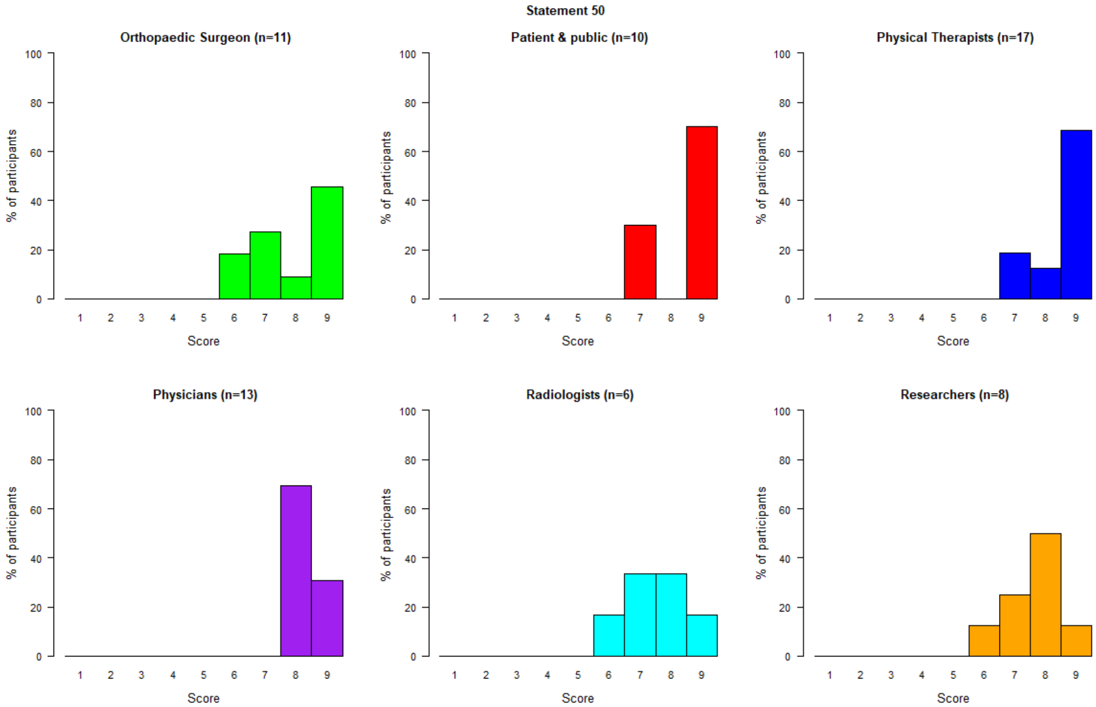


	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	8	7	9
Patient & Public In	9	7	9
Physical Therapists	9	8	9
Physicians	8	8	8
Radiologists	7	6	7
Researchers	7	6	8

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Percentage panelists that scored the statement as critical	88.9%
Percentage panelists that scored the statement as not important	0%
RESULT	**CONSENSUS IN**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R1

R1	R2	
6	8	Input from clinical or research opinion
6	7	influenced by scores from other respondents

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	8	7	9	8	7	9
Patient & Public In	9	7	9	9	7	9
Physical Therapists	9	8	9	9	8	9
Physicians	8	8	8	8	8	9
Radiologists	7	6	7	8	7	8

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Researchers	7	6	8	8	7	8

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	88.9%	93.8%
Percentage panelists that scored the statement as not important	0%	0%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Statement 51: Prospective cohort studies that investigate how primary cam morphology develops in different parasport cohorts (causal inference approach to investigate load as a risk factor for primary cam morphology)

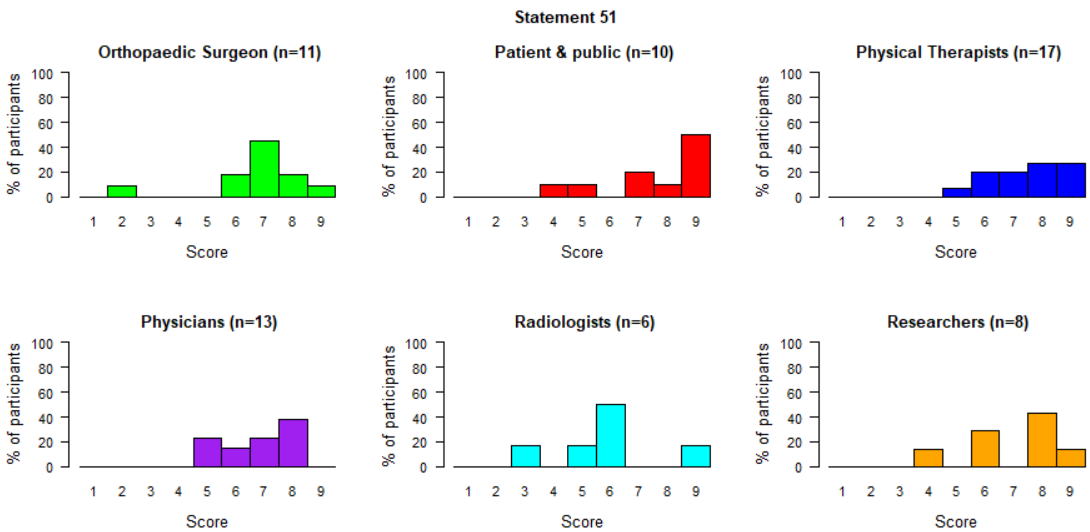
R1: NO CONSENSUS

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms? Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.) Research Priorities

RESULTS: ROUND 1

1. non modifiable
2. I do not agree that the concept of Primary and secondary CAM is commonly agreed and established
3. I do not know the extent of hip-related pain in parasports. This would influence the relevance of further research

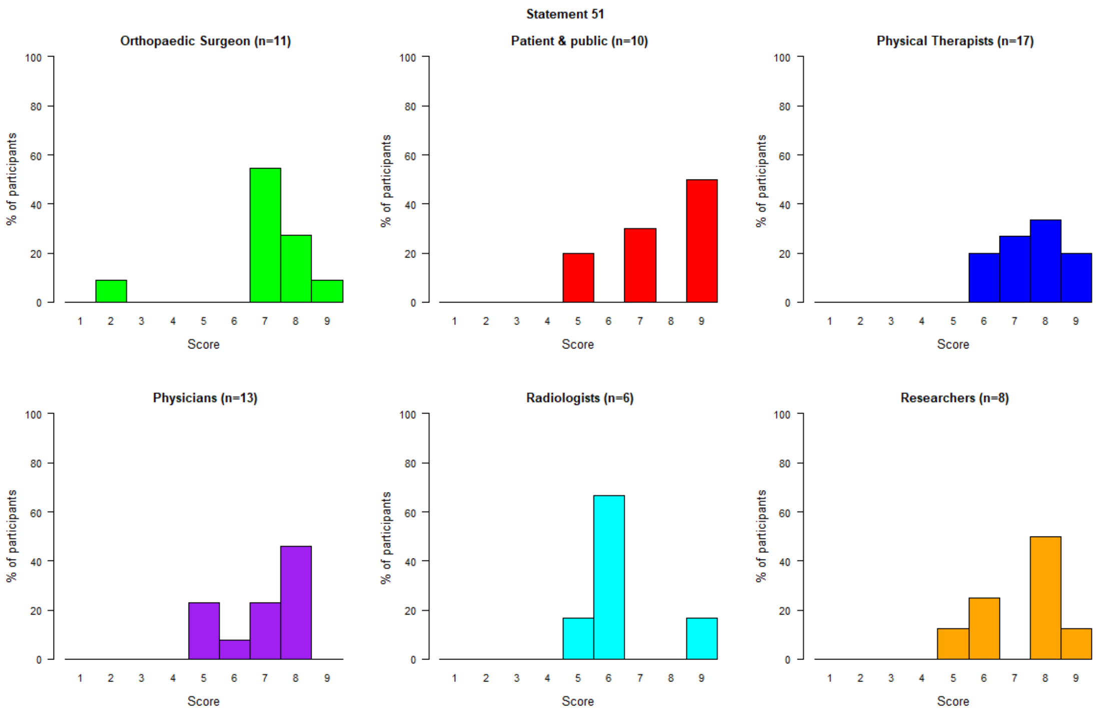


	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	8
Patient & Public In	9	7	9
Physical Therapists	8	6	9
Physicians	7	6	8
Radiologists	6	5	6

Researchers	8	6	8

Percentage panelists that scored the statement as critical	64.5%
Percentage panelists that scored the statement as not important	3.2%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for significant score boundary changes between R1 and R2

R1	R2	
6	7	I misread this initial stem and place greater importance on para-sport research
3	6	at first i didn't call it critital because in my opinio the type sport does not matter

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Orthopaedic Surgeon	7	6	8	7	7	8
Patient & Public In	9	7	9	8	7	9
Physical Therapists	8	6	9	8	7	8
Physicians	7	6	8	7	6	8
Radiologists	6	5	6	6	6	6
Researchers	8	6	8	8	6	8

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	64.5%	71.4%
Percentage panelists that scored the statement as not important	3.2%	1.6%
RESULT	**NO CONSENSUS**	**CONSENSUS IN**

Statement 52: Prospective cohort studies that investigate how primary cam morphology develops in different race/ ethnic cohorts (causal inference approach to investigate race/ ethnicity as a risk factor for primary cam morphology)

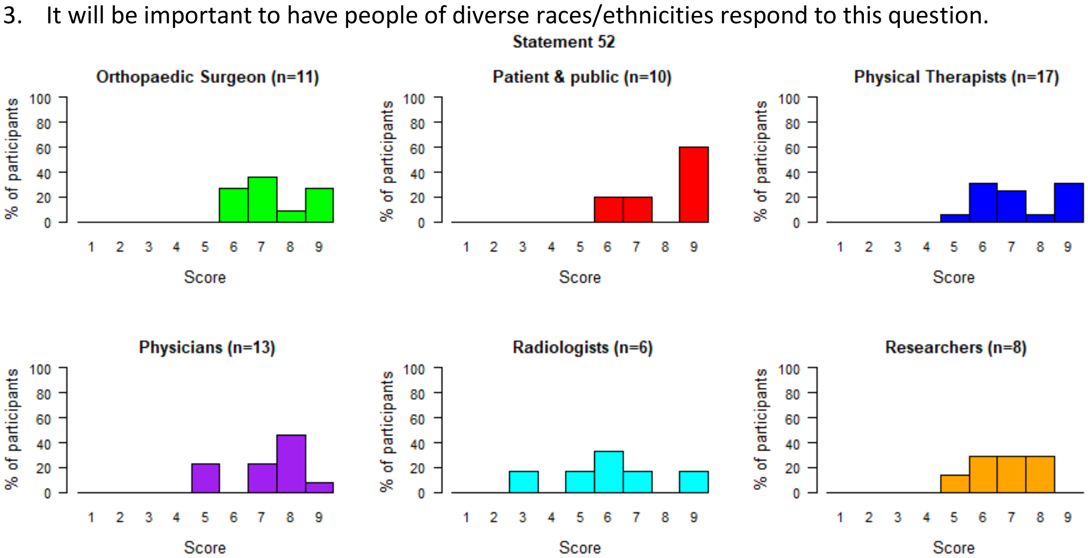
R1: NO CONSENSUS

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms? Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.)

RESULTS: ROUND 1

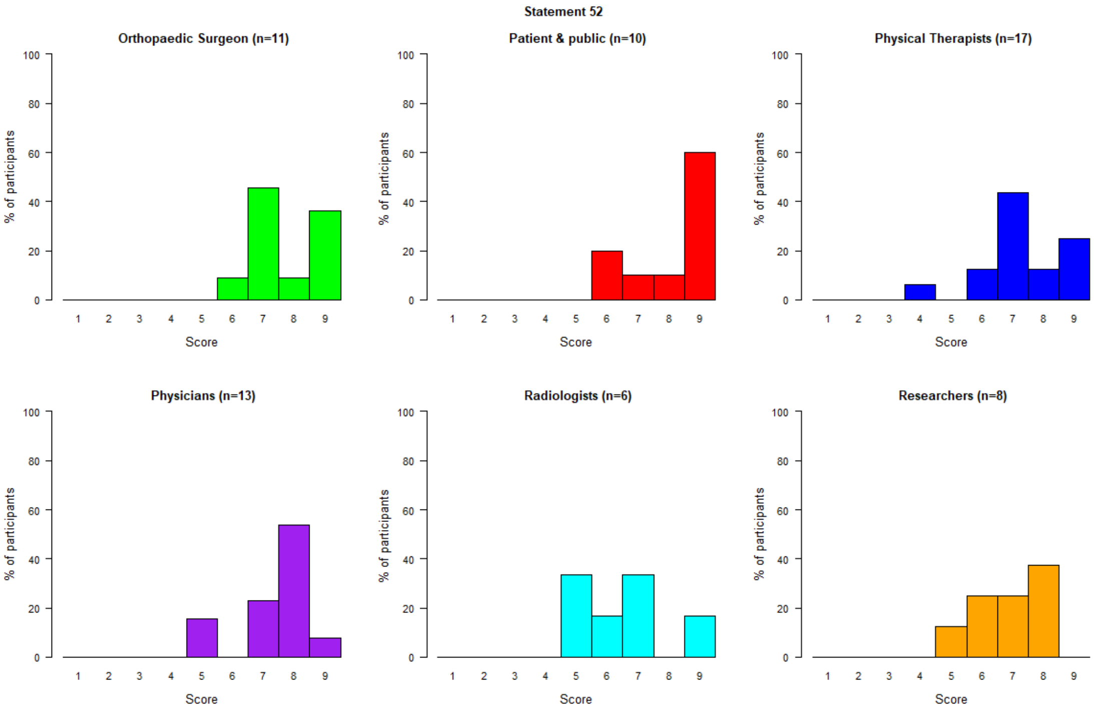
1. non modifiable
2. I do not agree that the concept of Primary and secondary CAM is commonly agreed and established
3. It will be important to have people of diverse races/ethnicities respond to this question.



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	9
Patient & Public In	9	7	9
Physical Therapists	7	6	9
Physicians	8	7	8
Radiologists	6	5	7
Researchers	7	6	8

Percentage panelists that scored the statement as critical	66.7%
Percentage panelists that scored the statement as not important	1.6%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	Happy that this is needed - prefer to leave level of priority to the ENHR process
6	7	Input from clinical or research opinion
3	5	I think there is not so much differences betweeen groups but it is nice to know

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	9	7	7	9
Patient & Public In	9	7	9	9	7	9

Physical Therapists	7	6	9	7	7	9
Physicians	8	7	8	8	7	8
Radiologists	6	5	7	7	5	7
Researchers	7	6	8	7	6	8

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	66.7%	78.1%
Percentage panelists that scored the statement as not important	1.6%	0%
RESULT	**NO CONSENSUS**	**CONSENSUS IN**

Statement 53: Prospective cohort studies that investigate other potential risk factors for primary cam morphology (causal inference approach to investigate the following risk factors: anatomical – spine, acetabulum, femur; kinetic and kinematic risk factors; mechanical and biomechanical; other possible risk factors that might emerge over time)

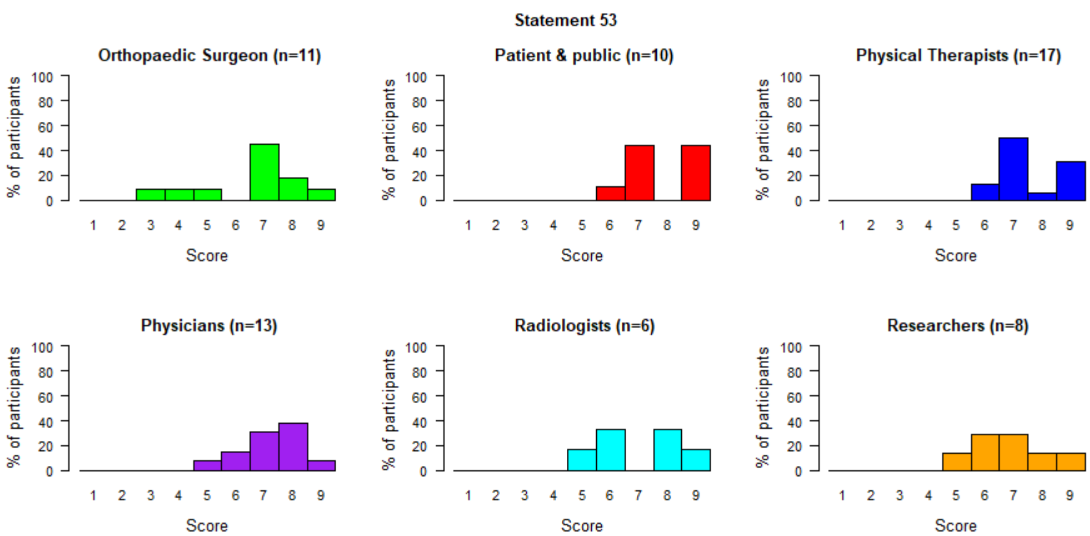
R1: CONSENSUS IN

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms? Warwick agreement: What is the role of structural features in FAI syndrome e.g., Femoral anteversion, capsular tightness? Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.) Research Priorities

RESULTS: ROUND 1

1. unclear how this differs from the first statement --but with more focus
2. I do not agree that the concept of Primary and secondary CAM is commonly agreed and established

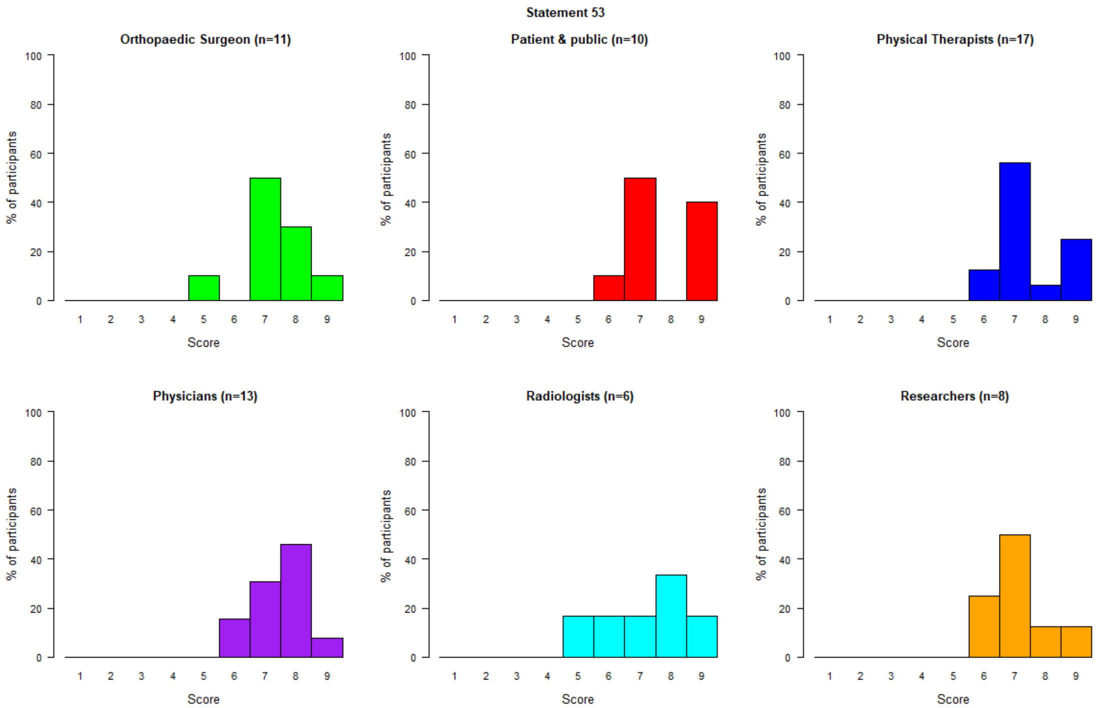


	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	5	8
Patient & Public In	7	7	9
Physical Therapists	7	7	9
Physicians	7	7	8
Radiologists	7	6	8

Researchers	7	6	8

Percentage panelists that scored the statement as critical	75.8%
Percentage panelists that scored the statement as not important	1.6%
RESULT	**CONSENSUS IN**

RESULTS: ROUND 2



Reasons for score changes between R1 and R2

R1	R2	
6	7	new literature
6	7	calibration from the other disciplines
6	7	study aims are relevant
6	7	influenced by scores from other respondents
6	7	on second thougt it is important
7	6	minor adjustment

Median, IQR

	ROUND 1	ROUND 2

	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	5	8	7	7	8
Patient & Public In	7	7	9	7	7	9
Physical Therapists	7	7	9	7	7	9
Physicians	7	7	8	8	7	8
Radiologists	7	6	8	8	6	8
Researchers	7	6	8	7	7	8

	Round 1	Round 2
Percentage panelists that scored the statement as critical	75.8%	84.1%
Percentage panelists that scored the statement as not important	1.6%	0%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Statement 54: Prospective cohort studies that investigate prognosis (consequences) of primary cam morphology in different cohorts

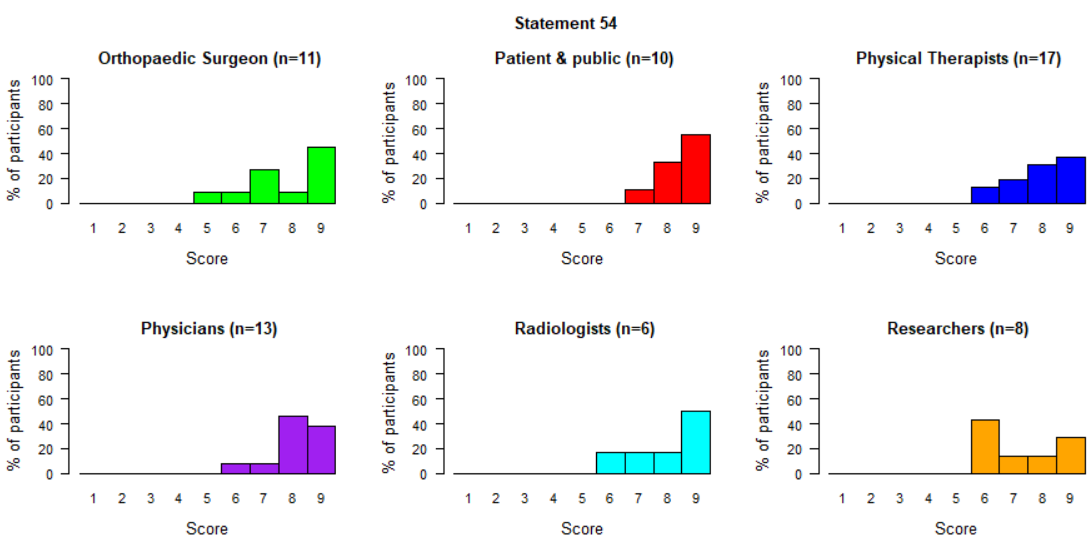
R1: CONSENSUS IN

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: In those with FAI morphology, can we predict who will become symptomatic? Warwick agreement: What is the natural history of FAI morphology? Warwick agreement: Can rehabilitation prevent FAI pain and if so, how? Warwick agreement: What is the source of pain in FAI? Warwick agreement: Does operating on asymptomatic hips (with Cam and/or Pincer morphology) lead to long-term benefits in terms of reducing OA? Warwick agreement: What is the incidence and prevalence of FAI syndrome? Warwick agreement: What are the best outcome measures to show change following treatment? Warwick agreement: What is the role of structural features in FAI syndrome e.g., Femoral anteversion, capsular tightness? Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.) Mosler et al (2019: Research recommendation 5: The Return To Sport (RTS) continuum recommended by the 2016 RTS consensus paper (Ardern et al) should be used in future research. Definitions used in studies examining RTS following management of hip-related pain often consider RTS as a dichotomous variable (yes/no) and fail to distinguish between the differing levels of RTS or consider whether the athlete has successfully returned to their preinjury sporting performance. Two recent studies have applied this graded definition, providing a more nuanced picture of RTS expectations for patients following hip arthroscopy. The 2016 consensus statement on RTS introduced the concept of RTS being considered a continuum through which an athlete progresses during the rehabilitation process.

RESULTS: ROUND 1

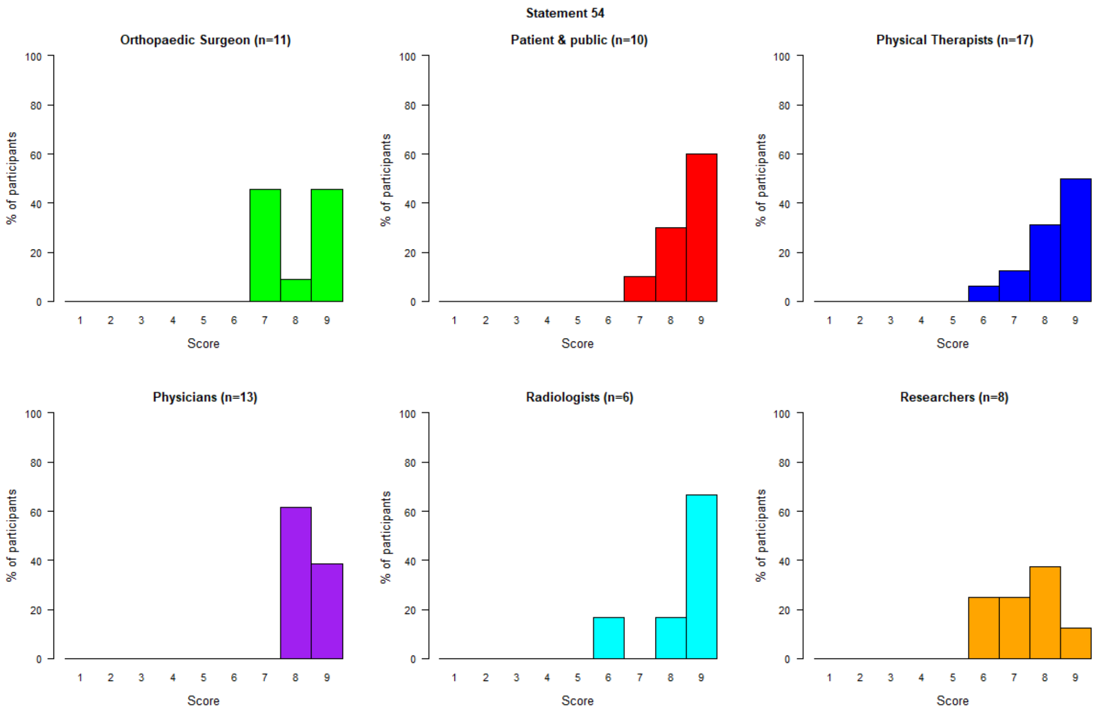
I do not agree that the concept of Primary and secondary CAM is commonly agreed and established



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	8	7	9
Patient & Public In	9	8	9
Physical Therapists	8	7	9
Physicians	8	8	9
Radiologists	9	7	9
Researchers	7	6	9

Percentage panelists that scored the statement as critical	85%
Percentage panelists that scored the statement as not important	0%
RESULT	**CONSENSUS IN**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	While I think other research priorities are more important; prognosis is meaningful

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	8	7	9	8	7	9
Patient & Public In	9	8	9	9	8	9
Physical Therapists	8	7	9	9	8	9
Physicians	8	8	9	8	8	9
Radiologists	9	7	9	9	8	9
Researchers	7	6	9	8	7	8

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	85%	93.8%
Percentage panelists that scored the statement as not important	0%	0%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Statement 55: Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology

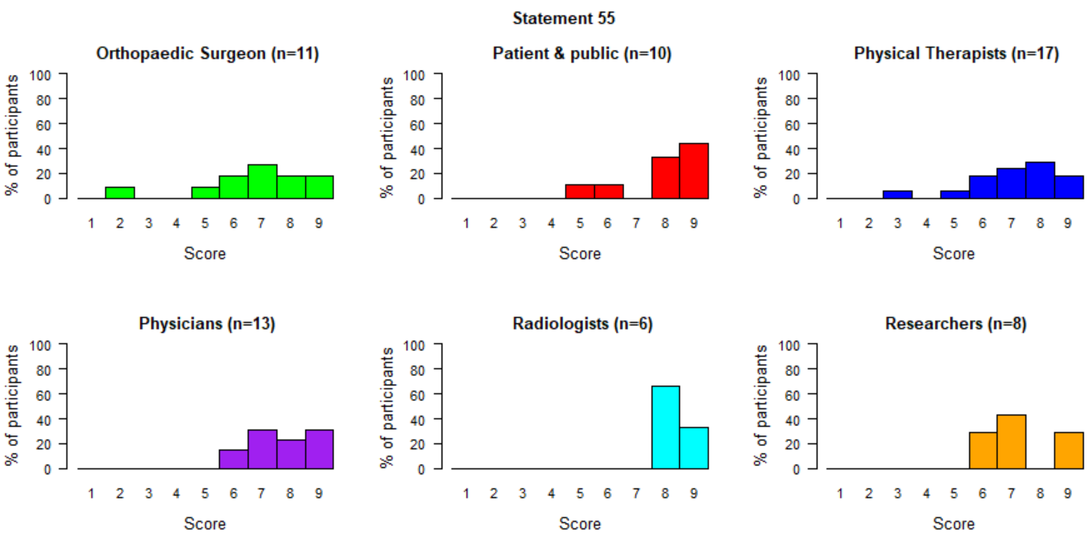
R1: CONSENSUS IN

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: What are the diagnostic criteria for Cam and Pincer morphology? Reiman et al (2019) - R1: Measures of bony morphology should be reported in detail. We recommend that bony morphology outcome measures (such as the alpha angle or centre-edge angle) should be clearly defined, measured and reported (e.g, detailed methodological description, blinding, per hip/per person reporting with statistical correction as appropriate, reliability measures)

RESULTS: ROUND 1

The question is unclear to me. If referring to the clinical diagnosis of CAM; I think this potential is limited and research less relevant.

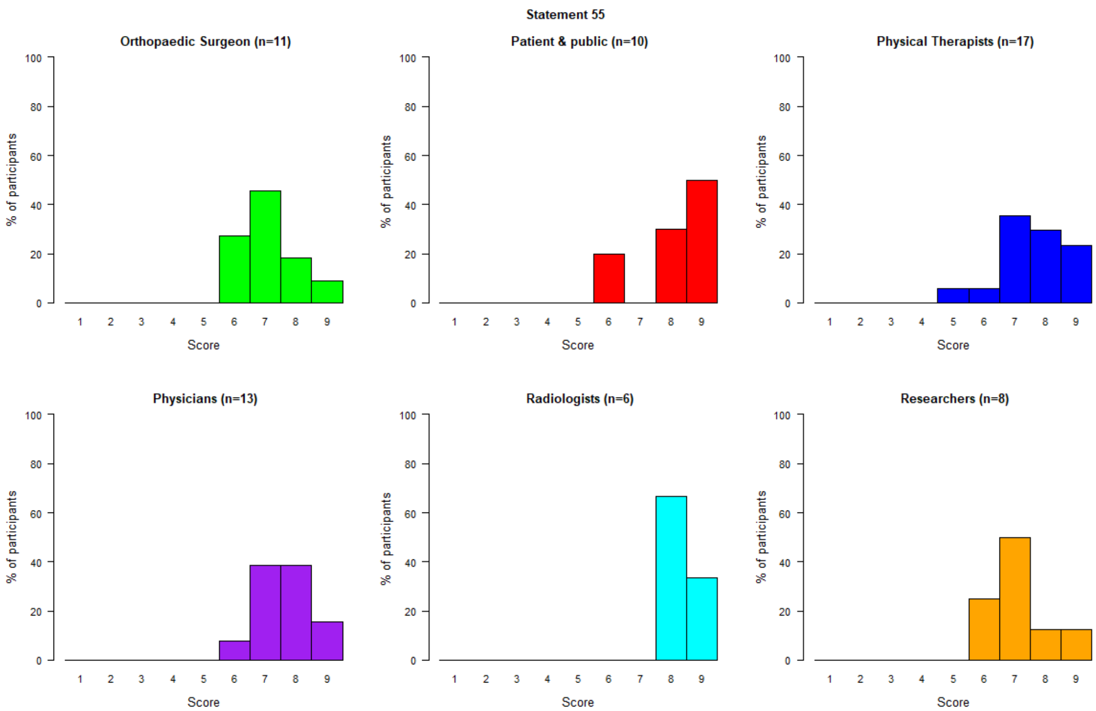


	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	8
Patient & Public In	8	8	9
Physical Therapists	7	6	8
Physicians	8	7	9
Radiologists	8	8	9
Researchers	7	6	9

Percentage panelists that scored the statement as critical	76.2%
Percentage panelists that scored the statement as not important	3.2%
RESULT	**CONSENSUS IN**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
3	7	More attention paid to imaging
6	7	calibration from the other disciplines

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	8	7	6	8
Patient & Public In	8	8	9	9	8	9
Physical Therapists	7	6	8	8	7	8
Physicians	8	7	9	8	7	8
Radiologists	8	8	9	8	8	9
Researchers	7	6	9	7	7	8

	Round 1	Round 2

Percentage panelists that scored the statement as critical	76.2%	84.6%
Percentage panelists that scored the statement as not important	3.2%	0%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Statement 56: Studies to develop and validate diagnostic and prognostic models for primary cam morphology in young (maturing) athletes

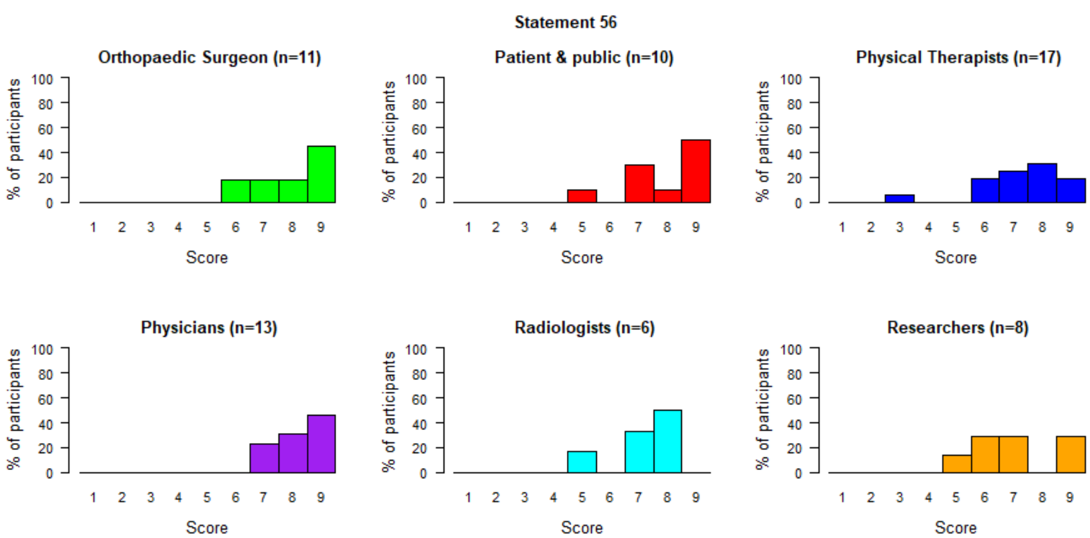
R1 CONSENSUS IN

R2 CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: In those with FAI morphology, can we predict who will become symptomatic? Warwick agreement: What is the natural history of FAI morphology? Warwick agreement: Can rehabilitation prevent FAI pain and if so, how? Warwick agreement: What is the source of pain in FAI? Warwick agreement: Does operating on asymptomatic hips (with Cam and/or Pincer morphology) lead to long-term benefits in terms of reducing OA? Warwick agreement: What is the incidence and prevalence of FAI syndrome? Warwick agreement: What are the best outcome measures to show change following treatment? Warwick agreement: What is the role of structural features in FAI syndrome e.g., Femoral anteversion, capsular tightness? Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.)

RESULTS: ROUND 1

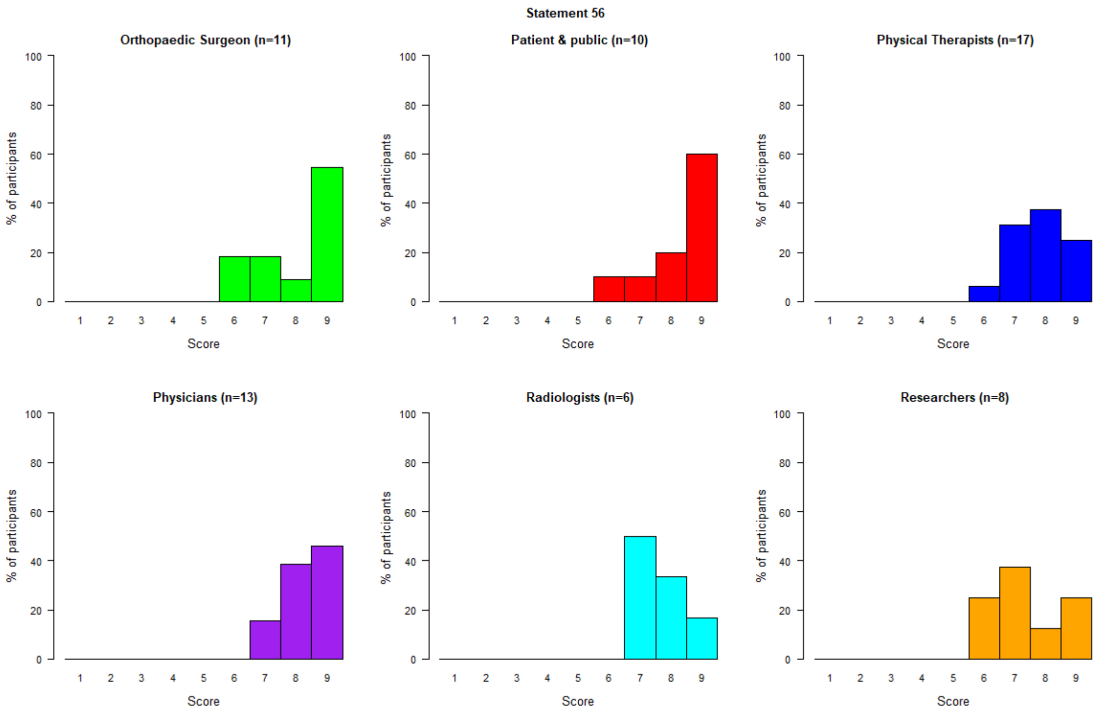
1. This will be important in the future; but I don't think the field is ready right now. Seems identification of risk factors (e.g. explanatory analyses) is more important right now than risk stratification (e.g. prediction)
2. I averaged the rating. I would not combine prognostic and diagnostic in the same question. For me it is more critical prognostic.
3. I do not agree that the concept of Primary and secondary CAM is commonly agreed and established



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	8	7	9
Patient & Public In	9	7	9
Physical Therapists	8	7	8
Physicians	8	8	9
Radiologists	8	7	8
Researchers	7	6	9

Percentage panelists that scored the statement as critical	82.5%
Percentage panelists that scored the statement as not important	1.6%
RESULT	**CONSENSUS IN**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
3	9	General concensus
6	7	minor adjustment
6	8	influenced by scores from other respondents
5	7	the same

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Median, IQR

	ROUND 1			ROUND 2		
	Median	**Percentile 25**	**Percentile 75**	**Median**	**Percentile 25**	**Percentile 75**
Orthopaedic Surgeon	8	7	9	9	7	9
Patient & Public In	9	7	9	9	8	9
Physical Therapists	8	7	8	8	7	9
Physicians	8	8	9	8	8	9
Radiologists	8	7	8	8	7	8
Researchers	7	6	9	7	7	9

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	82.5%	90.6%
Percentage panelists that scored the statement as not important	1.6%	0%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Statement 57: Prospective cohort studies to investigate how exercise intervention influences the development and prognosis of primary cam morphology in cohorts with variable loading demands

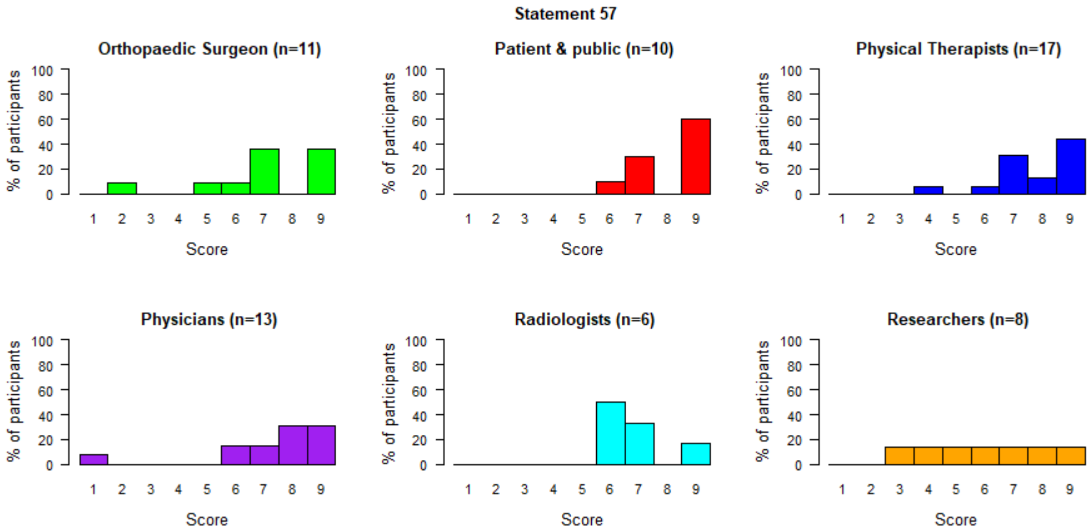
R1: CONSENSUS IN

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms? Warwick agreement: Can rehabilitation prevent FAI pain and if so, how? Warwick agreement: Does operating on asymptomatic hips (with Cam and/or Pincer morphology) lead to long-term benefits in terms of reducing OA? Warwick: Does operating on asymptomatic hips (with Cam and/or Pincer morphology) lead to long-term benefits in terms of reducing OA? Warwick agreement: What is the role of structural features in FAI syndrome e.g., Femoral anteversion, capsular tightness? Kemp et al (2019) – Research Recommendation 1. Reporting of exercise programmes. Exercise descriptors such as load magnitude, number of repetitions and sets, duration of whole programme, duration of contractile element of exercise, duration of one repetition, time under tension, rest between repetitions, range of motion through which the exercise is performed and rest between exercise sessions should be considered and reported. The primary goal of studies examining physiotherapist-led exercise therapies for hip-related pain is to develop and then test the most effective exercises for the condition. When developing effective and tailored treatment programmes, the mechanistic effect of particular elements of the exercises on the target muscles and surrounding tissues is considered. Kemp et al (2019) – Research Recommendation 2. Development of high-quality exercise programmes. Research should investigate the optimal frequency, intensity, time, type, volume and progression of exercise therapy. Exercise-based programmes used in clinical research should include patient input in their design and be appropriately constructed to gain maximal improvements in outcomes. In strength-based treatments, exercise programme require adequate load to gain a strength effect. The frequency, intensity, time, type, volume and progression of exercise therapy may need to be manipulated to gain the desired effect. The expert group recommended that guidelines, such as those developed by the American College of Sports Medicine (ACSM), should be used with the development of strength-based treatments. The group also indicated that fidelity and adherence of exercise programmes were often not suitable to gain the desired effect. Studies evaluating the effectiveness of physiotherapist-led exercise programmes should ensure that treatments are developed and reported using these principles. Mosler et al (2019: Research recommendation 5: The Return To Sport (RTS) continuum recommended by the 2016 RTS consensus paper (Ardern et al) should be used in future research. Definitions used in studies examining RTS following management of hip-related pain often consider RTS as a dichotomous variable (yes/no) and fail to distinguish between the differing levels of RTS or consider whether the athlete has successfully returned to their preinjury sporting performance. Two recent studies have applied this graded definition, providing a more nuanced picture of RTS expectations for patients following hip arthroscopy. The 2016 consensus statement on RTS introduced the concept of RTS being considered a continuum through which an athlete progresses during the rehabilitation process. Research Priorities

RESULTS: ROUND 1

1. i do not think we are at this stage yet!
2. I do not agree that the concept of Primary and secondary CAM is commonly agreed and established
3. This cant be effectively done until prospective cohort studies are complete and interventions are developed

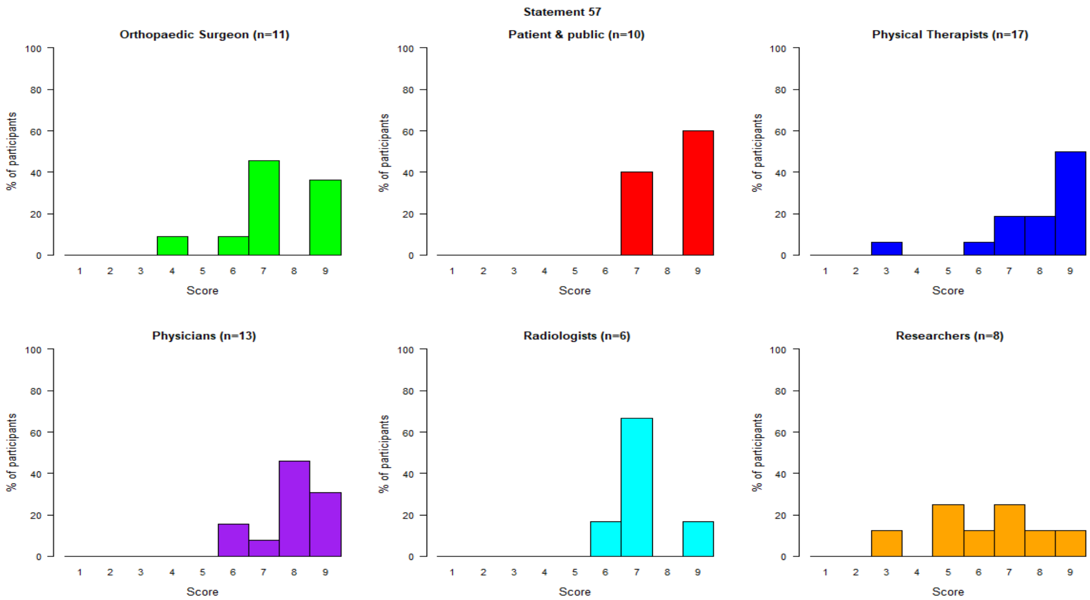


	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	9
Patient & Public In	9	7	9
Physical Therapists	8	7	9
Physicians	8	7	9
Radiologists	7	6	7
Researchers	6	4	8

Percentage panelists that scored the statement as critical	74.6%
Percentage panelists that scored the statement as not important	4.8%
RESULT	**CONSENSUS IN**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	8	We must focus more on exercise intervention (and then well described programs (type of exercise; repetitions; load)); particularly in the pre surgery phase. Most important to me first is conservative treatment with exercise for symptomatic patients.
6	7	Input from clinical or research opinion
1	6	not sure
6	7	it is nice to know if theory on loading is true
6	7	Having followed webinar; I think that it is important.

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	9	7	7	9
Patient & Public In	9	7	9	9	7	9
Physical Therapists	8	7	9	9	7	9
Physicians	8	7	9	8	8	9
Radiologists	7	6	7	7	7	7
Researchers	6	4	8	7	5	8

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	74.6%	82.8%
Percentage panelists that scored the statement as not important	4.8%	3.1%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Statement 58: Randomised controlled clinical trials to investigate how exercise intervention (load management) influences the development and prognosis of primary cam morphology in different demographic (e.g., sex/ gender; race/ ethnicity) and load (variable loading demands – e.g., different sports, dance, and physical activity level) cohorts

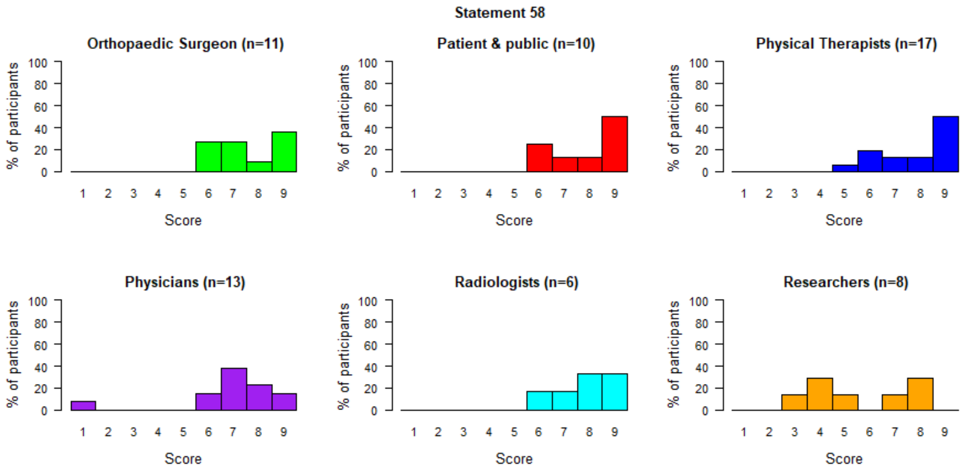
R1: CONSENSUS IN

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: Do changes to training in adolescent athletes decrease Cam formation? Warwick agreement: Can rehabilitation prevent FAI pain and if so, how? Warwick agreement: What is the source of pain in FAI? Warwick agreement: What are the best outcome measures to show change following treatment? Warwick agreement: What is the role of structural features in FAI syndrome e.g., Femoral anteversion, capsular tightness? Kemp et al (2019) – Research Recommendation 1. Reporting of exercise programmes. Exercise descriptors such as load magnitude, number of repetitions and sets, duration of whole programme, duration of contractile element of exercise, duration of one repetition, time under tension, rest between repetitions, range of motion through which the exercise is performed and rest between exercise sessions should be considered and reported. The primary goal of studies examining physiotherapist-led exercise therapies for hip-related pain is to develop and then test the most effective exercises for the condition. When developing effective and tailored treatment programmes, the mechanistic effect of particular elements of the exercises on the target muscles and surrounding tissues is considered. Kemp et al (2019) – Research Recommendation 2. Development of high-quality exercise programmes. Research should investigate the optimal frequency, intensity, time, type, volume and progression of exercise therapy. Exercise-based programmes used in clinical research should include patient input in their design and be appropriately constructed to gain maximal improvements in outcomes. In strength-based treatments, exercise programme require adequate load to gain a strength effect. The frequency, intensity, time, type, volume and progression of exercise therapy may need to be manipulated to gain the desired effect. The expert group recommended that guidelines, such as those developed by the American College of Sports Medicine (ACSM), should be used with the development of strength-based treatments. The group also indicated that fidelity and adherence of exercise programmes were often not suitable to gain the desired effect. Studies evaluating the effectiveness of physiotherapist-led exercise programmes should ensure that treatments are developed and reported using these principles. Mosler et al (2019: Research recommendation 5: The Return To Sport (RTS) continuum recommended by the 2016 RTS consensus paper (Ardern et al) should be used in future research. Definitions used in studies examining RTS following management of hip-related pain often consider RTS as a dichotomous variable (yes/no) and fail to distinguish between the differing levels of RTS or consider whether the athlete has successfully returned to their preinjury sporting performance. Two recent studies have applied this graded definition, providing a more nuanced picture of RTS expectations for patients following hip arthroscopy. The 2016 consensus statement on RTS introduced the concept of RTS being considered a continuum through which an athlete progresses during the rehabilitation process. Mosler et al (2019: Research recommendation 6: Future research is required to quantify, and report return to physical activity (including sport and occupation) following management of hip-related pain.

RESULTS: ROUND 1

1. I am unsure how randomised controlled clinical trials would differ from prospective cohort studies. In any case; this item seems worthy of further research; however that is done.
2. Feasibility for an appropriate RCT seems to me low.
3. I do not agree that the concept of Primary and secondary CAM is commonly agreed and established

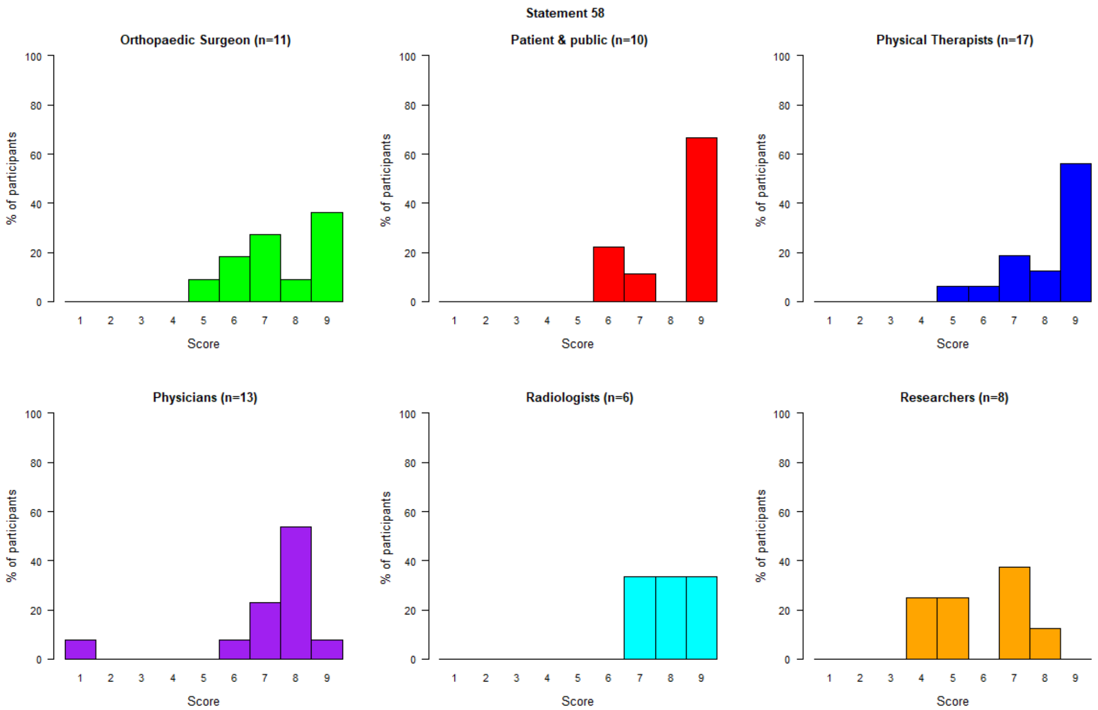


	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	9
Patient & Public In	9	7	9
Physical Therapists	9	7	9
Physicians	7	7	8
Radiologists	8	7	9
Researchers	5	4	8

Percentage panelists that scored the statement as critical	72.1%
Percentage panelists that scored the statement as not important	3.3%
RESULT	**CONSENSUS IN**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	Happy that this is needed - prefer to leave level of priority to the ENHR process
6	8	See my answer above: well defined exercise intervention in asymptomatic and symptomatic patients.
6	7	Input from clinical or research opinion
3	4	I would take an RCT over a cohort study.
6	7	new literature

Median, IQR

	ROUND 1			ROUND 2		
	Median	**Percentile 25**	**Percentile 75**	**Median**	**Percentile 25**	**Percentile 75**
Orthopaedic Surgeon	7	6	9	7	6	9
Patient & Public In	9	7	9	9	7	9
Physical Therapists	9	7	9	9	7	9
Physicians	7	7	8	8	7	8
Radiologists	8	7	9	8	7	9
Researchers	5	4	8	6	5	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	72.1%	79.4%
Percentage panelists that scored the statement as not important	3.3%	1.6%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Statement 59: Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes

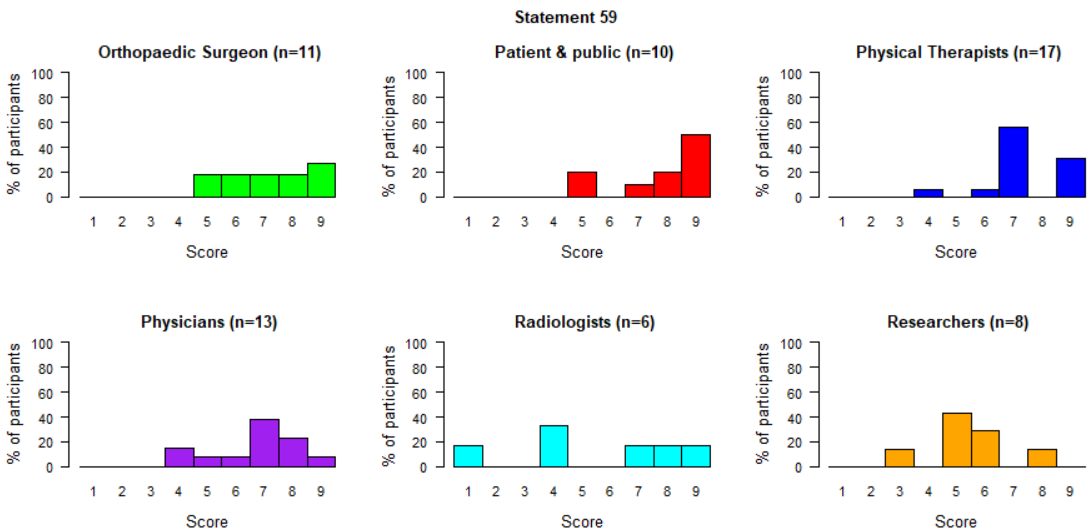
R1: NO CONSENSUS

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the optimal method to treat labral pathology? Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.)

RESULTS: ROUND 1

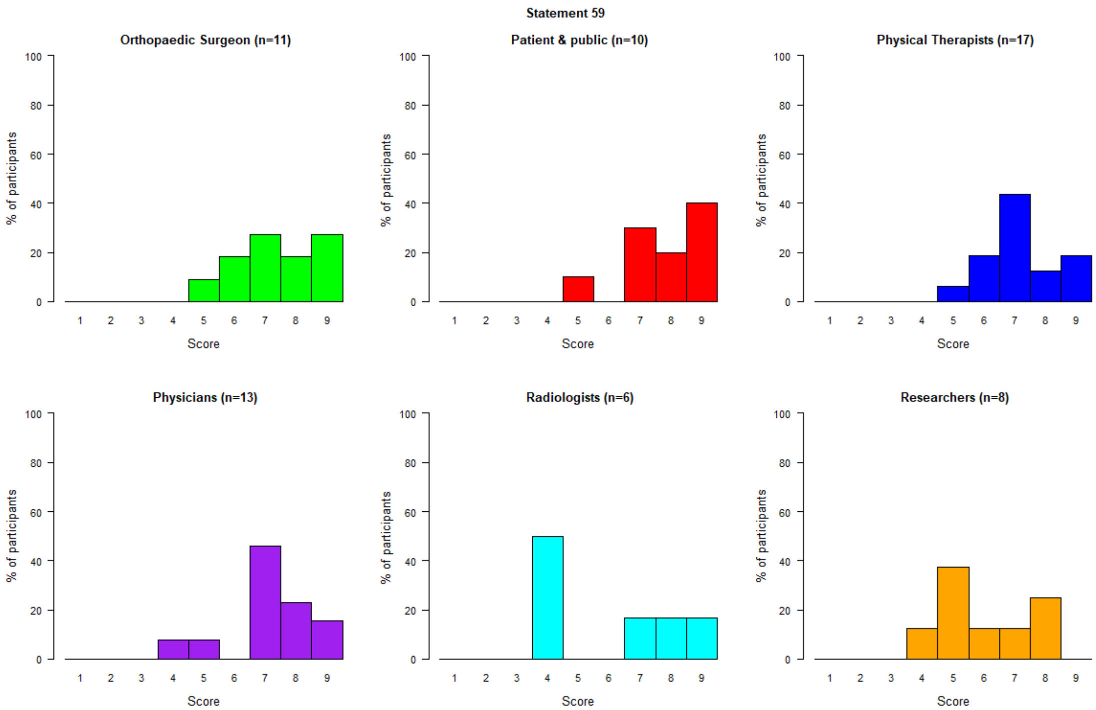
I do not agree that the concept of Primary and secondary CAM is commonly agreed and established



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	9
Patient & Public In	9	7	9
Physical Therapists	7	7	9
Physicians	7	6	8
Radiologists	6	4	8
Researchers	5	5	6

Percentage panelists that scored the statement as critical	66.7%
Percentage panelists that scored the statement as not important	3.2%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
4	9	Second webinar informations
3	4	This isn't as important as some of the other research priorities but I value the desire to study benefit/harm tradeoffs
6	7	calibration from the other disciplines
6	8	influenced by scores from other respondents
1	4	I think screening is not usefull; but since is was a bit out of range to others I changed it.
7	6	minor adjustment
7	6	new literature

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	9	7	6	9
Patient & Public In	9	7	9	8	7	9
Physical Therapists	7	7	9	7	7	8
Physicians	7	6	8	7	7	8

Radiologists	6	4	8	6	4	8
Researchers	5	5	6	6	5	8

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	66.7%	71.9%
Percentage panelists that scored the statement as not important	3.2%	0%
RESULT	**NO CONSENSUS**	**CONSENSUS IN**

Statement 60: Studies involving economic evaluation to determine the cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to primary cam morphology

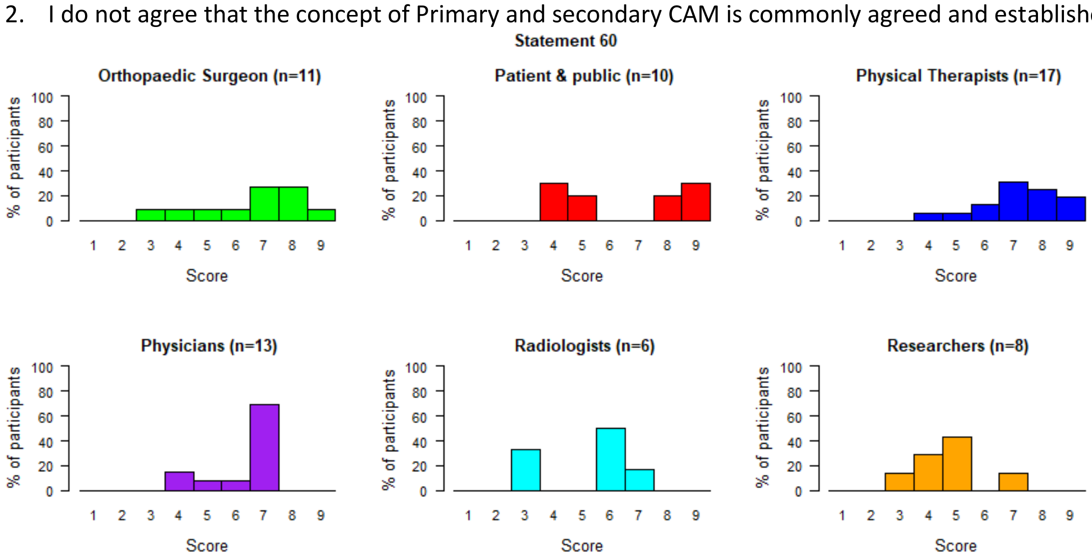
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Kemp et al (2019) – Research Recommendation 1. Reporting of exercise programmes. Exercise descriptors such as load magnitude, number of repetitions and sets, duration of whole programme, duration of contractile element of exercise, duration of one repetition, time under tension, rest between repetitions, range of motion through which the exercise is performed and rest between exercise sessions should be considered and reported. The primary goal of studies examining physiotherapist-led exercise therapies for hip-related pain is to develop and then test the most effective exercises for the condition. When developing effective and tailored treatment programmes, the mechanistic effect of particular elements of the exercises on the target muscles and surrounding tissues is considered.

RESULTS: ROUND 1

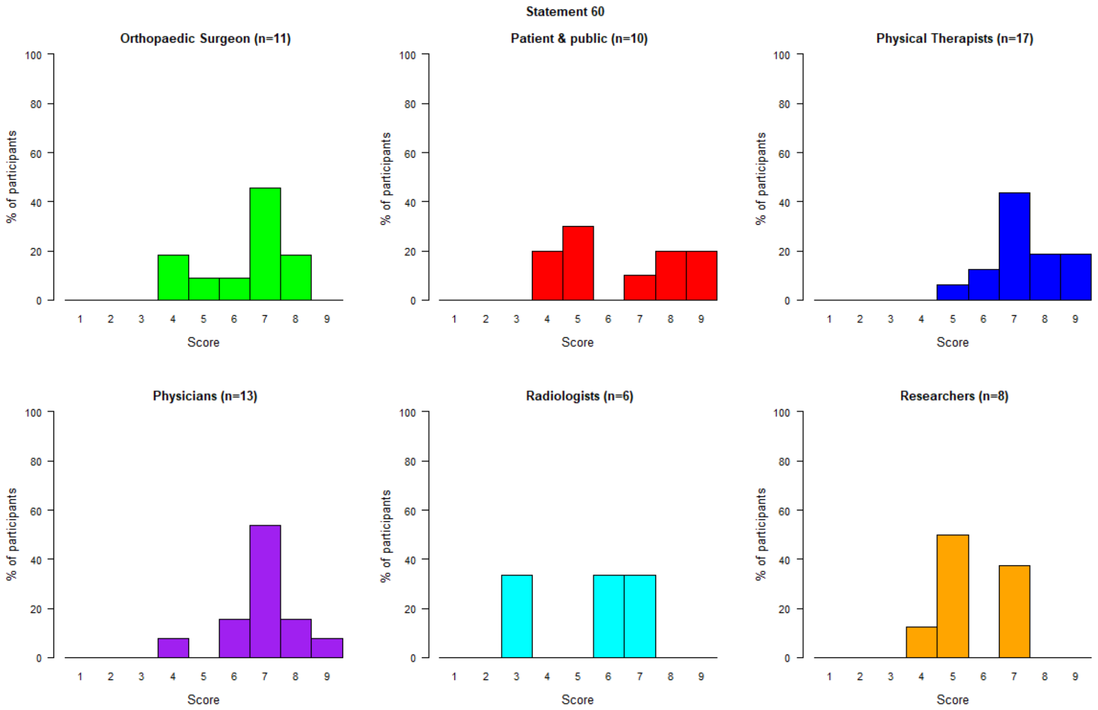
1. Maybe once we've established more information; then we can worry about optimising costs of associated treatments; etc.
2. I do not agree that the concept of Primary and secondary CAM is commonly agreed and established



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	5	8
Patient & Public In	7	4	9
Physical Therapists	7	7	8
Physicians	7	6	7
Radiologists	6	3	6
Researchers	5	4	5

Percentage panelists that scored the statement as critical	55.6%
Percentage panelists that scored the statement as not important	6.3%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
4	9	Second webinar informations
3	4	same as before; I think more of the mechanistic studies will be most helpful to initially move this field forward; though important down the road
6	7	Initial misevaluation of the importance of the statement

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	5	8	7	5	7
Patient & Public In	7	4	9	6	5	8

Physical Therapists	7	7	8	7	7	8
Physicians	7	6	7	7	7	7
Radiologists	6	3	6	6	3	7
Researchers	5	4	5	5	5	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	55.6%	62.5%
Percentage panelists that scored the statement as not important	6.3%	3.1%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Statement 61: Qualitative/ Mixed-methods studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of primary cam morphology stakeholders (e.g., but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers);

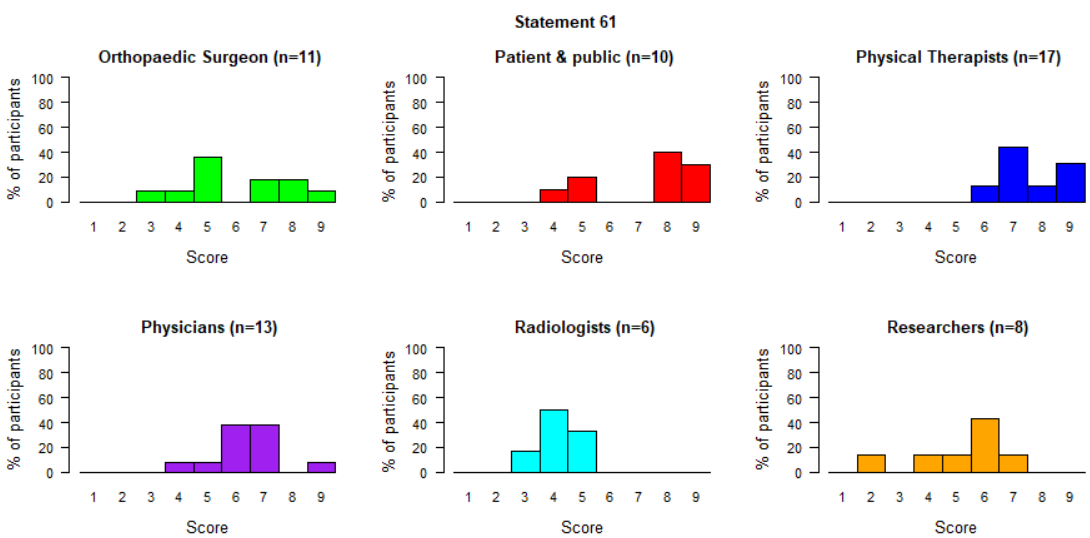
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the source of pain in FAI? Warwick agreement: What are the return to sport criteria following FAI surgery [or physiotherapy directed exercise program]? Kemp et al (2019) – Research Recommendation 2. Development of high-quality exercise programmes. Research should investigate the optimal frequency, intensity, time, type, volume and progression of exercise therapy. Exercise-based programmes used in clinical research should include patient input in their design and be appropriately constructed to gain maximal improvements in outcomes. In strength-based treatments, exercise programme require adequate load to gain a strength effect. The frequency, intensity, time, type, volume and progression of exercise therapy may need to be manipulated to gain the desired effect. The expert group recommended that guidelines, such as those developed by the American College of Sports Medicine (ACSM), should be used with the development of strength-based treatments. The group also indicated that fidelity and adherence of exercise programmes were often not suitable to gain the desired effect. Studies evaluating the effectiveness of physiotherapist-led exercise programmes should ensure that treatments are developed and reported using these principles. Kemp et al (2019) – Research Recommendation 3. Research should examine the effect of patient education in people with hip-related pain. To our knowledge, no studies have investigated patient education in people with hip-related pain. We recommended that future studies assess the specific effect of patient education for hip-related pain including content, modes of delivery and the use of innovative technologies to enhance education benefits. Mosler et al (2019) - MEASURES OF PHYSICAL ACTIVITY AND RETRUN TO SPORT: Research recommendation 4: The patient's goals, expectations, physical activity and occupational requirements should be measured using quantitative and qualitative methods. Quantifying patient expectations, and their fulfilment, regarding RTS, physical activity and occupational requirements is important to accurately interpret the efficacy of management of hip-related pain (clinical recommendation 5, Mosler et al, 2019). It is equally important that these measures, in addition to patient satisfaction, be included in studies of interventions for hip-related pain. The IHiPRN participants also recommended in clinical recommendation 4 (Mosler et al, 2019) that physical activity be quantified using objective methods of measurement in people with hip-related pain. This recommendation is equally relevant for hip-related pain research as it is for clinical practice.

RESULTS: ROUND 1

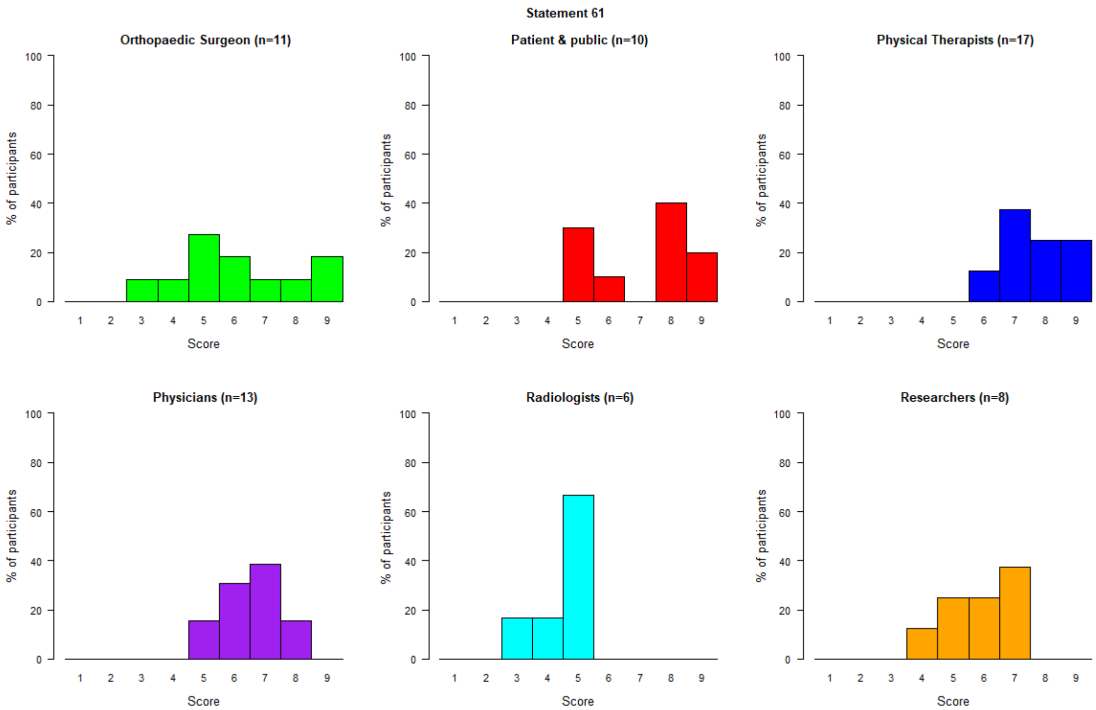
I do not agree that the concept of Primary and secondary CAM is commonly agreed and established



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	5	5	8
Patient & Public In	8	5	9
Physical Therapists	7	7	9
Physicians	6	6	7
Radiologists	4	4	5
Researchers	6	4	6

Percentage panelists that scored the statement as critical	52.4%
Percentage panelists that scored the statement as not important	4.8%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	8	Second webinar informations
2	4	I think understanding the science behind primary cam morphology has greatest potential for impact; but value stakeholder experiences

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	5	5	8	6	5	8
Patient & Public In	8	5	9	8	5	8
Physical Therapists	7	7	9	8	7	9
Physicians	6	6	7	7	6	7
Radiologists	4	4	5	5	4	5
Researchers	6	4	6	6	5	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	52.4%	53.1%
Percentage panelists that scored the statement as not important	4.8%	3.1%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Statement 62: Prospective cohort studies that investigate how pincer morphology develops in different cohorts

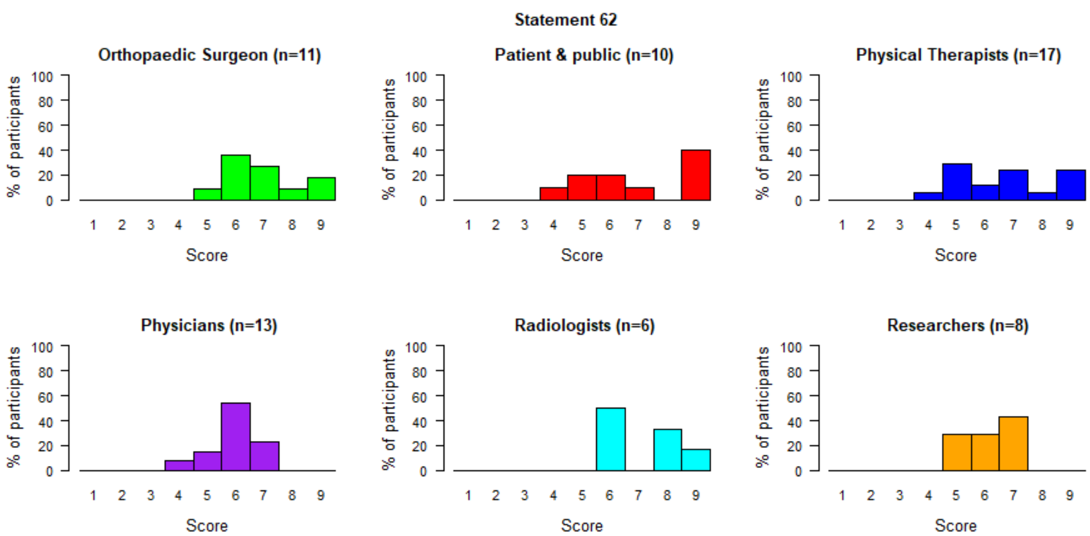
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms? Warwick agreement: What are the best outcome measures to show change following treatment? Warwick agreement: What is the role of structural features in FAI syndrome e.g., Femoral anteversion, capsular tightness? Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.)

Research Priorities

RESULTS: ROUND 1

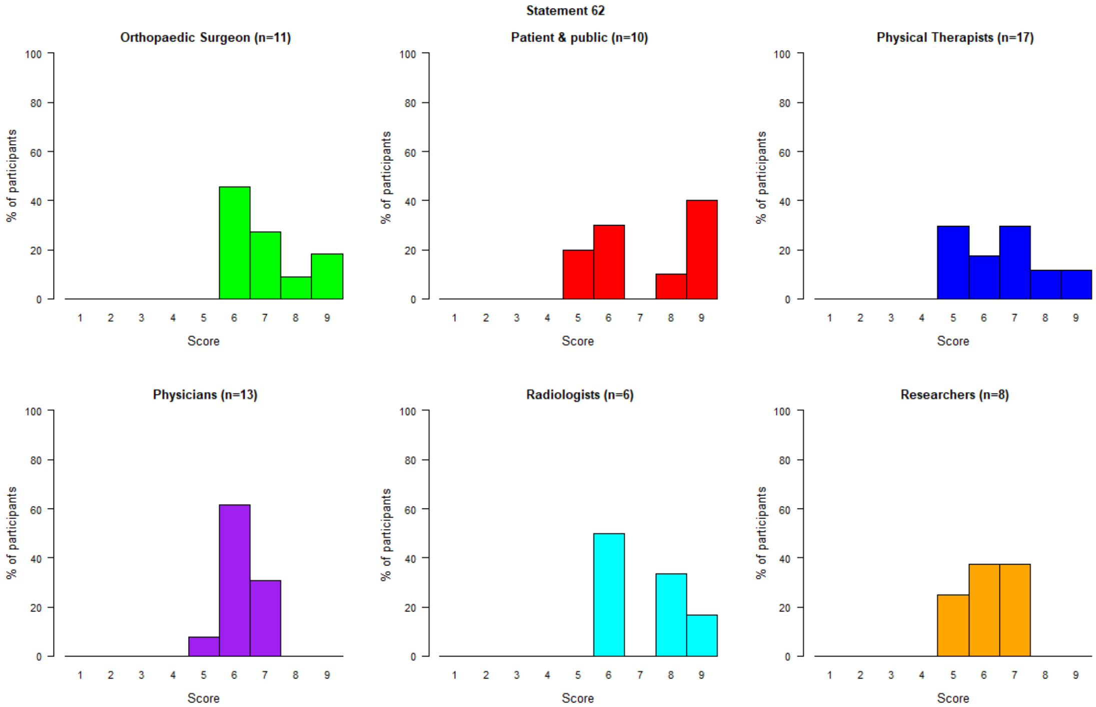


	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	8
Patient & Public In	7	5	9
Physical Therapists	7	5	8
Physicians	6	6	6
Radiologists	7	6	8
Researchers	6	5	7

Percentage panelists that scored the statement as critical	45.3%

Percentage panelists that scored the statement as not important	0%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
4	7	I was too harsh last time: we can't do RCTs so this is a good method
6	8	seeing how my colleagues scored
7	6	I think cam research is more important at the moment

Median, IQR

	ROUND 1			ROUND 2		
	Median	**Percentile 25**	**Percentile 75**	**Median**	**Percentile 25**	**Percentile 75**
Orthopaedic Surgeon	7	6	8	7	6	8
Patient & Public In	7	5	9	7	6	9
Physical Therapists	7	5	8	7	5	7
Physicians	6	6	6	6	6	7
Radiologists	7	6	8	7	6	8

Researchers	6	5	7	6	6	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	45.3%	46.2%
Percentage panelists that scored the statement as not important	0%	0%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Statement 63: Prospective cohort studies that investigate pincer morphology prognosis in different cohorts

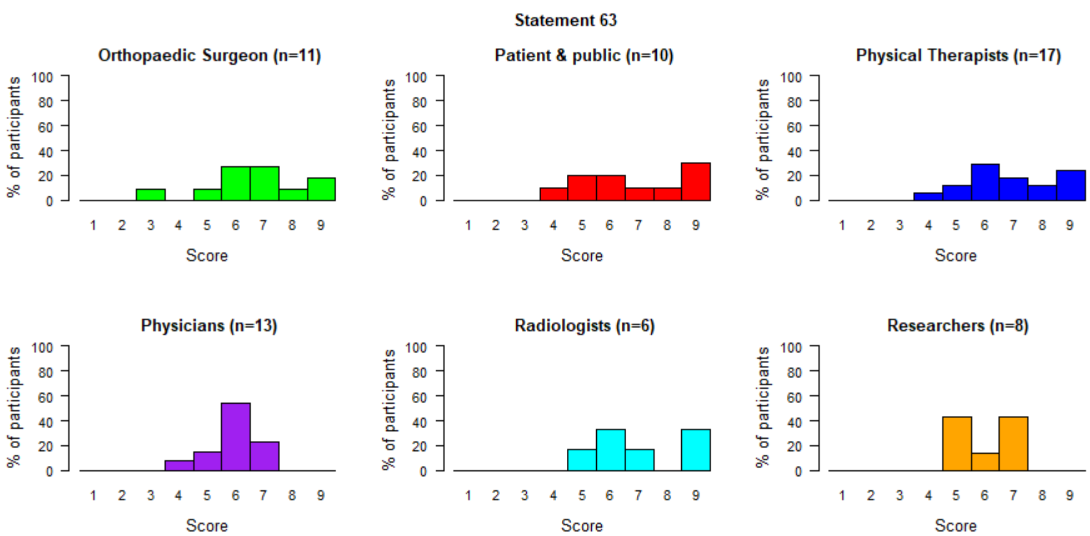
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms? Warwick agreement: What are the best outcome measures to show change following treatment? Warwick agreement: What is the role of structural features in FAI syndrome e.g., Femoral anteversion, capsular tightness? Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.)

RESULTS: ROUND 1

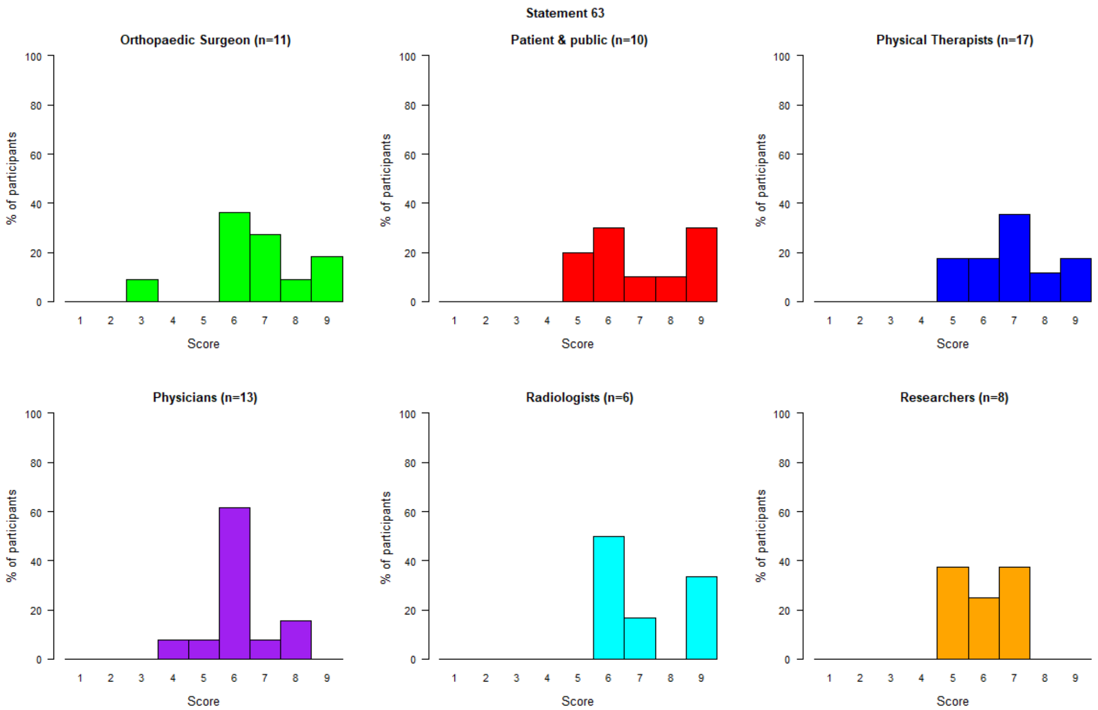
more important than how; s whether it actually matters - i.e. prognosis



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	8
Patient & Public In	7	5	9
Physical Therapists	7	6	8
Physicians	6	6	6
Radiologists	7	6	9
Researchers	6	5	7

Percentage panelists that scored the statement as critical	45.3%
Percentage panelists that scored the statement as not important	1.6%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	I decided we needed to know more about pincer as the evidence is conflicting but not as high a priority as cam morphology
6	7	seeing how my colleagues scored
7	6	I think cam research is more important at the moment

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	8	7	6	8
Patient & Public In	7	5	9	7	6	9
Physical Therapists	7	6	8	7	6	8
Physicians	6	6	6	6	6	6
Radiologists	7	6	9	7	6	9
Researchers	6	5	7	6	5	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	45.3%	47.7%
Percentage panelists that scored the statement as not important	1.6%	1.5%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Statement 64: Prospective cohort studies to investigate risk factors for the development and prognosis of femoroacetabular impingement (FAI) syndrome in different cohorts

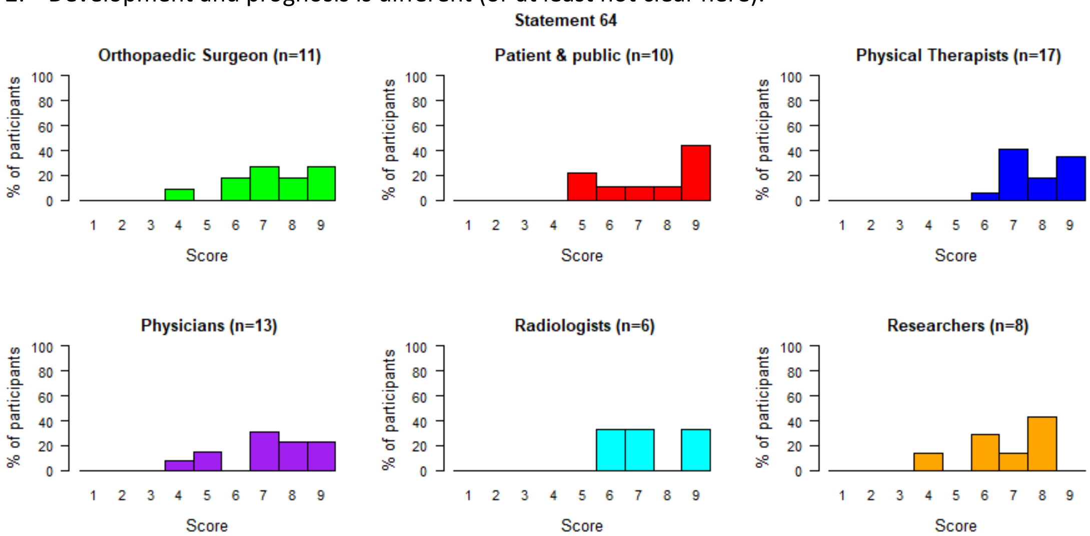
R1: CONSENSUS IN

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms? Warwick agreement: Can rehabilitation prevent FAI pain and if so, how? Warwick agreement: What is the source of pain in FAI? Warwick agreement: What is the role of structural features in FAI syndrome e.g., Femoral anteversion, capsular tightness? Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.

RESULTS: ROUND 1

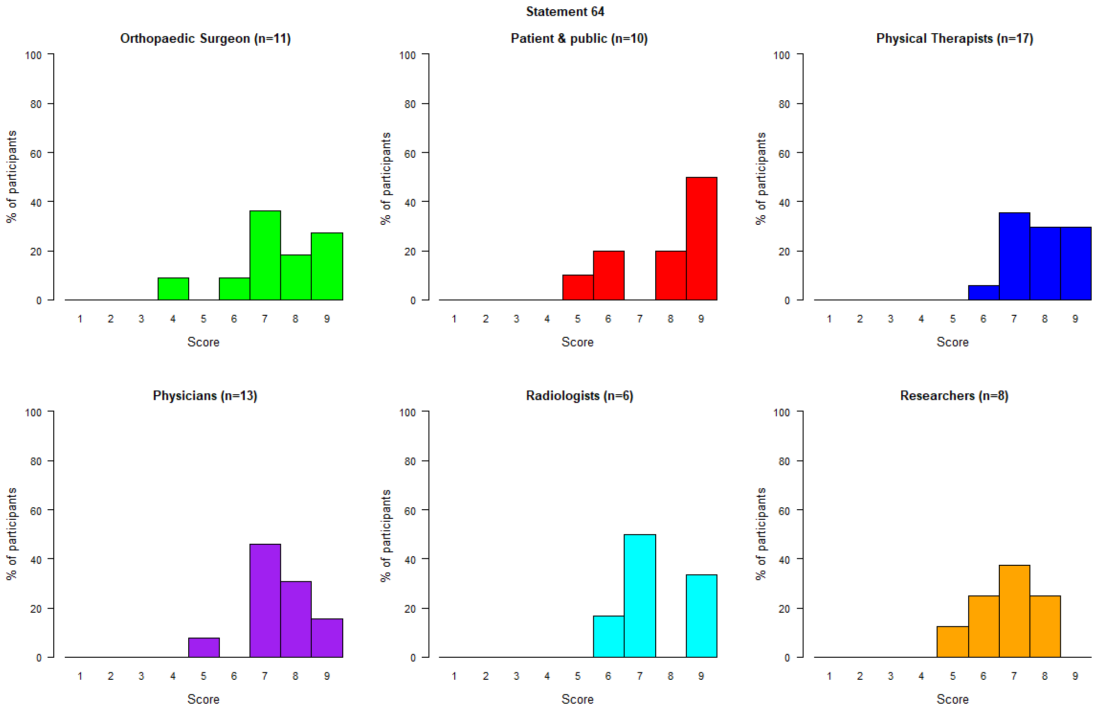
1. I've scored this higher as it includes CAM; and my understanding is that this is more likely to lead to symptomatic concerns; but I feel the more specific questions asked earlier on are more critical.
2. Development and prognosis is different (or at least not clear here).



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	9
Patient & Public In	8	6	9
Physical Therapists	8	7	9
Physicians	7	7	8
Radiologists	7	6	9
Researchers	7	6	8

Percentage panelists that scored the statement as critical	76.2%
Percentage panelists that scored the statement as not important	0%
RESULT	**CONSENSUS IN**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
5	7	calibration from the other disciplines
6	7	to be a bit more in line with others

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	9	7	7	9
Patient & Public In	8	6	9	9	6	9
Physical Therapists	8	7	9	8	7	9
Physicians	7	7	8	7	7	8

Radiologists	7	6	9	7	7	9
Researchers	6	5	7	6	5	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	76.2%	83.1%
Percentage panelists that scored the statement as not important	0%	0%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Statement 65: Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of femoroacetabular impingement syndrome in cohorts with variable loading demands

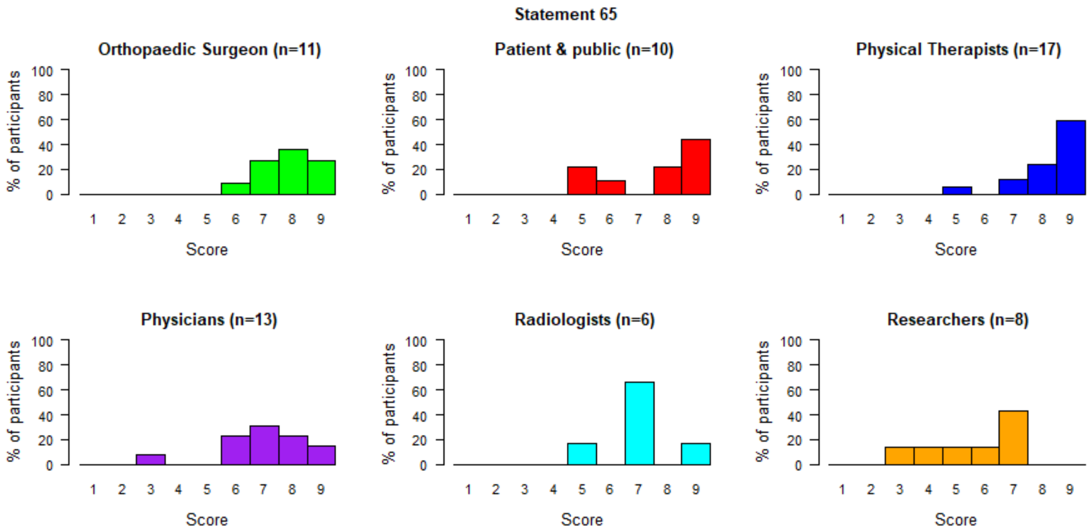
R1: CONSENSUS IN

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the outcome of conservative treatment? Warwick agreement: Which patients respond best to conservative management? Warwick agreement: What is the most effective conservative management program? Warwick agreement: What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms? Warwick agreement: Can rehabilitation prevent FAI pain and if so, how? Warwick agreement: What are the best outcome measures to show change following treatment? Warwick agreement: What are the return to sport criteria following FAI surgery [or physiotherapy directed exercise program]? Impellizzeri et al (2020) - Recommendation 1: The HAGOS and iHOT instruments (long and reduced versions) are the most appropriate PROMs to use in young and middle-aged active adults with hip-related pain. Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.) Kemp et al (2019) – Research Recommendation 1. Reporting of exercise programmes. Exercise descriptors such as load magnitude, number of repetitions and sets, duration of whole programme, duration of contractile element of exercise, duration of one repetition, time under tension, rest between repetitions, range of motion through which the exercise is performed and rest between exercise sessions should be considered and reported. The primary goal of studies examining physiotherapist-led exercise therapies for hip-related pain is to develop and then test the most effective exercises for the condition. When developing effective and tailored treatment programmes, the mechanistic effect of particular elements of the exercises on the target muscles and surrounding tissues is considered. Kemp et al (2019) – Research Recommendation 2. Development of high-quality exercise programmes. Research should investigate the optimal frequency, intensity, time, type, volume and progression of exercise therapy. Exercise-based programmes used in clinical research should include patient input in their design and be appropriately constructed to gain maximal improvements in outcomes. In strength-based treatments, exercise programme require adequate load to gain a strength effect. The frequency, intensity, time, type, volume and progression of exercise therapy may need to be manipulated to gain the desired effect. The expert group recommended that guidelines, such as those developed by the American College of Sports Medicine (ACSM), should be used with the development of strength-based treatments. The group also indicated that fidelity and adherence of exercise programmes were often not suitable to gain the desired effect. Studies evaluating the effectiveness of physiotherapist-led exercise programmes should ensure that treatments are developed and reported using these principles. Kemp et al (2019) – Research Recommendation 5: Research should examine the impact of comorbidities and social determinants on treatment effectiveness in people with hip-related pain. The expert group indicated that comorbidities and social determinants (eg, socioeconomic status, education level) can influence the patient's prognosis as well as the effectiveness of treatment. Comorbidities including chronic pain, insomnia and anxiety increased following hip arthroscopy surgery, although causation was not implied. To date, no studies examining physiotherapist- led treatment for hip-related pain have determined whether comorbidities influence the outcome of treatment or whether they change with treatment. These factors should be examined in future studies exploring physiotherapist-led treatment for hip-related pain. Mosler et al (2019: Research recommendation 5: The Return To Sport (RTS) continuum recommended by the 2016 RTS consensus paper (Ardern et al) should be used in future research. Definitions used in studies examining RTS following management of hip-related pain often consider RTS as a dichotomous variable (yes/no) and fail to distinguish between the differing levels of RTS or consider whether the athlete has successfully returned to their preinjury sporting performance. Two recent studies have applied this graded definition, providing a more nuanced picture of RTS expectations for patients following hip arthroscopy. The 2016 consensus statement on RTS introduced the concept of RTS being considered a continuum through which an athlete progresses during the rehabilitation process. Mosler et al (2019: Research recommendation 6: Future research is required to quantify, and report return to physical activity (including sport and occupation) following management of hip-related pain. Mosler et al (2019) - Research recommendation 7: Research is recommended to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain.

RESULTS: ROUND 1

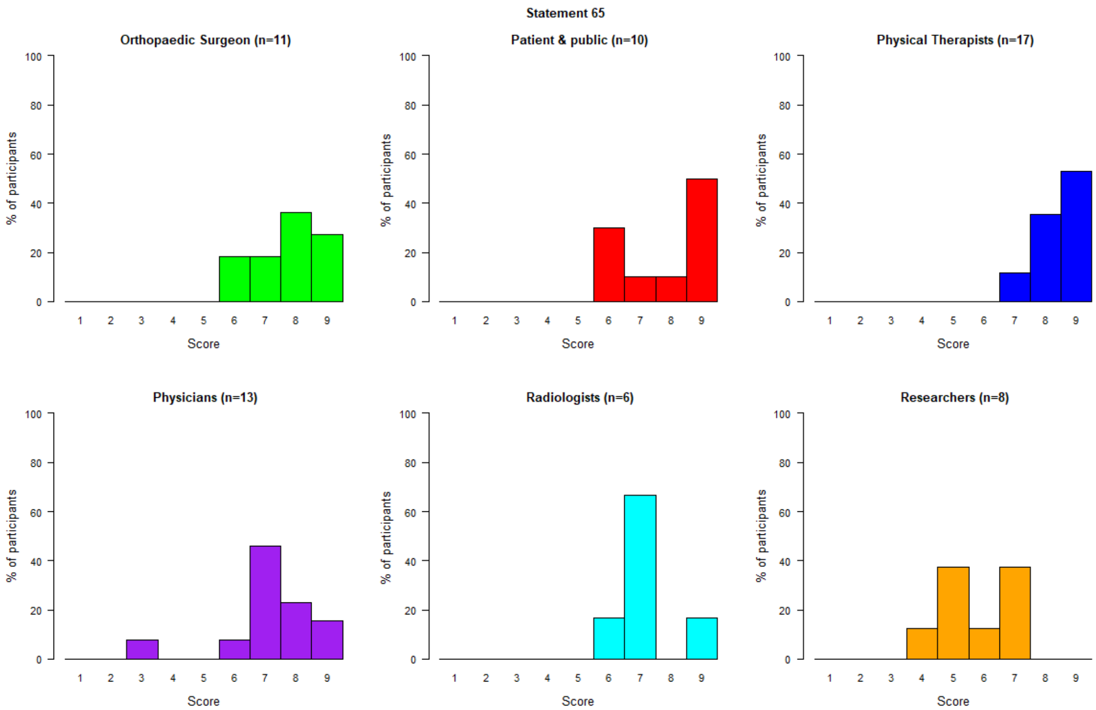
1. One first need to determine the extent of the problem before moving on to RCTs
2. I have never had surgery so may be a bit biased towards non-surgical treatments.



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	8	7	9
Patient & Public In	8	6	9
Physical Therapists	9	8	9
Physicians	7	6	8
Radiologists	7	7	7
Researchers	6	4	7

Percentage panelists that scored the statement as critical	77.8%
Percentage panelists that scored the statement as not important	3.2%
RESULT	**CONSENSUS IN**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	I followed the lead of the majority
3	4	I would take an RCT over a cohort study.
7	5	influenced by scores from other respondents

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	8	7	9	8	7	9
Patient & Public In	8	6	9	9	6	9
Physical Therapists	9	8	9	9	8	9
Physicians	7	6	8	7	7	8
Radiologists	7	7	7	7	7	7
Researchers	6	4	7	6	5	7

	Round 1	Round 2

Percentage panelists that scored the statement as critical	77.8%	80%
Percentage panelists that scored the statement as not important	3.2%	1.5%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Statement 66: Randomised controlled clinical trials to investigate best practice physiotherapy vs arthroscopic hip surgery, vs sham surgery, in cohorts with variable loading demands diagnosed with femoroacetabular impingement syndrome

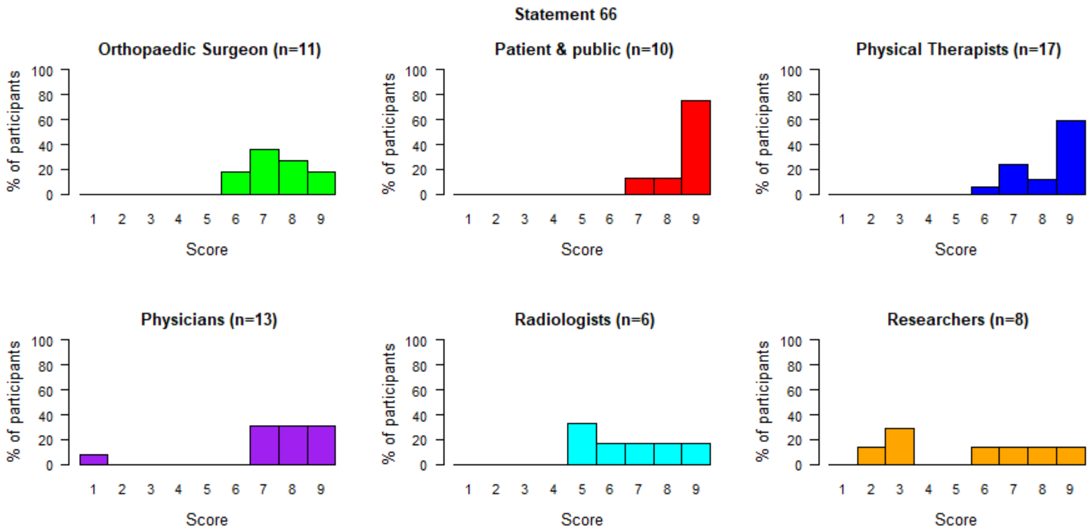
R1: CONSENSUS IN

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: Is surgery or conservative management more effective for improving short- and long-term outcomes? Warwick agreement: What is the outcome of conservative treatment? Warwick agreement: Is FAI surgery more effective than sham surgery? Warwick agreement: Which patients respond best to conservative management? Warwick agreement: Can rehabilitation prevent FAI pain and if so, how? Warwick agreement: What is the source of pain in FAI? Warwick agreement: Does operating on asymptomatic hips (with Cam and/or Pincer morphology) lead to long-term benefits in terms of reducing OA? Warwick agreement: What are the best outcome measures to show change following treatment? Warwick agreement: What is the optimal post-operative rehabilitation program? Warwick agreement: What is the optimal method to treat labral pathology? Warwick agreement: Which factors affect surgical outcomes e.g., pre- and post-operative alpha angle, femoral retroversion, age, sex, OA? Warwick agreement: Does pre-operative rehabilitation improve post-operative outcomes? Warwick agreement: What are the return to sport criteria following FAI surgery [or physiotherapy directed exercise program]? Warwick agreement: Does capsule closure lead to improved patient outcomes? Impellizzeri et al (2020) - Recommendation 1: The HAGOS and iHOT instruments (long and reduced versions) are the most appropriate PROMs to use in young and middle-aged active adults with hip-related pain. Reiman et al (2019) - Research recommendation 2: Future research recommendations: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.) Kemp et al (2019) – Research Recommendation 1. Reporting of exercise programmes. Exercise descriptors such as load magnitude, number of repetitions and sets, duration of whole programme, duration of contractile element of exercise, duration of one repetition, time under tension, rest between repetitions, range of motion through which the exercise is performed and rest between exercise sessions should be considered and reported. The primary goal of studies examining physiotherapist-led exercise therapies for hip-related pain is to develop and then test the most effective exercises for the condition. When developing effective and tailored treatment programmes, the mechanistic effect of particular elements of the exercises on the target muscles and surrounding tissues is considered. Kemp et al (2019) – Research Recommendation 2. Development of high-quality exercise programmes. Research should investigate the optimal frequency, intensity, time, type, volume and progression of exercise therapy. Exercise-based programmes used in clinical research should include patient input in their design and be appropriately constructed to gain maximal improvements in outcomes. In strength-based treatments, exercise programme require adequate load to gain a strength effect. The frequency, intensity, time, type, volume and progression of exercise therapy may need to be manipulated to gain the desired effect. The expert group recommended that guidelines, such as those developed by the American College of Sports Medicine (ACSM), should be used with the development of strength-based treatments. The group also indicated that fidelity and adherence of exercise programmes were often not suitable to gain the desired effect. Studies evaluating the effectiveness of physiotherapist-led exercise programmes should ensure that treatments are developed and reported using these principles. Kemp et al (2019) – Research Recommendation 5: Research should examine the impact of comorbidities and social determinants on treatment effectiveness in people with hip-related pain. The expert group indicated that comorbidities and social determinants (eg, socioeconomic status, education level) can influence the patient's prognosis as well as the effectiveness of treatment. Comorbidities including chronic pain, insomnia and anxiety increased following hip arthroscopy surgery, although causation was not implied. To date, no studies examining physiotherapist- led treatment for hip-related pain have determined whether comorbidities influence the outcome of treatment or whether they change with treatment. These factors should be examined in future studies exploring physiotherapist-led treatment for hip-related pain. Mosler et al (2019: Research recommendation 5: The Return To Sport (RTS) continuum recommended by the 2016 RTS consensus paper (Ardern et al) should be used in future research. Definitions used in studies examining RTS following management of hip-related pain often consider RTS as a dichotomous variable (yes/no) and fail to distinguish between the differing levels of RTS or consider whether the athlete has successfully returned to their preinjury sporting performance. Two recent studies have applied this graded definition, providing a more nuanced picture of RTS expectations for patients following hip arthroscopy. The 2016 consensus statement on RTS introduced the concept of RTS being considered a continuum through which an athlete progresses during the rehabilitation process. Mosler et al (2019: Research recommendation 6: Future research is required to quantify, and report return to physical activity (including sport and occupation) following management of hip-related pain. Mosler et al (2019) - Research recommendation 7: Research is recommended to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain.

RESULTS: ROUND 1

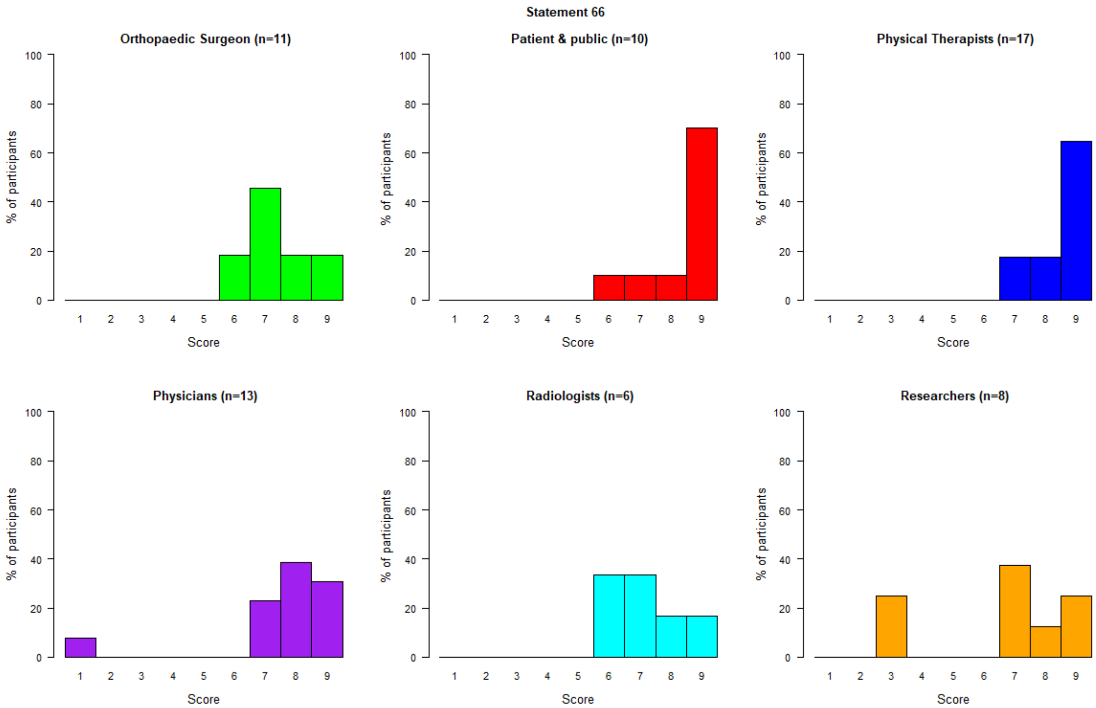
1. or what happens if we leave it - i.e. true control/no treatment
2. we already have 3 trials
3. Before one need to establish what best practice physiotherapy is.
4. See note above about randomised controlled clinical trials.



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	7	8
Patient & Public In	9	9	9
Physical Therapists	9	7	9
Physicians	8	7	9
Radiologists	7	5	8
Researchers	6	3	8

Percentage panelists that scored the statement as critical	82.3%
Percentage panelists that scored the statement as not important	6.5%
RESULT	**CONSENSUS IN**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
3	7	Misread the question first time round
6	7	Happy that this is needed - prefer to leave level of priority to the ENHR process
6	7	to be a bit more in line with others

Median, IQR

	ROUND 1			ROUND 2		
	Median	**Percentile 25**	**Percentile 75**	**Median**	**Percentile 25**	**Percentile 75**
Orthopaedic Surgeon	7	7	8	7	7	8
Patient & Public In	9	9	9	9	8	9
Physical Therapists	9	7	9	9	8	9
Physicians	8	7	9	8	7	9

Radiologists	7	5	8	7	6	8
Researchers	6	3	8	7	5	9

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	82.3%	87.7%
Percentage panelists that scored the statement as not important	6.5%	4.6%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Statement 67: Prospective cohort studies to investigate the prognosis after best practice physiotherapy and/ or arthroscopic hip surgery in different sport/ dance/ physical activity level cohorts with femoroacetabular impingement syndrome

R1: NO CONSENSUS

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: Is surgery or conservative management more effective for improving short- and long-term outcomes? Warwick agreement: What is the source of pain in FAI? Warwick agreement: What are the best outcome measures to show change following treatment? Warwick agreement: What is the optimal method to treat labral pathology? Warwick agreement: Which factors affect surgical outcomes e.g., pre- and post-operative alpha angle, femoral retroversion, age, sex, OA? Warwick agreement: Does pre-operative rehabilitation improve post-operative outcomes? Warwick agreement: What are the return to sport criteria following FAI surgery [or physiotherapy directed exercise program]? Impellizzeri et al (2020) - Recommendation 1: The HAGOS and iHOT instruments (long and reduced versions) are the most appropriate PROMs to use in young and middle-aged active adults with hip-related pain. Kemp et al (2019) – Research Recommendation 1. Reporting of exercise programmes. Exercise descriptors such as load magnitude, number of repetitions and sets, duration of whole programme, duration of contractile element of exercise, duration of one repetition, time under tension, rest between repetitions, range of motion through which the exercise is performed and rest between exercise sessions should be considered and reported. The primary goal of studies examining physiotherapist-led exercise therapies for hip-related pain is to develop and then test the most effective exercises for the condition. When developing effective and tailored treatment programmes, the mechanistic effect of particular elements of the exercises on the target muscles and surrounding tissues is considered. Kemp et al (2019) – Research Recommendation 2. Development of high-quality exercise programmes. Research should investigate the optimal frequency, intensity, time, type, volume and progression of exercise therapy. Exercise-based programmes used in clinical research should include patient input in their design and be appropriately constructed to gain maximal improvements in outcomes. In strength-based treatments, exercise programme require adequate load to gain a strength effect. The frequency, intensity, time, type, volume and progression of exercise therapy may need to be manipulated to gain the desired effect. The expert group recommended that guidelines, such as those developed by the American College of Sports Medicine (ACSM), should be used with the development of strength-based treatments. The group also indicated that fidelity and adherence of exercise programmes were often not suitable to gain the desired effect. Studies evaluating the effectiveness of physiotherapist-led exercise programmes should ensure that treatments are developed and reported using these principles. Mosler et al (2019: Research recommendation 5: The Return To Sport (RTS) continuum recommended by the 2016 RTS consensus paper (Ardern et al) should be used in future research. Definitions used in studies examining RTS following management of hip-related pain often consider RTS as a dichotomous variable (yes/no) and fail to distinguish between the differing levels of RTS or consider whether the athlete has successfully returned to their preinjury sporting performance. Two recent studies have applied this graded definition, providing a more nuanced picture of RTS expectations for patients following hip arthroscopy. The 2016 consensus statement on RTS introduced the concept of RTS being considered a continuum through which an athlete progresses during the rehabilitation process. Mosler et al (2019: Research recommendation 6: Future research is required to quantify, and report return to physical activity (including sport and occupation) following management of hip-related pain. Mosler et al (2019) - Research recommendation 7: Research is recommended to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain.

RESULTS: ROUND 1

I feel this is already covered under an earlier statement on variable loads.

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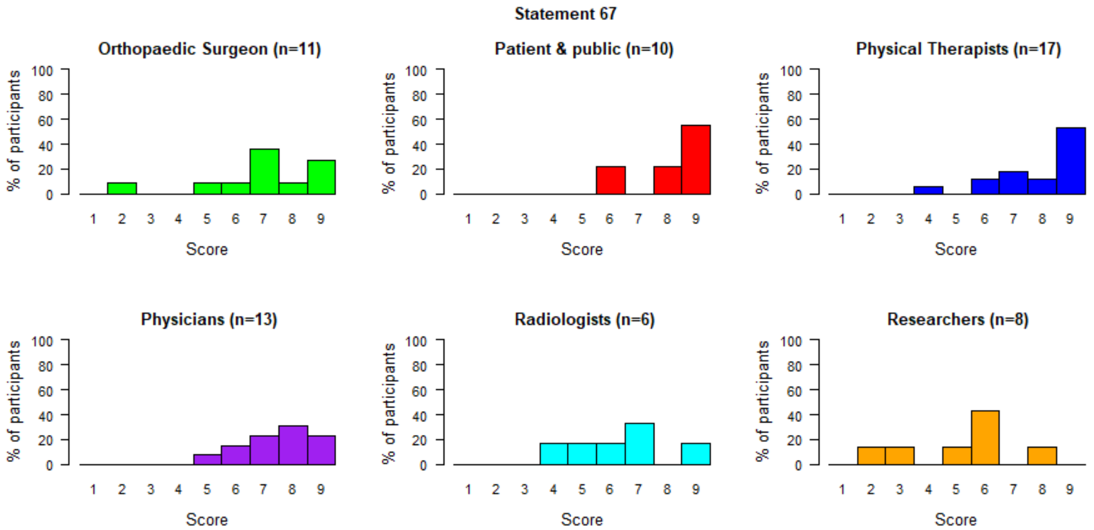
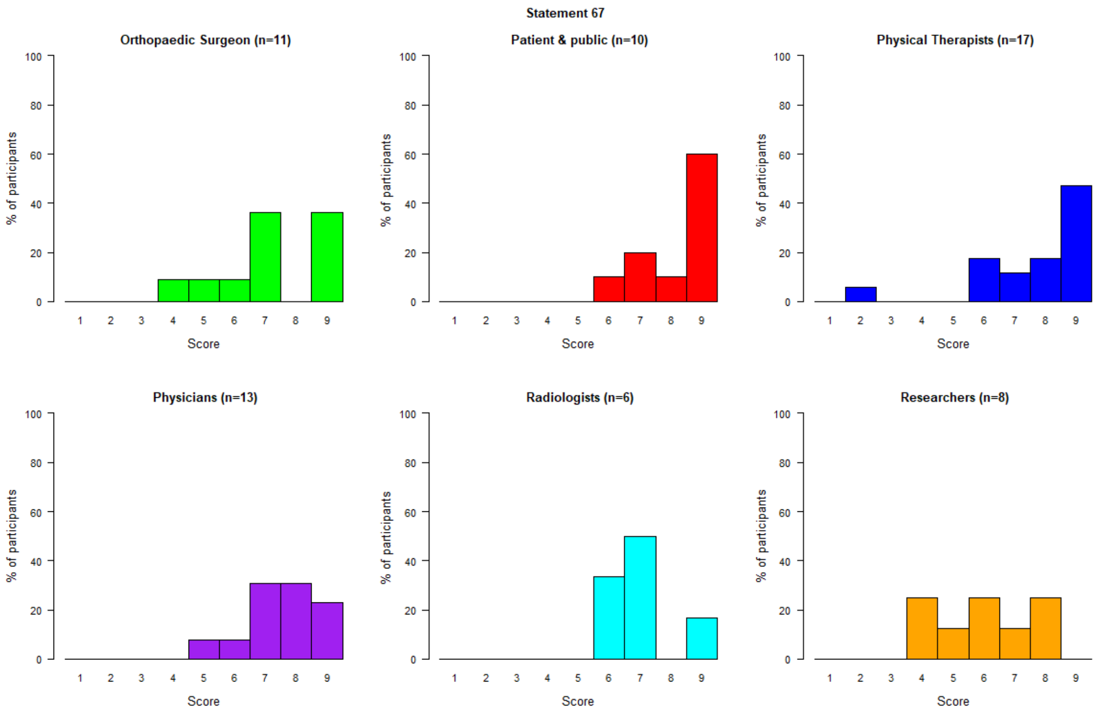


	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	9
Patient & Public In	9	8	9
Physical Therapists	9	7	9
Physicians	8	7	8
Radiologists	7	5	7
Researchers	6	3	6

Percentage panelists that scored the statement as critical	68.3%
Percentage panelists that scored the statement as not important	4.8%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	Agree rather than neutral - more important than I initially graded.
3	4	Researching best practices is somewhat important.
2	4	are we ready for this? Do we know best practice yet such that we can test it in different cohorts?
6	7	Having followed webinar; I think that it is important.
7	6	minor adjustment
9	6	Better with RCT

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	9	7	6	9
Patient & Public In	9	8	9	9	7	9
Physical Therapists	9	7	9	8	7	9
Physicians	8	7	8	8	7	8
Radiologists	7	5	7	7	6	7

Researchers	6	3	6	6	5	8

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	68.3%	73.8%
Percentage panelists that scored the statement as not important	4.8%	1.5%
RESULT	**NO CONSENSUS**	**CONSENSUS IN**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

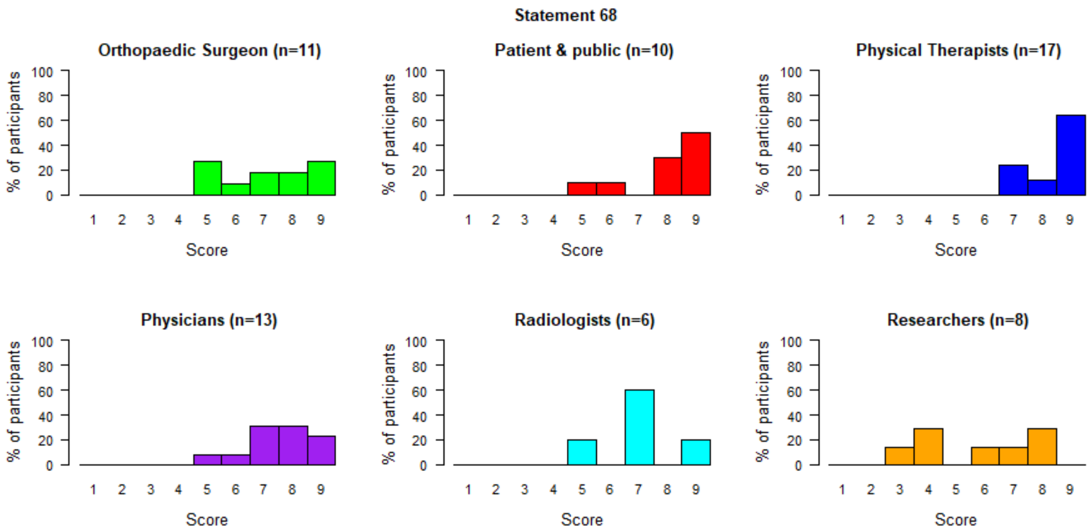
Statement 68: Randomised controlled clinical trials to investigate what best practice physiotherapy is (e.g., in different populations and settings; pre- and post-surgery)
R1: CONSENSUS IN

R2: CONSENSUS IN

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the outcome of conservative treatment? Warwick agreement: Which patients respond best to conservative management? Warwick agreement: What is the most effective conservative management program? Warwick agreement: What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms? Warwick agreement: Can rehabilitation prevent FAI pain and if so, how? Warwick agreement: Does pre-operative rehabilitation improve post-operative outcomes? Warwick agreement: What are the return to sport criteria following FAI surgery [or physiotherapy directed exercise program]? Kemp et al (2019) – Research Recommendation 1. Reporting of exercise programmes. Exercise descriptors such as load magnitude, number of repetitions and sets, duration of whole programme, duration of contractile element of exercise, duration of one repetition, time under tension, rest between repetitions, range of motion through which the exercise is performed and rest between exercise sessions should be considered and reported. The primary goal of studies examining physiotherapist-led exercise therapies for hip-related pain is to develop and then test the most effective exercises for the condition. When developing effective and tailored treatment programmes, the mechanistic effect of particular elements of the exercises on the target muscles and surrounding tissues is considered. Kemp et al (2019) – Research Recommendation 2. Development of high-quality exercise programmes. Research should investigate the optimal frequency, intensity, time, type, volume and progression of exercise therapy. Exercise-based programmes used in clinical research should include patient input in their design and be appropriately constructed to gain maximal improvements in outcomes. In strength-based treatments, exercise programme require adequate load to gain a strength effect. The frequency, intensity, time, type, volume and progression of exercise therapy may need to be manipulated to gain the desired effect. The expert group recommended that guidelines, such as those developed by the American College of Sports Medicine (ACSM), should be used with the development of strength-based treatments. The group also indicated that fidelity and adherence of exercise programmes were often not suitable to gain the desired effect. Studies evaluating the effectiveness of physiotherapist-led exercise programmes should ensure that treatments are developed and reported using these principles. Kemp et al (2019) – Research Recommendation 5: Research should examine the impact of comorbidities and social determinants on treatment effectiveness in people with hip-related pain. The expert group indicated that comorbidities and social determinants (eg, socioeconomic status, education level) can influence the patient's prognosis as well as the effectiveness of treatment. Comorbidities including chronic pain, insomnia and anxiety increased following hip arthroscopy surgery, although causation was not implied. To date, no studies examining physiotherapist- led treatment for hip-related pain have determined whether comorbidities influence the outcome of treatment or whether they change with treatment. These factors should be examined in future studies exploring physiotherapist-led treatment for hip-related pain. Mosler et al (2019: Research recommendation 5: The Return To Sport (RTS) continuum recommended by the 2016 RTS consensus paper (Ardern et al) should be used in future research. Definitions used in studies examining RTS following management of hip-related pain often consider RTS as a dichotomous variable (yes/no) and fail to distinguish between the differing levels of RTS or consider whether the athlete has successfully returned to their preinjury sporting performance. Two recent studies have applied this graded definition, providing a more nuanced picture of RTS expectations for patients following hip arthroscopy. The 2016 consensus statement on RTS introduced the concept of RTS being considered a continuum through which an athlete progresses during the rehabilitation process. Mosler et al (2019: Research recommendation 6: Future research is required to quantify, and report return to physical activity (including sport and occupation) following management of hip-related pain. Mosler et al (2019) - Research recommendation 7: Research is recommended to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain.

RESULTS: ROUND 1

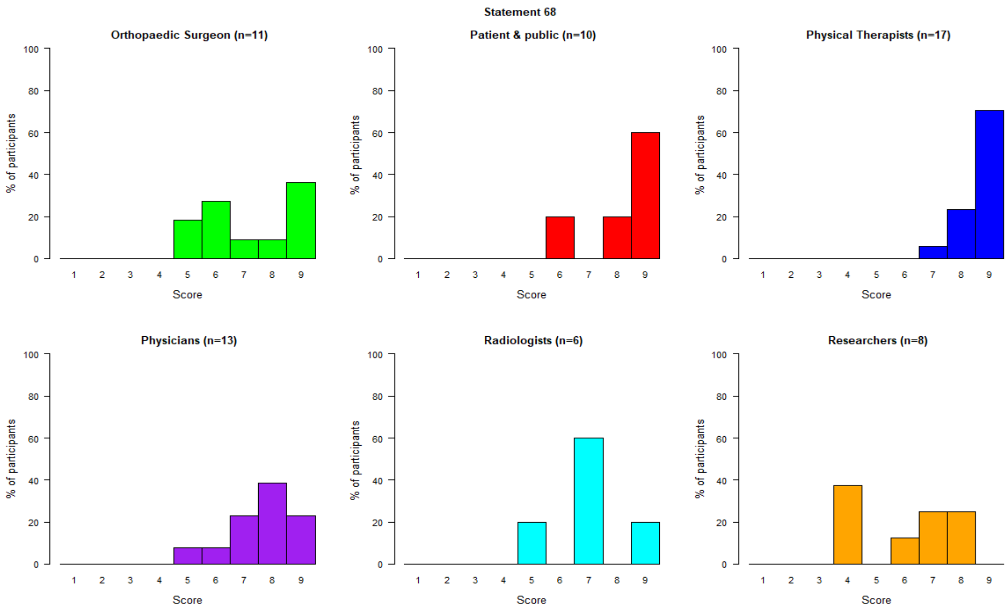
Strongly agree w this. My experience of physiotherapy as an elite athlete was v mixed - some good; some poor.



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	5	9
Patient & Public In	9	8	9
Physical Therapists	9	8	9
Physicians	8	7	8
Radiologists	7	7	7
Researchers	6	4	8

Percentage panelists that scored the statement as critical	79.4%
Percentage panelists that scored the statement as not important	1.6%
RESULT	**CONSENSUS IN**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
3	4	RCTs are gold standard; but not sure the field is ready for them

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	5	9	7	6	9
Patient & Public In	9	8	9	9	8	9
Physical Therapists	9	8	9	9	8	9
Physicians	8	7	8	8	7	8
Radiologists	7	7	7	7	7	7
Researchers	6	4	8	7	4	8

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	79.4%	78.1%
Percentage panelists that scored the statement as not important	1.6%	0%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Statement 69: Studies to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain

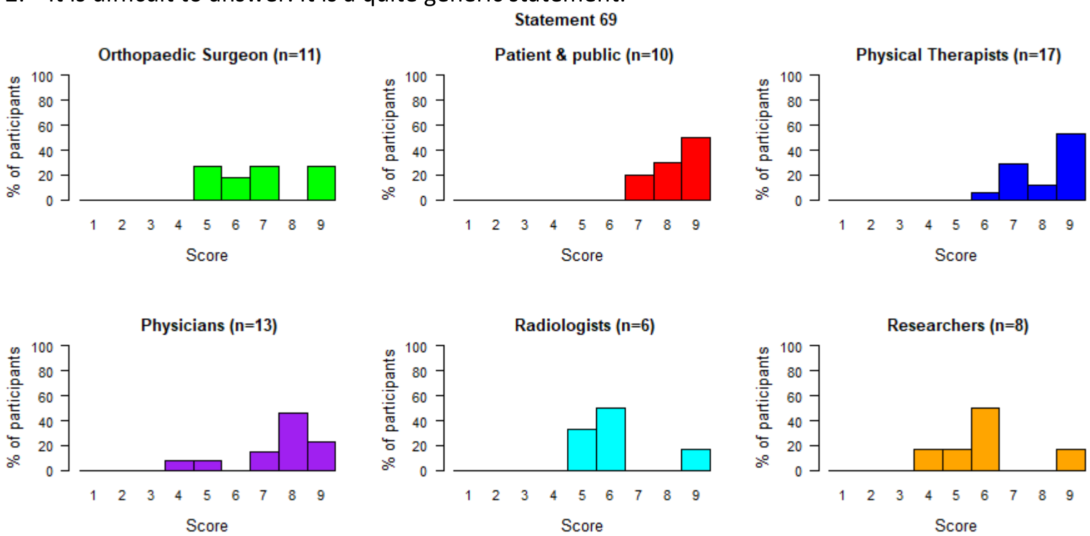
R1: CONSENSUS IN

R2: CONSENSUS IN

HELPTEXT: Mosler et al (2019) - Research recommendation 7: Research is recommended to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain. Several studies have reported RTS criteria following hip arthroscopy (refer to online supplementary appendix, Mosler et al, 2019). However, there have been no reports of RTS criteria following non-surgical management of hip-related pain. There is also evidence that clinicians vary considerably in how they weight the importance of various outcome measures that may influence the RTS decision. Readiness to RTS should take into account the individual patient and the physical and psychological demands of the sport. Psychological readiness has rarely been considered in published data on RTS following hip surgery. Clearly, a significant gap exists in the literature with respect to standardised RTS criteria following management of hip-related pain, and this was identified as a future research priority by the IHiPRN participants

RESULTS: ROUND 1

1. As an elite athlete worries about RTS (which was my living) caused major anxiety for me so this is important.
2. It is difficult to answer. It is a quite generic statement.



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	5	9
Patient & Public In	9	8	9
Physical Therapists	9	7	9
Physicians	8	7	8
Radiologists	6	5	6
Researchers	6	5	6

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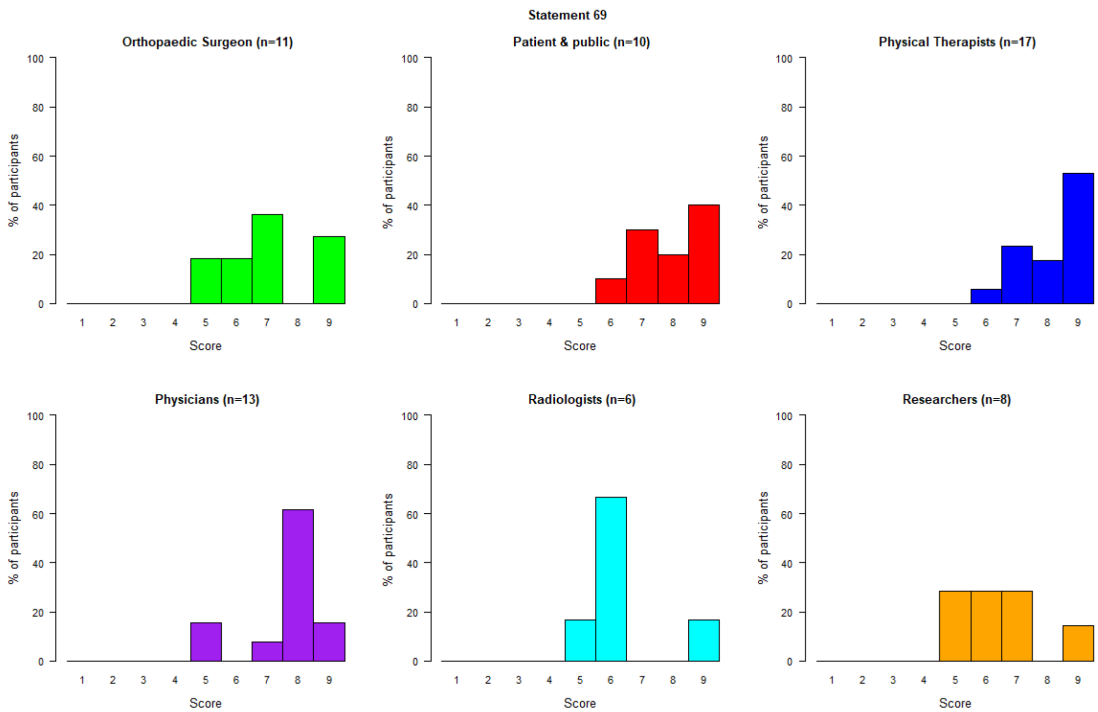
Percentage panelists that scored the statement as critical	71.4%
Percentage panelists that scored the statement as not important	0%
RESULT	**CONSENSUS IN**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	Happy that this is needed - prefer to leave level of priority to the ENHR process
6	7	influenced by scores from other respondents
9	6	Important but other issues may be more important.

Median, IQR

	ROUND 1			ROUND 2		
	Median	**Percentile 25**	**Percentile 75**	**Median**	**Percentile 25**	**Percentile 75**
Orthopaedic Surgeon	7	5	9	7	6	9
Patient & Public In	9	8	9	8	7	9
Physical Therapists	9	7	9	9	7	9

Physicians	8	7	8	8	8	8
Radiologists	6	5	6	6	6	6
Researchers	6	5	6	6	5	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	71.4%	73.4%
Percentage panelists that scored the statement as not important	0%	0%
RESULT	**CONSENSUS IN**	**CONSENSUS IN**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Statement 70: Studies to investigate, report and improve the psychometric properties of tests of (1) range of motion, (2) muscle strength (3) functional performance (4) Quality of Life (QOL) and other psychological outcomes for studies on aetiology, diagnosis, treatment and prognosis

R1: NO CONSENSUS

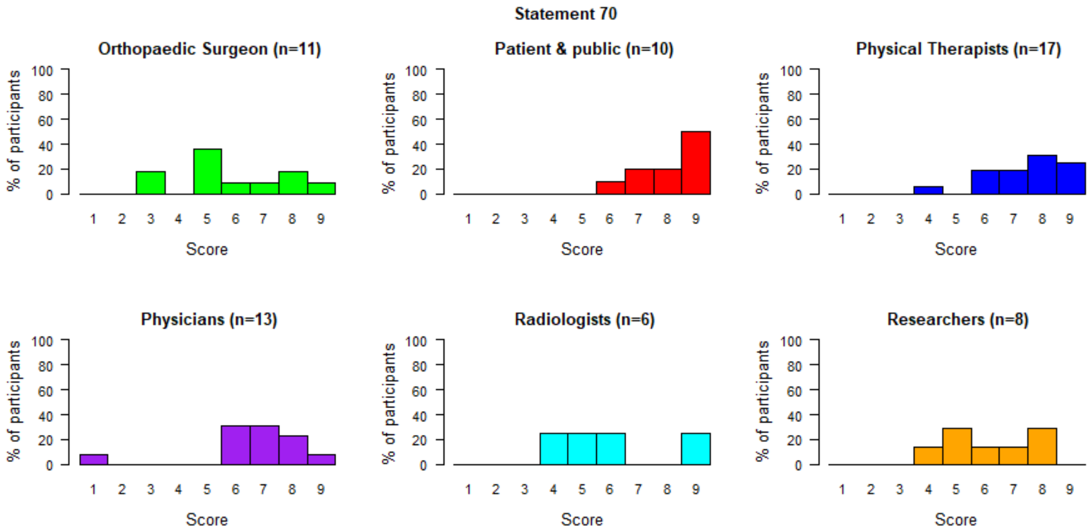
R2: NO CONSENSUS

HELPTEXT: Mosler et al (2019) - CLINICAL MEASURES: Research recommendation 1: Further research should investigate, report and improve the measurement properties of tests of range of motion, muscle strength and functional performance. There are multiple areas of uncertainty regarding measurement of hip range of motion. These areas included: the use of active versus passive movements, examination of only pain-free range, optimal stabilisation methods, and whether mechanical devices, such as the hip internal rotation examination chair, are required to improve accuracy and reliability. The IHiPRN participants also discussed whether side-to- side comparisons in symptomatic individuals were acceptable for research purposes or comparisons be limited to asymptomatic individuals, as the clinical interpretation of differences between symptomatic and asymptomatic limbs is currently unclear. High-quality studies that follow the minimal reporting standards for clinical research are required to clarify these areas of uncertainty. Specifically, clear diagnostic inclusion criteria for the participants of the study should be reported, and a detailed description provided of all measurement methods (including clinimetric properties) and instruments used in the study. The literature review provided clearer guidance for standardised methods of measurement of hip muscle strength in people with hip-related pain. However, reporting of intertester reliability and measurement error is currently lacking. Therefore, high-quality studies are needed to examine and report the clinimetric properties of measurement methods for hip muscle strength and investigate the validity of strength testing in symptomatic populations. There was considerable discussion of methods measuring functional performance to be recommended for clinical and research purposes. Since people with hip-related pain demonstrate reduced squat depth and have impaired performance on single-leg balance tasks and the SEBT, these tests are recommended to be included in clinical research in this area. There is limited and conflicting evidence that hopping performance is impaired in this patient population, and further high-quality studies are required to resolve this uncertainty. Furthermore, the IHiPRN participants also discussed that the methods of assessment of functional performance should be adapted to the population of interest. For example, the examination of running technique may be important for a football player, but less so for a swimmer.

Research Priorities

RESULTS: ROUND 1

1. methodological work is underpinning of strong science
2. This question is unclear to me



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	5	5	8
Patient & Public In	9	7	9
Physical Therapists	8	7	9
Physicians	7	6	8
Radiologists	6	5	8
Researchers	6	5	8

Percentage panelists that scored the statement as critical	60.7%
Percentage panelists that scored the statement as not important	4.9%
RESULT	**NO CONSENSUS**

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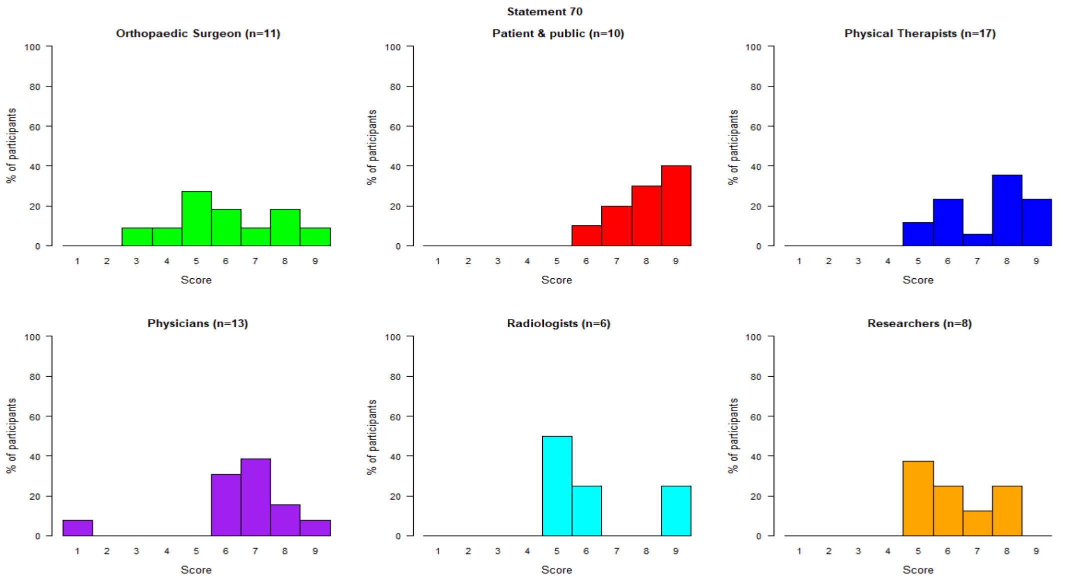
RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
7	6	These are patient outcomes that I deem important to study but clinicians may feel more strongly about some of the other research topics

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	5	5	8	6	5	8
Patient & Public In	9	7	9	8	7	9
Physical Therapists	8	7	9	8	6	8
Physicians	7	6	8	7	6	7
Radiologists	6	5	8	6	5	8
Researchers	6	5	8	6	5	8

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	60.7%	57.1%
Percentage panelists that scored the statement as not important	4.9%	3.2%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Statement 71: Studies to investigate the relationship among movement-related parameters (biomechanics, muscle function), symptoms, function, quality of life, and imaging and intra-articular hip findings in individuals with hip-related pain

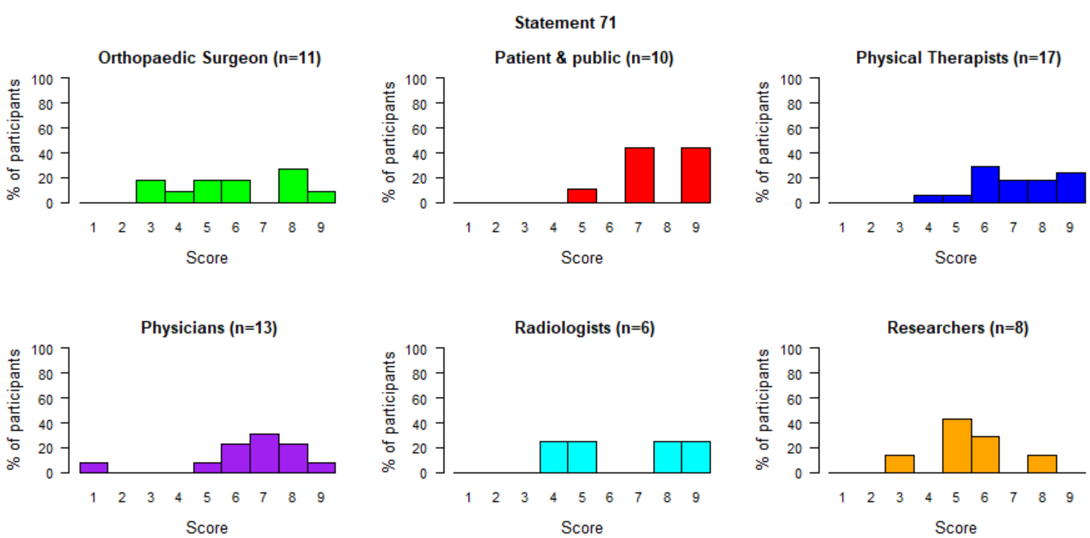
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Mosler et al (2019) - BIOMECHANICS AND MUSCLE FUNCTION: Research recommendation 2: Future research is needed to investigate the relationship among movement-related parameters (biomechanics, muscle function), symptoms, function, quality of life, and imaging and intra-articular findings. Evidence suggests that hip biomechanics are altered in multiple planes in individuals with hip-related pain when compared with asymptomatic controls. Individuals with FAI syndrome walk with a lower peak hip extension angle, peak internal rotation angle, and external rotation joint torque, and squat to a lesser depth despite no difference in peak hip flexion angle compared with individuals without hip-related pain. Individuals with developmental hip dysplasia walk with a lower peak hip extension angle than individuals without pain. However, the relationship between these movement-related parameters and other measures of hip-related pain (symptoms, function, quality of life, imaging and intra-articular findings) is unknown. The evidence is limited, and conflicting, regarding differences in muscle activity between young and middle-aged active adults with hip-related pain and individuals without pain. The evidence is also limited, and inconsistent, regarding differences in muscle size and adiposity of individual muscles in people with hip-related pain compared with those without. To understand how movement-related parameters, including biomechanics and muscle function, may contribute to or result from symptoms, function, quality of life, imaging and intra-articular findings, future research should include measures of each of these parameters to identify the inter-relationships. The method of obtaining and grading imaging and intra-articular findings should be reported in future research on hip-related pain (Reiman et al, 2019). Research recommendation 3: Established minimum reporting standards for movement-related parameters (eg, biomechanics, muscle function) should be followed, or determined as appropriate. The optimal methods for biomechanical and muscle function measurements are currently not established for individuals with hip-related pain, but this aim was beyond the scope of the current consensus meeting. We instead focused on the reporting of these measurements in the literature and found that the lack of consistent reporting limited the ability to critically appraise and reproduce previous studies, which also impeded their inclusion in meta-analyses (online supplementary appendix). Currently, there are no reporting standards for biomechanical measures, although there are recommendations for methods of data collection. Despite established reporting standards for electromyographic data, reporting across studies remains poor (refer to online supplementary appendix, Mosler et al, 2019). For measurement of muscle size and adiposity, there are no reporting standards and the methods of measurement are inconsistent (online supplementary appendix). Thus, it is important that reporting standards should be followed (when available) and should be developed (when not available).

Research Priorities

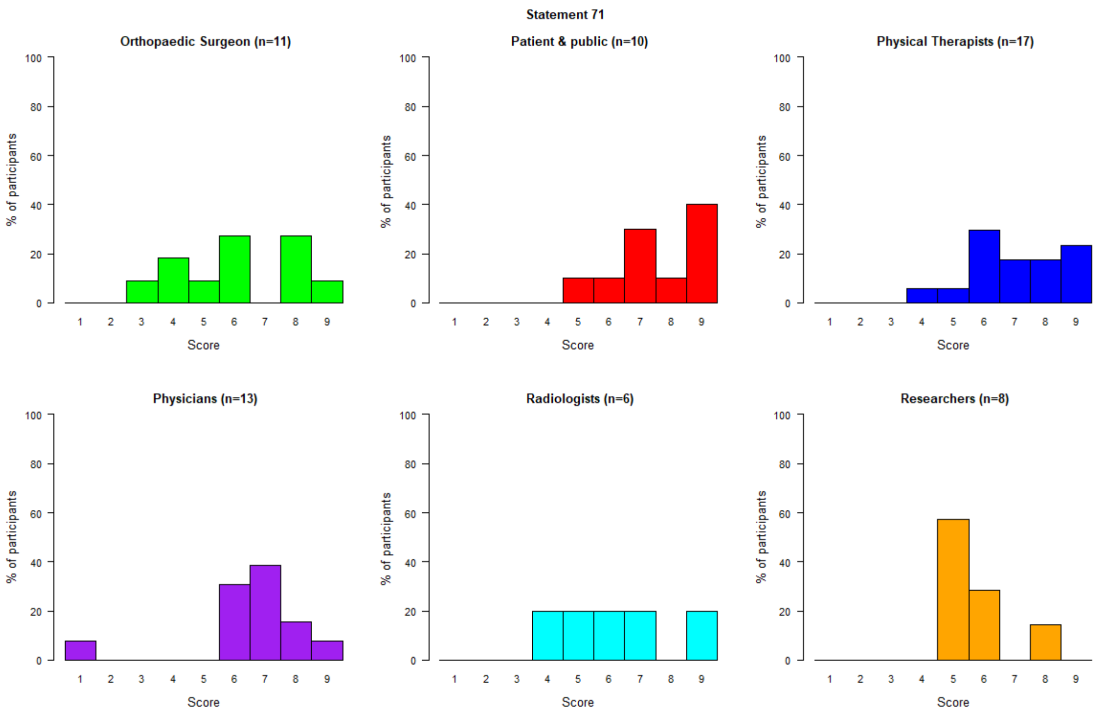
RESULTS: ROUND 1



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	6	4	8
Patient & Public In	7	7	9
Physical Therapists	7	6	8
Physicians	7	6	8
Radiologists	7	5	9
Researchers	5	5	6

Percentage panelists that scored the statement as critical	54.1%
Percentage panelists that scored the statement as not important	6.6%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
3	5	These could be valuable in that primary cam morphology is most likely multifactorial

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	6	4	8	6	4	8
Patient & Public In	7	7	9	8	7	9
Physical Therapists	7	6	8	7	6	8
Physicians	7	6	8	7	6	7
Radiologists	7	5	9	6	5	7
Researchers	5	5	6	5	5	6

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	54.1%	52.4%
Percentage panelists that scored the statement as not important	6.6%	3.2%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Statement 72: Studies (randomised controlled clinical trials; cohort studies; cross sectional studies; qualitative studies) to investigate the clinical effectiveness of other treatments used in people with hip-related pain (hip joint intra-articular injections, analgesic and anti-inflammatory medications, manual therapy adjunctive techniques such as taping, bracing and orthotics)

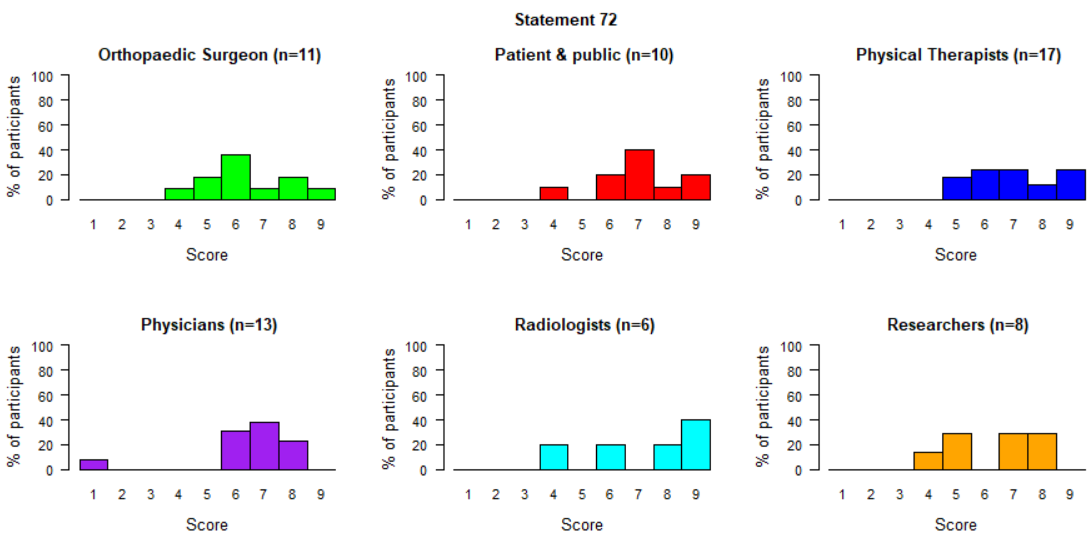
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Kemp et al (2019) – Research Recommendation 4. Research should investigate the effect of other treatments used in people with hip-related pain. Hip joint intra-articular injections, analgesic and anti-inflammatory medications, manual therapy adjunctive techniques such as taping, bracing and orthotics might be used by clinicians; however, their rate of use and clinical effectiveness is unknown. Although the group acknowledged that clinical treatment of hip-related pain is generally multimodal, these adjunct therapies should not replace exercise-based treatment. Further research is required to determine the frequency of use and the effectiveness of adjunct therapies used for hip-related pain.

RESULTS: ROUND 1

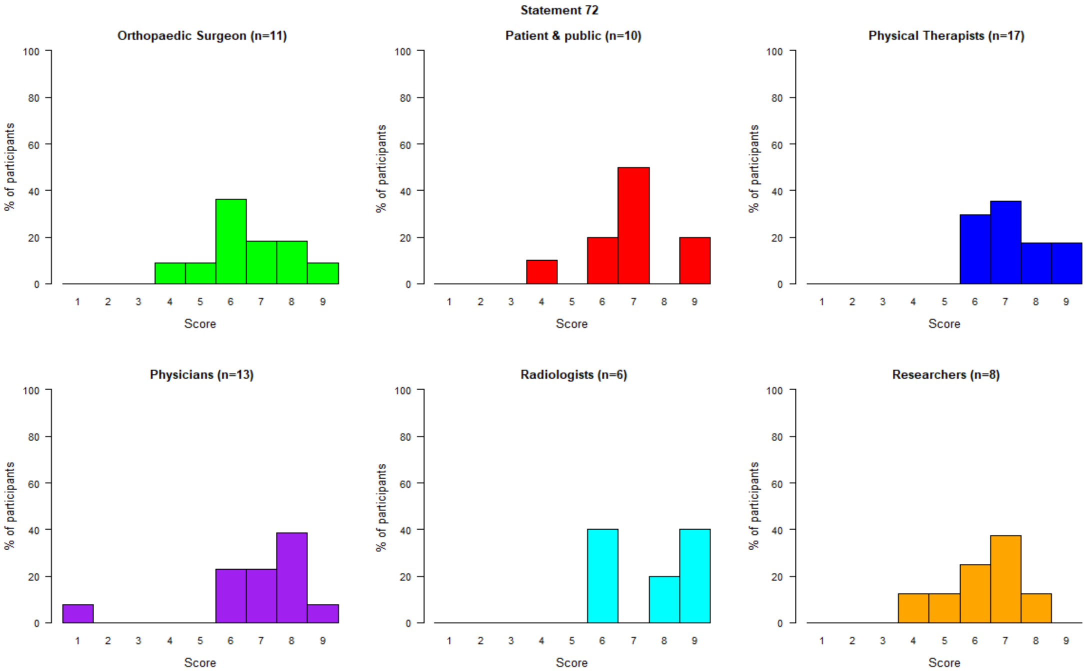
Agree - I always saw surgery as a last resort.



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	6	5	8
Patient & Public In	7	6	8
Physical Therapists	7	6	8
Physicians	7	6	7
Radiologists	8	6	9
Researchers	7	5	8

Percentage panelists that scored the statement as critical	57.1%
Percentage panelists that scored the statement as not important	1.6%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	Happy that this is needed - prefer to leave level of priority to the ENHR process
6	7	new literature

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	6	5	8	6	6	8
Patient & Public In	7	6	8	7	6	7
Physical Therapists	7	6	8	7	6	8
Physicians	7	6	7	7	6	8
Radiologists	8	6	9	8	6	9
Researchers	7	5	8	7	6	7

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	57.1%	62.5%
Percentage panelists that scored the statement as not important	1.6%	1.6%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

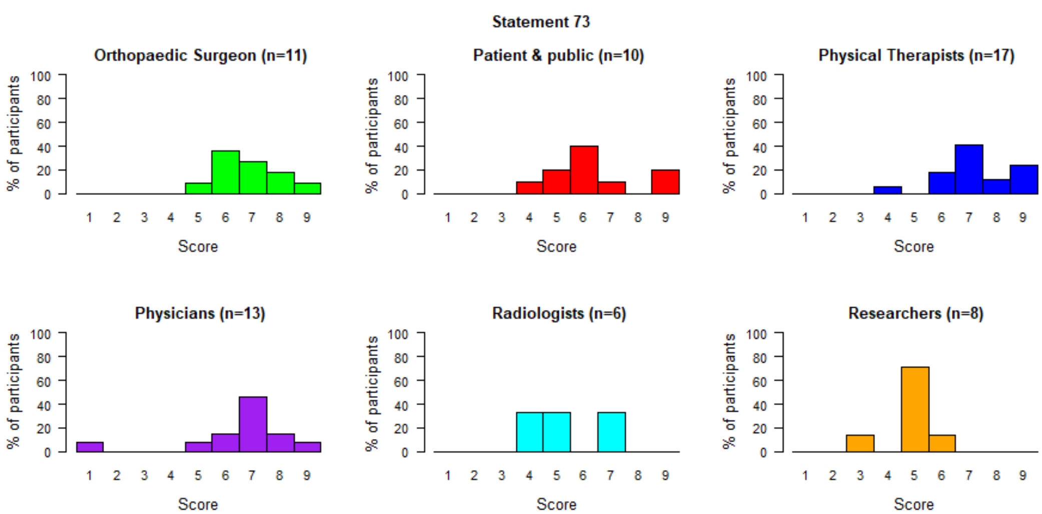
Statement 73: Studies to investigate cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to femoroacetabular impingement syndrome and primary cam morphology

R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the optimal method to treat labral pathology? Warwick: Which factors affect surgical outcomes e.g., pre- and post-operative alpha angle, femoral retroversion, age, sex, OA? Warwick agreement: Does pre-operative rehabilitation improve post-operative outcomes? Kemp et al (2019) – Research Recommendation 1. Reporting of exercise programmes. Exercise descriptors such as load magnitude, number of repetitions and sets, duration of whole programme, duration of contractile element of exercise, duration of one repetition, time under tension, rest between repetitions, range of motion through which the exercise is performed and rest between exercise sessions should be considered and reported. The primary goal of studies examining physiotherapist-led exercise therapies for hip-related pain is to develop and then test the most effective exercises for the condition. When developing effective and tailored treatment programmes, the mechanistic effect of particular elements of the exercises on the target muscles and surrounding tissues is considered.

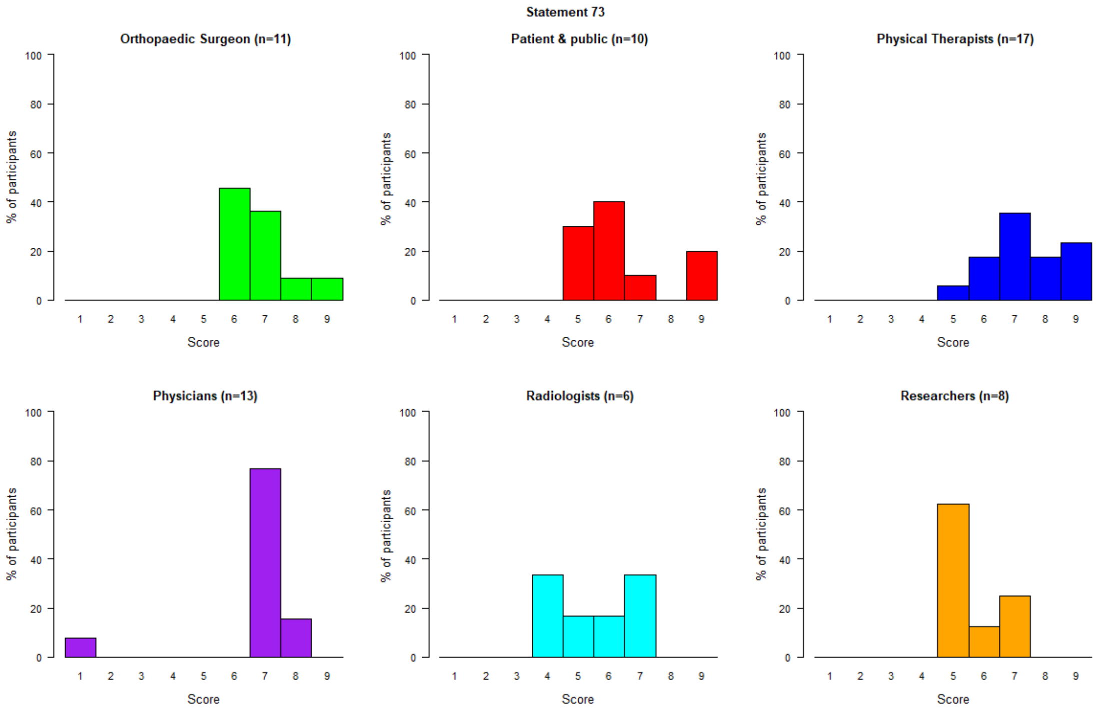
RESULTS: ROUND 1



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	8
Patient & Public In	6	5	7
Physical Therapists	7	7	8
Physicians	7	6	7
Radiologists	5	4	7
Researchers	5	5	5

Percentage panelists that scored the statement as critical	51.6%
Percentage panelists that scored the statement as not important	3.1%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	Second webinar informations
6	7	I think understanding cost-effectiveness is an important aspect to assessing diagnostic; therapeutic interventions
3	5	Cost-effectiveness is less important to me at this stage; but I value its importance to clinicians

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	8	7	6	7
Patient & Public In	6	5	7	6	5	7
Physical Therapists	7	7	8	7	7	8

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Physicians	7	6	7	7	7	7
Radiologists	5	4	7	6	4	7
Researchers	5	5	5	5	5	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	51.6%	58.5%
Percentage panelists that scored the statement as not important	3.1%	1.5%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Statement 74: Qualitative studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of femoroacetabular impingement syndrome (including FAI syndrome and primary cam morphology) stakeholders (e.g., but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers)

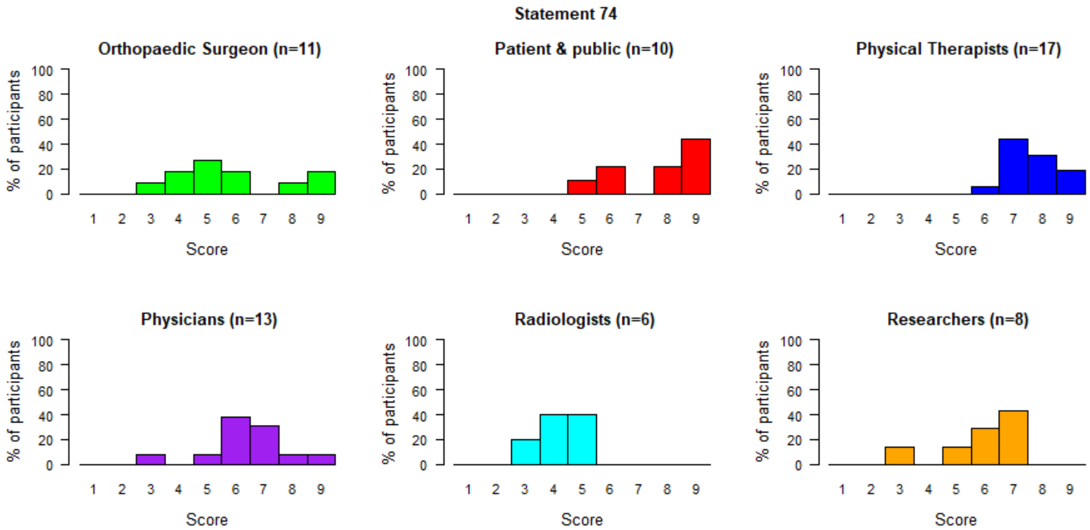
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the source of pain in FAI? Warwick agreement: Which factors affect surgical outcomes e.g., pre- and post-operative alpha angle, femoral retroversion, age, sex, OA? Warwick agreement: Does pre-operative rehabilitation improve post-operative outcomes? Warwick agreement: What are the return to sport criteria following FAI surgery [or physiotherapy directed exercise program]? Kemp et al (2019) – Research Recommendation 1. Reporting of exercise programmes. Exercise descriptors such as load magnitude, number of repetitions and sets, duration of whole programme, duration of contractile element of exercise, duration of one repetition, time under tension, rest between repetitions, range of motion through which the exercise is performed and rest between exercise sessions should be considered and reported. The primary goal of studies examining physiotherapist-led exercise therapies for hip-related pain is to develop and then test the most effective exercises for the condition. When developing effective and tailored treatment programmes, the mechanistic effect of particular elements of the exercises on the target muscles and surrounding tissues is considered. Kemp et al (2019) – Research Recommendation 2. Development of high-quality exercise programmes. Research should investigate the optimal frequency, intensity, time, type, volume and progression of exercise therapy. Exercise-based programmes used in clinical research should include patient input in their design and be appropriately constructed to gain maximal improvements in outcomes. In strength-based treatments, exercise programme require adequate load to gain a strength effect. The frequency, intensity, time, type, volume and progression of exercise therapy may need to be manipulated to gain the desired effect. The expert group recommended that guidelines, such as those developed by the American College of Sports Medicine (ACSM), should be used with the development of strength-based treatments. The group also indicated that fidelity and adherence of exercise programmes were often not suitable to gain the desired effect. Studies evaluating the effectiveness of physiotherapist-led exercise programmes should ensure that treatments are developed and reported using these principles. Mosler et al (2019)- MEASURES OF PHYSICAL ACTIVITY AND RETRUN TO SPORT: Research recommendation 4: The patient's goals, expectations, physical activity and occupational requirements should be measured using quantitative and qualitative methods. Quantifying patient expectations, and their fulfilment, regarding RTS, physical activity and occupational requirements is important to accurately interpret the efficacy of management of hip-related pain (clinical recommendation 5, Mosler et al, 2019). It is equally important that these measures, in addition to patient satisfaction, be included in studies of interventions for hip-related pain. The IHiPRN participants also recommended in clinical recommendation 4 (Mosler et al, 2019) that physical activity be quantified using objective methods of measurement in people with hip-related pain. This recommendation is equally relevant for hip-related pain research as it is for clinical practice. Mosler et al (2019: Research recommendation 5: The Return To Sport (RTS) continuum recommended by the 2016 RTS consensus paper (Ardern et al) should be used in future research. Definitions used in studies examining RTS following management of hip-related pain often consider RTS as a dichotomous variable (yes/no) and fail to distinguish between the differing levels of RTS or consider whether the athlete has successfully returned to their preinjury sporting performance. Two recent studies have applied this graded definition, providing a more nuanced picture of RTS expectations for patients following hip arthroscopy. The 2016 consensus statement on RTS introduced the concept of RTS being considered a continuum through which an athlete progresses during the rehabilitation process. Mosler et al (2019: Research recommendation 6: Future research is required to quantify, and report return to physical activity (including sport and occupation) following management of hip-related pain.

RESULTS: ROUND 1

1. In principle I am in favour of including these kinds of stakeholders. But in reality some have whacky views (like anti-vaxxers) which may not helpfully inform clinical progress.
2. I do not agree that the concept of Primary and secondary CAM is commonly agreed and established



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	5	4	8
Patient & Public In	8	6	9
Physical Therapists	8	7	8
Physicians	6	6	7
Radiologists	4	4	5
Researchers	6	5	7

Percentage panelists that scored the statement as critical	54.1%
Percentage panelists that scored the statement as not important	6.6%
RESULT	NO CONSENSUS

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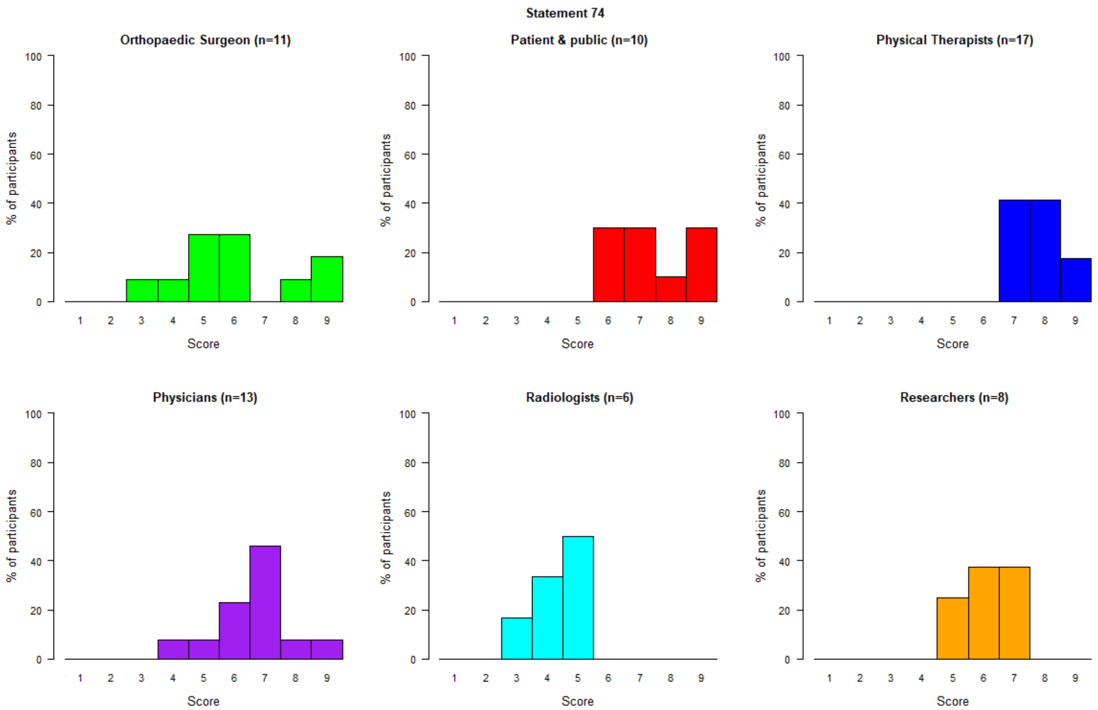
RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	As above
3	5	Again; this type of research is important but don't think it is where we should focus research priorities currently. Moved up to indicate importance
7	6	influenced by scores from other respondents
10	5	on second thought I can answer this

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	5	4	8	6	5	8
Patient & Public In	8	6	9	7	6	9
Physical Therapists	8	7	8	8	7	8
Physicians	6	6	7	7	6	7
Radiologists	4	4	5	5	4	5
Researchers	6	5	7	6	6	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	54.1%	58.5%
Percentage panelists that scored the statement as not important	6.6%	3.1%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Statement 75: Education intervention studies (pilot studies; RCT) in individuals with hip-related pain to assess the specific effect of patient education (in addition to other interventions, e.g., exercise intervention) on pre-defined patient-related outcomes. For education intervention consider content, modes of delivery and the use of innovative technologies to enhance education benefits.

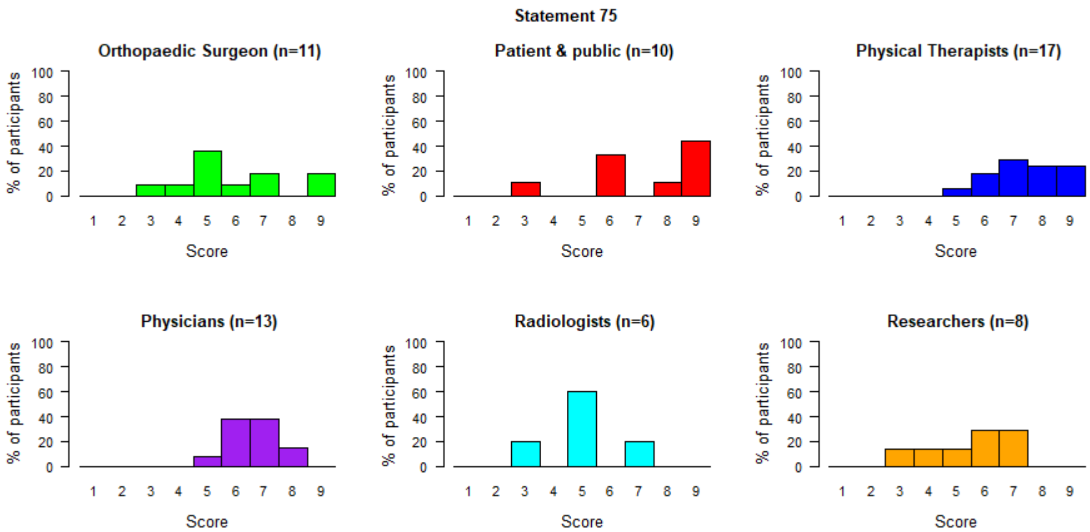
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Kemp et al (2019) – Research Recommendation 3. Research should examine the effect of patient education in people with hip-related pain. To our knowledge, no studies have investigated patient education in people with hip-related pain. We recommended that future studies assess the specific effect of patient education for hip-related pain including content, modes of delivery and the use of innovative technologies to enhance education benefits.

RESULTS: ROUND 1

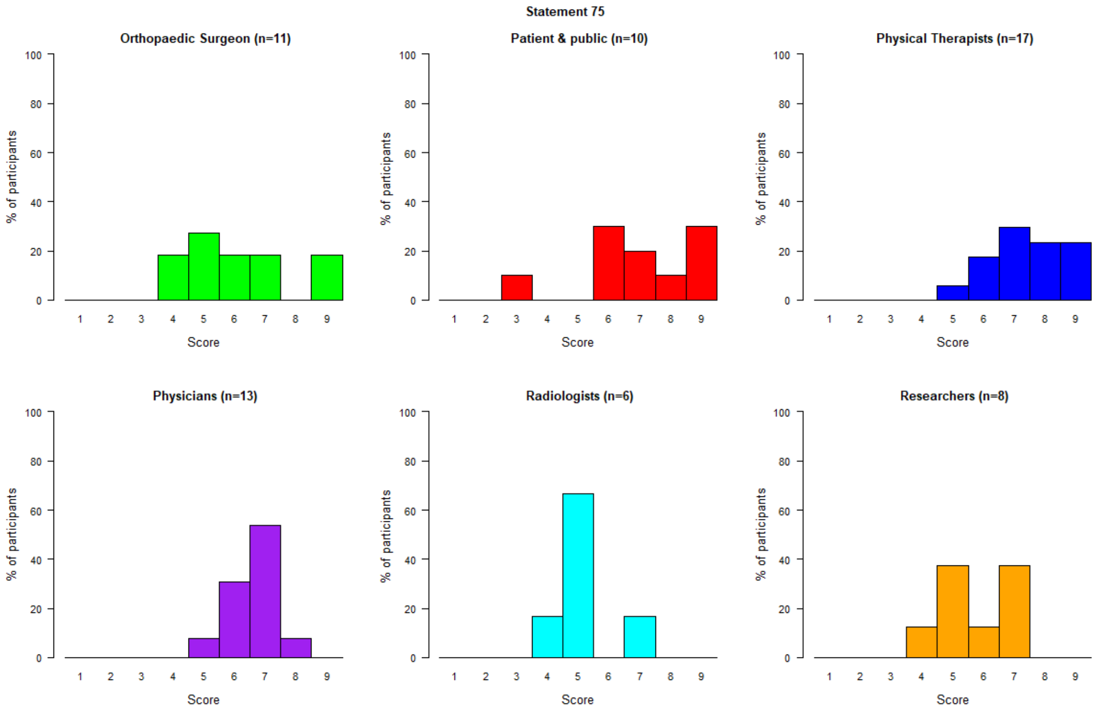
Strongly in favour of patient education. As an elite athlete receiving treatment I always felt insufficiently educated about injuries I was having to recover from and scientific jargon from specialists can be bewildering.



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	5	5	7
Patient & Public In	8	6	9
Physical Therapists	7	7	8
Physicians	7	6	7
Radiologists	5	5	5
Researchers	6	4	7

Percentage panelists that scored the statement as critical	51.6%
Percentage panelists that scored the statement as not important	6.5%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	Happy that this is needed - prefer to leave level of priority to the ENHR process
3	4	Input from clinical or research opinion
3	5	same as above-- patient education is important but are we ready to provide them with evidence based guidance? Other research questions more important. Moved closer to center to align with importance of topic
7	6	minor adjustment
10	5	Not my cup of tea but since the webinar patients perspective is important and also to teach

Median, IQR

	ROUND 1			ROUND 2		
	Median	**Percentile 25**	**Percentile 75**	**Median**	**Percentile 25**	**Percentile 75**
Orthopaedic Surgeon	5	5	7	6	5	7
Patient & Public In	8	6	9	7	6	9
Physical Therapists	7	7	8	7	7	8
Physicians	7	6	7	7	6	7
Radiologists	5	5	5	5	5	5
Researchers	6	4	7	6	5	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	51.6%	53.8%
Percentage panelists that scored the statement as not important	6.5%	1.5%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Statement 76: Studies to investigate the performance of the diagnostic criteria for hip disease presenting with hip-related pain in young and active adults

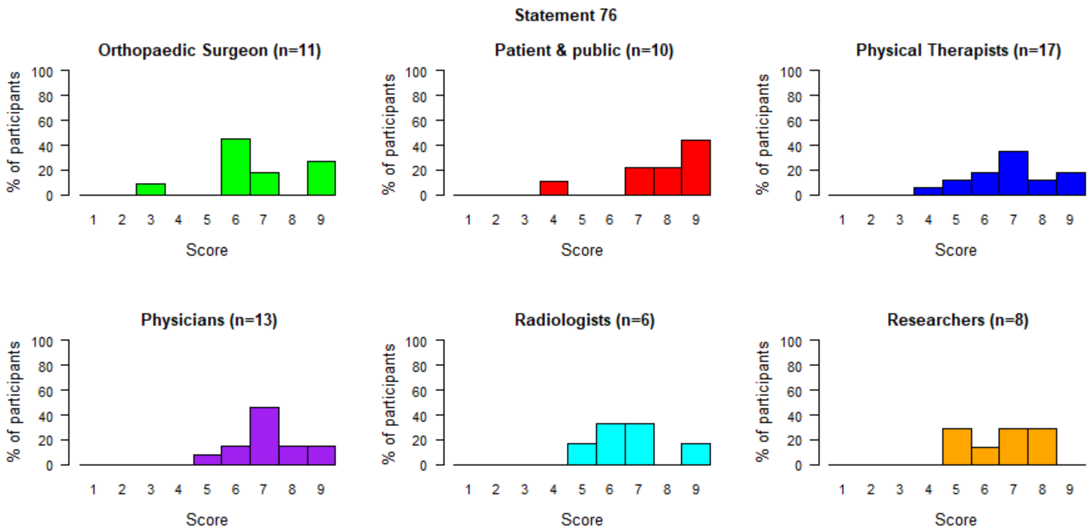
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Reiman et al (2019) - ClinicalResearch1: Hip-related pain may be further categorised after imaging into: (1) femoroacetabularimpingement (FAI) syndrome, (2) acetabular dysplasia and/or hip instability and (3) other conditions causing hip-related pain. This last category could include soft-tissue conditions without specific bony morphology.

RESULTS: ROUND 1

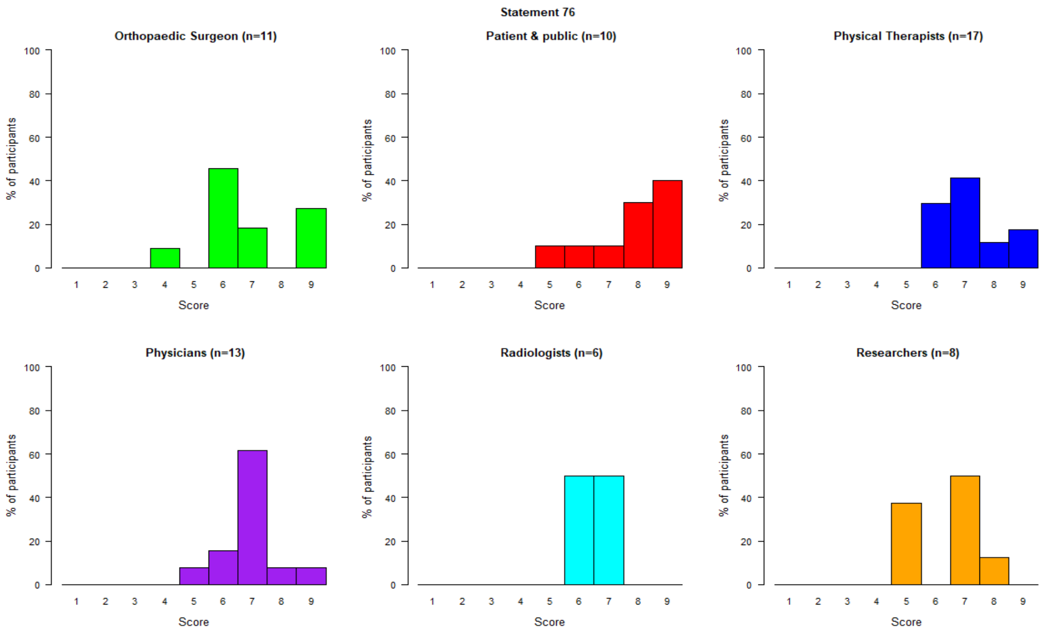
This seems like it should be a major priority to ensure accurate and appropriate diagnosis



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	6	6	9
Patient & Public In	8	7	9
Physical Therapists	7	6	8
Physicians	7	7	8
Radiologists	7	6	7
Researchers	7	5	8

Percentage panelists that scored the statement as critical	65.1%
Percentage panelists that scored the statement as not important	1.6%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
7	6	minor adjustment

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	6	6	9	6	6	9
Patient & Public In	8	7	9	8	7	9
Physical Therapists	7	6	8	7	6	8
Physicians	7	7	8	7	7	7
Radiologists	7	6	7	7	6	7
Researchers	7	5	8	7	5	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	65.1%	66.2%
Percentage panelists that scored the statement as not important	1.6%	0%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

No outliers

Statement 77: Core outcome set (COS) development studies for each of the conditions related to hip disease/ hip-related pain in young and active adults

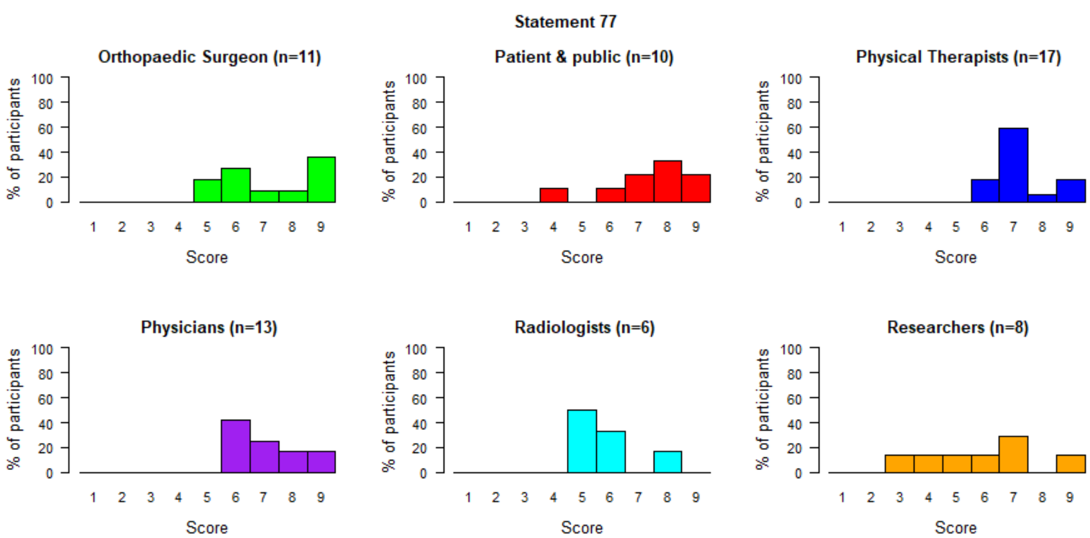
R1: NO CONSENSUS

R2: NO CONSENUS

HELPTEXT: Griffin et al (2016) - Warwick agreement: What are the best outcome measures to show change following treatment? Warwick agreement: What are the return to sport criteria following FAI surgery [or physiotherapy directed exercise program]? Recommendation 1: The HAGOS and iHOT instruments (long and reduced versions) are the most appropriate PROMs to use in young and middle-aged active adults with hip-related pain. Reiman et al (2019) - ClinicalResearch1: Hip-related pain may be further categorised after imaging into: (1) femoroacetabularimpingement (FAI) syndrome, (2) acetabular dysplasia and/or hip instability and (3) other conditions causing hip-related pain. This last category could include soft-tissue conditions without specific bony morphology. Reiman et al (2019) – Research recommendation 1: Measures of bony morphology should be reported in detail. We recommend that bony morphology outcome measures (such as the alpha angle or centre-edge angle) should be clearly defined, measured and reported (eg, detailed methodological description, blinding, per hip/per person reporting with statistical correction as appropriate, reliability measures) Impellizzeri et al (2020) - Recommendation 4: Future research should include further analysis of content and structural validity, and the relationship between individual measurement error and the minimal clinically important change for the recommended PROMs.

Research Priorities

RESULTS: ROUND 1

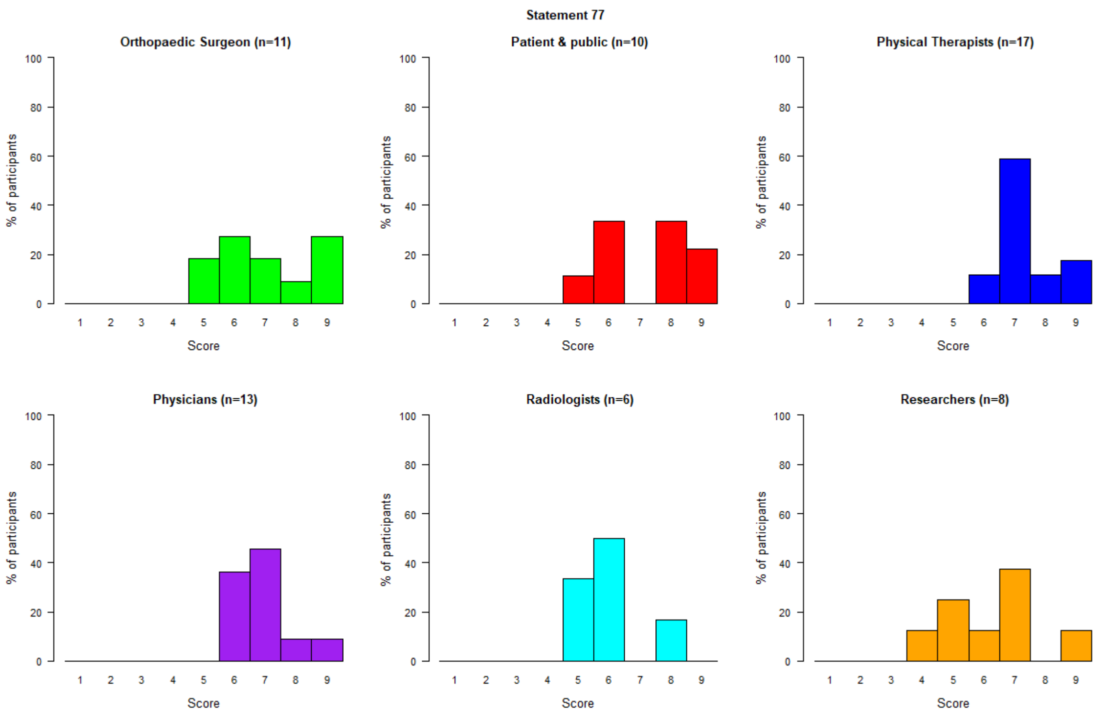


	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	9
Patient & Public In	8	7	8
Physical Therapists	7	7	7
Physicians	7	6	8

Radiologists	6	5	6
Researchers	6	4	7

Percentage panelists that scored the statement as critical	61.3%
Percentage panelists that scored the statement as not important	1.6%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
3	4	influenced by scores from other respondents

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	9	7	6	9
Patient & Public In	8	7	8	8	6	8
Physical Therapists	7	7	7	7	7	8

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Physicians	7	6	8	7	6	7
Radiologists	6	5	6	6	5	6
Researchers	6	4	7	7	5	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	61.3%	61.3%
Percentage panelists that scored the statement as not important	1.6%	0%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Statement 78: Research studies into the utility of HAGOS and iHOT instruments in a non-surgical treatment context

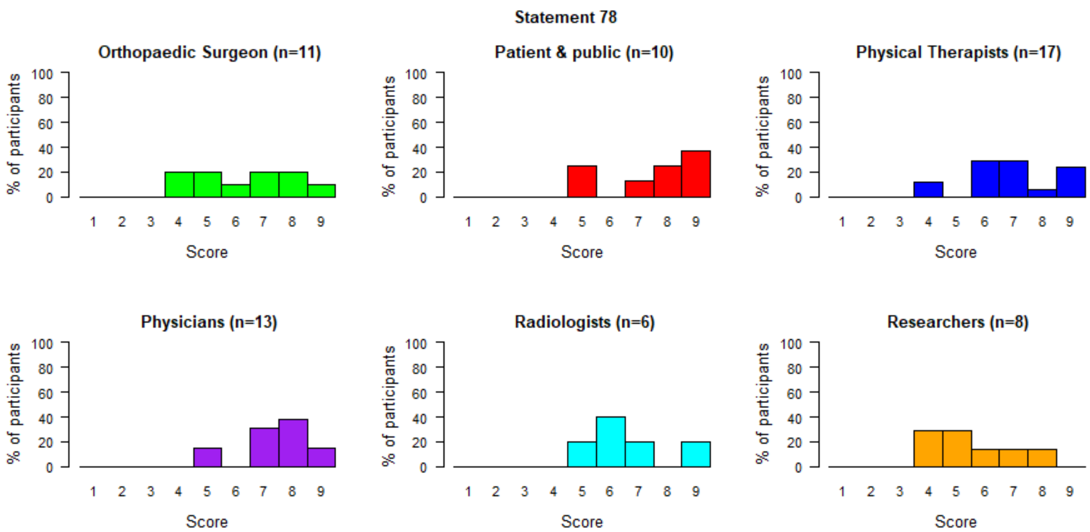
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Impellizzeri et al (2020) - Recommendation 1: The HAGOS and iHOT instruments (long and reduced versions) are the most appropriate PROMs to use in young and middle-aged active adults with hip-related pain. Impellizzeri et al (2020) - Recommendation 2: HAGOS and iHOT were developed mainly in surgical context. More research is needed into their utility in a non-surgical treatment context.

RESULTS: ROUND 1

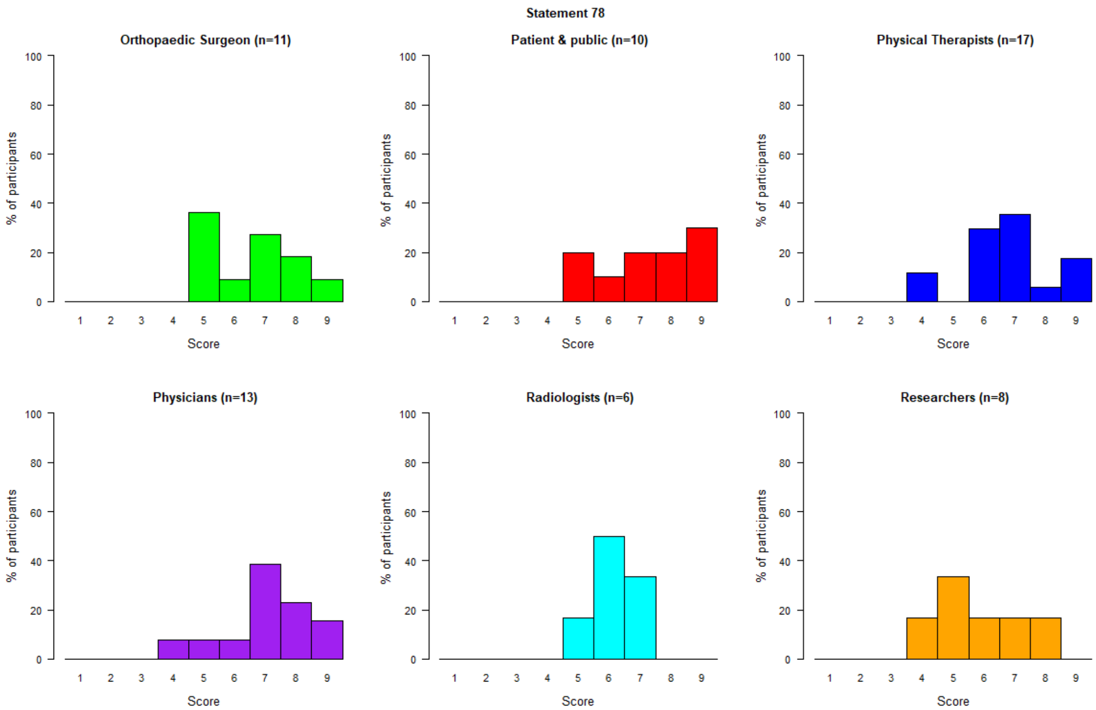
I am not sure if I understand this question properly. The HAGOS questionnaire has adequate measurement qualities for active patients with long-standing hip and/or groin pain. We have used both questioners for non-surgical and surgical pts



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	5	8
Patient & Public In	8	6	9
Physical Therapists	7	6	8
Physicians	8	7	8
Radiologists	6	6	7
Researchers	5	4	7

Percentage panelists that scored the statement as critical	60%
Percentage panelists that scored the statement as not important	0%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
5	10	not confident that I fully understood the question
8	6	calibration from the other disciplines

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	5	8	7	5	8
Patient & Public In	8	6	9	8	6	9
Physical Therapists	7	6	8	7	6	7
Physicians	8	7	8	7	7	8
Radiologists	6	6	7	6	6	7
Researchers	5	4	7	6	5	7

	Round 1	Round 2
Percentage panelists that scored the statement as critical	60%	58.7%

Percentage panelists that scored the statement as not important	0%	0%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Statement 79: Studies to analyse of content and structural validity, and the relationship between individual measurement error and the minimal clinically important change for the recommended PROMs.

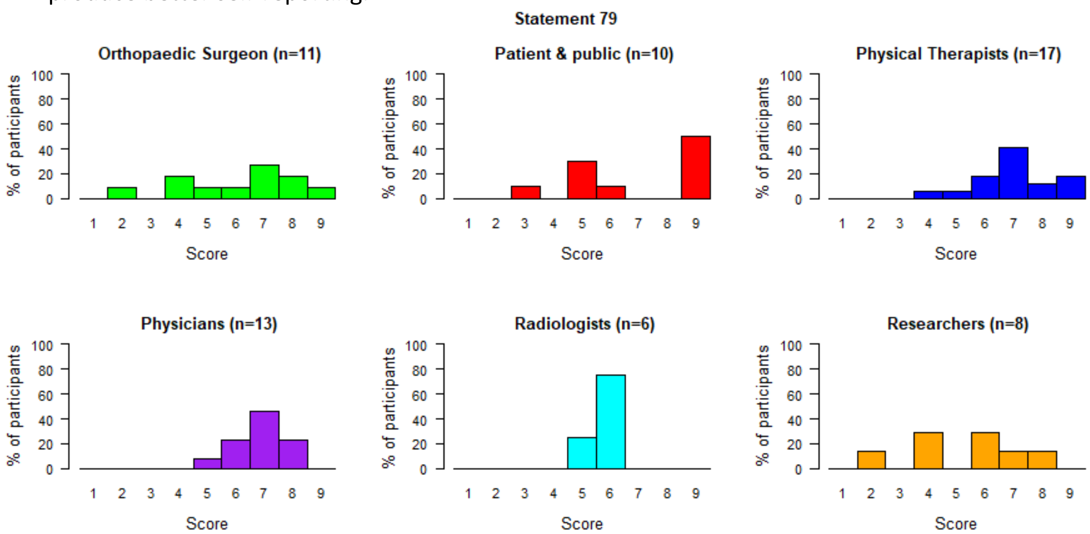
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Impellizzeri et al (2020) - Recommendation 4: Future research should include further analysis of content and structural validity, and the relationship between individual measurement error and the minimal clinically important change for the recommended PROMs.

RESULTS: ROUND 1

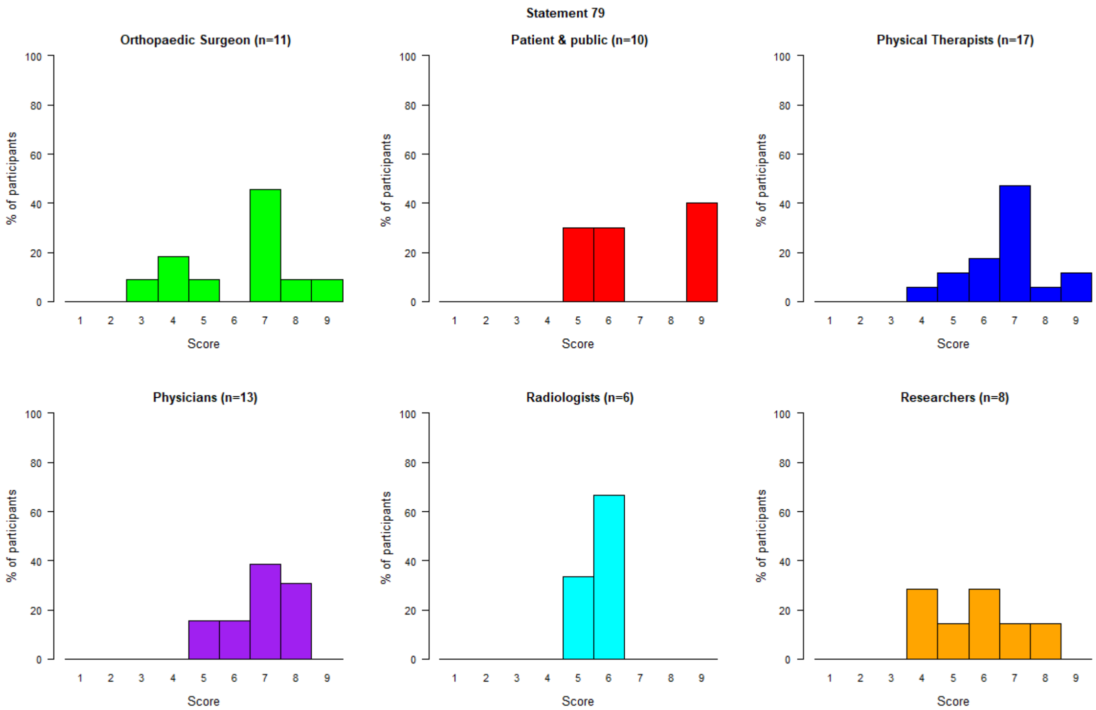
1. Need to validate the PROMs first
2. This is linked to need for education for patients above - if patients are better educated; they may produce better self-reporting.



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	4	8
Patient & Public In	8	5	9
Physical Therapists	7	6	8
Physicians	7	6	7
Radiologists	6	6	6
Researchers	6	4	7

Percentage panelists that scored the statement as critical	54.8%
Percentage panelists that scored the statement as not important	4.8%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	Happy that this is needed - prefer to leave level of priority to the ENHR process
2	4	influenced by scores from other respondents
3	5	Having followed webinar; I think that it is important.
9	6	I am not sure; the MIC is that important. I am more into PASS
7	5	important perspective of other colleagues to more clearly delineate

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	4	8	7	4	7
Patient & Public In	8	5	9	6	5	9
Physical Therapists	7	6	8	7	6	7
Physicians	7	6	7	7	6	8
Radiologists	6	6	6	6	5	6
Researchers	6	4	7	6	4	7

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	54.8%	51.6%
Percentage panelists that scored the statement as not important	4.8%	1.6%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Statement 80: Studies to investigate the impact of the diagnostic components of a specific hip condition on diagnostic or prognostic thinking (e.g., stratifying patients into high and low risk) in young and active adults

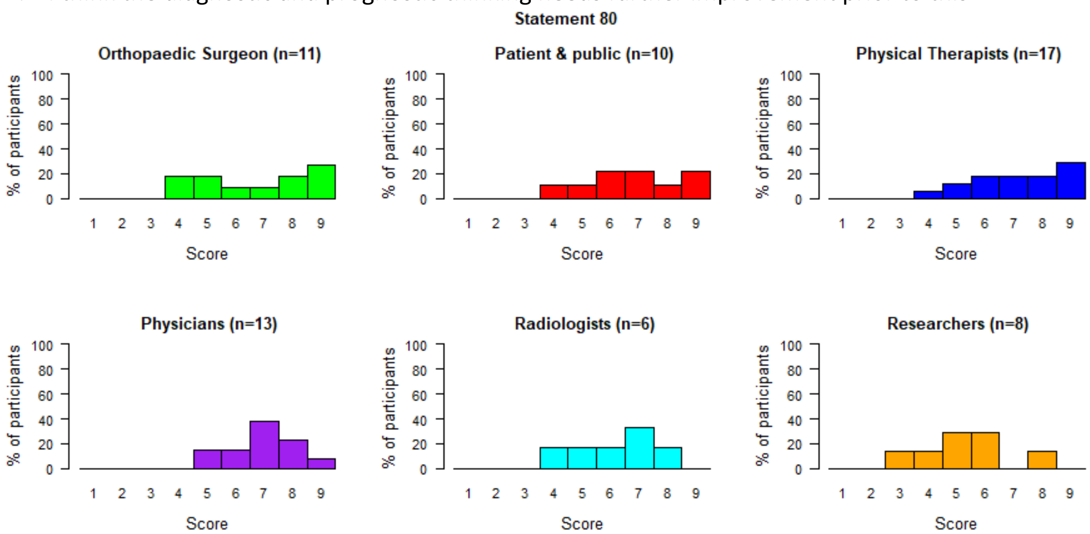
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Reiman et al (2019) - ClinicalResearch1: Hip-related pain may be further categorised after imaging into: (1) femoroacetabularimpingement (FAI) syndrome, (2) acetabular dysplasia and/or hip instability and (3) other conditions causing hip-related pain. This last category could include soft-tissue conditions without specific bony morphology.

RESULTS: ROUND 1

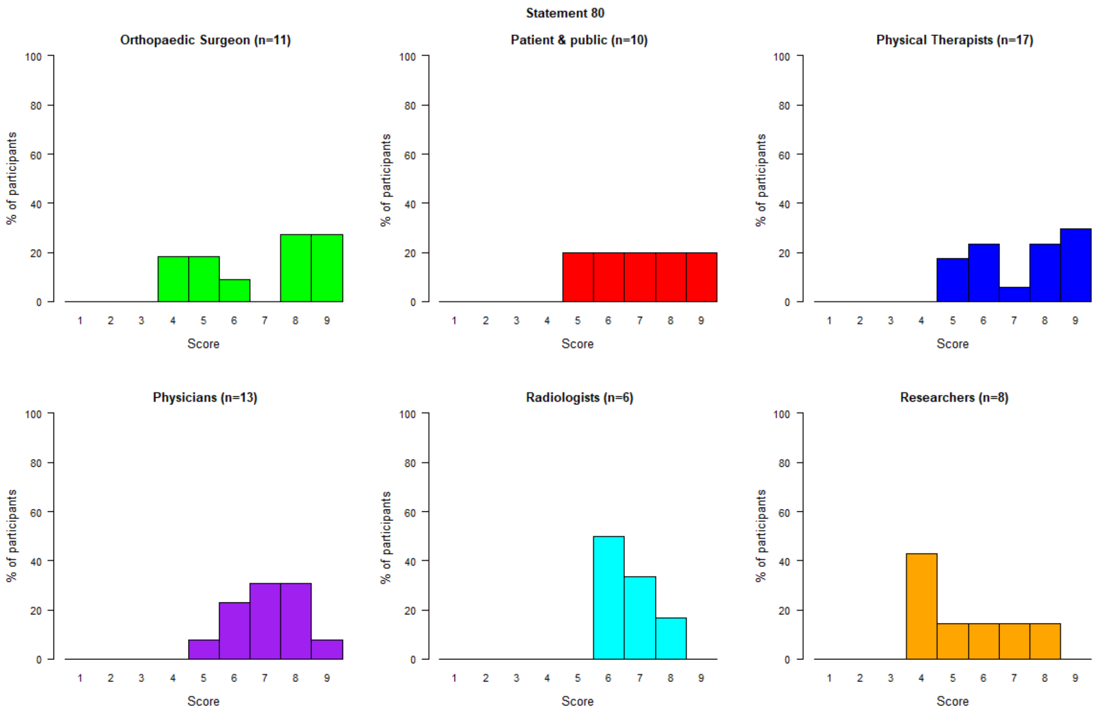
1. stratifying patients in this way has some methodological challenges
2. I think the diagnostic and prognostic thinking needs further improvement prior to this



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	5	9
Patient & Public In	7	6	8
Physical Therapists	7	6	9
Physicians	7	6	8
Radiologists	7	5	7
Researchers	5	4	6

Percentage panelists that scored the statement as critical	55.6%
Percentage panelists that scored the statement as not important	1.6%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	influenced by scores from other respondents
7	6	I was worried that the stratification process can falsely label patients as potential non-responders until we have clear prognostic indicators I would prefer to avoid stratification research.

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	5	9	8	5	9
Patient & Public In	7	6	8	7	6	8
Physical Therapists	7	6	9	8	6	9
Physicians	7	6	8	7	6	8
Radiologists	7	5	7	7	6	7
Researchers	5	4	6	5	4	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	55.6%	56.3%
Percentage panelists that scored the statement as not important	1.6%	0%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

Statement 81: Studies to develop and validate diagnostic and prognostic models for the different hip diseases presenting with hip-related pain in young persons

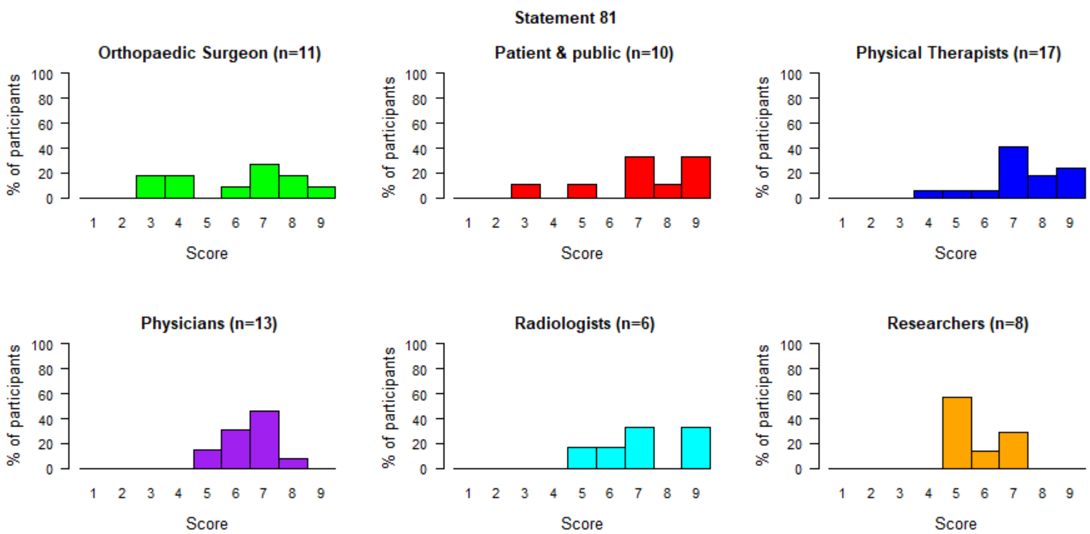
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the optimal method to treat labral pathology? Reiman et al (2019) - ClinicalResearch1: Hip-related pain may be further categorised after imaging into: (1) femoroacetabularimpingement (FAI) syndrome, (2) acetabular dysplasia and/or hip instability and (3) other conditions causing hip-related pain. This last category could include soft-tissue conditions without specific bony morphology.

RESULTS: ROUND 1

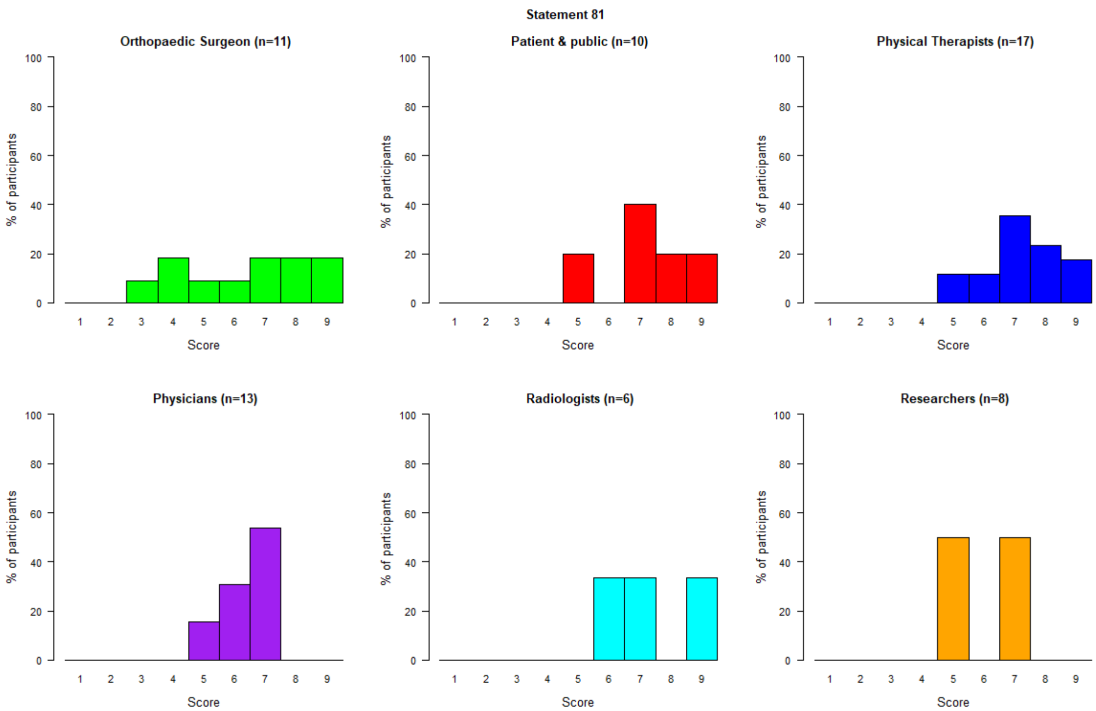
important in the future- not yet.



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	4	8
Patient & Public In	7	7	9
Physical Therapists	7	7	8
Physicians	7	6	7
Radiologists	7	6	9
Researchers	5	5	7

Percentage panelists that scored the statement as critical	63.5%
Percentage panelists that scored the statement as not important	4.8%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	influenced by scores from other respondents
3	5	Having followed webinar; I think that it is important.
9	5	Other issues more important.

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	4	8	7	4	8
Patient & Public In	7	7	9	7	7	8
Physical Therapists	7	7	8	7	7	8
Physicians	7	6	7	7	6	7
Radiologists	7	6	9	7	6	9
Researchers	5	5	7	6	5	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	63.5%	64.6%
Percentage panelists that scored the statement as not important	4.8%	1.5%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

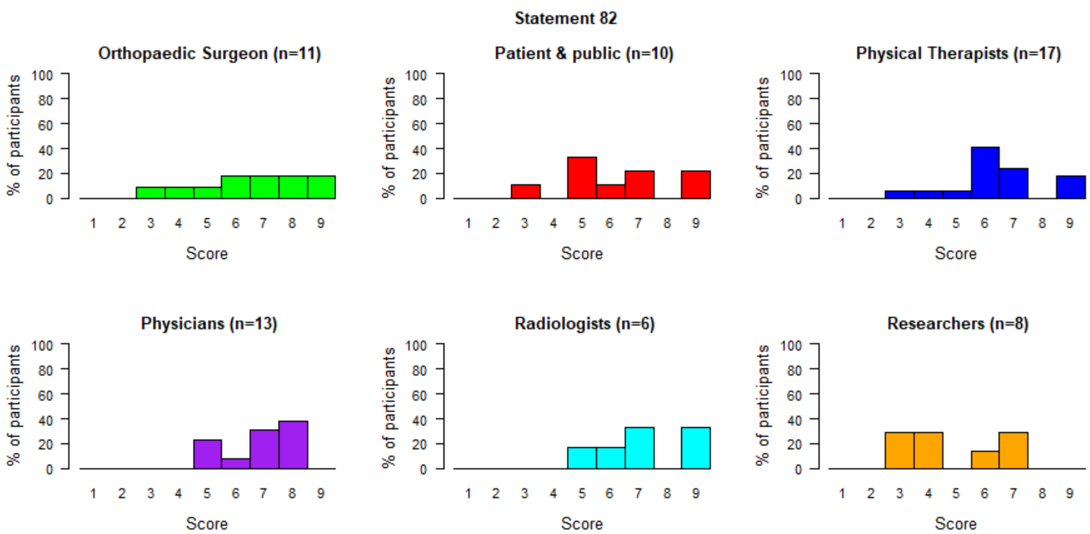
Statement 82: Studies to investigate the additional benefit of advanced imaging (e.g., magnetic resonance imaging and/ or computed tomography scan) for diagnosis of hip disease presenting with hip-related pain in young and active adults

R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Reiman et al (2019) - ClinicalResearch1: Hip-related pain may be further categorised after imaging into: (1) femoroacetabularimpingement (FAI) syndrome, (2) acetabular dysplasia and/or hip instability and (3) other conditions causing hip-related pain. This last category could include soft-tissue conditions without specific bony morphology.

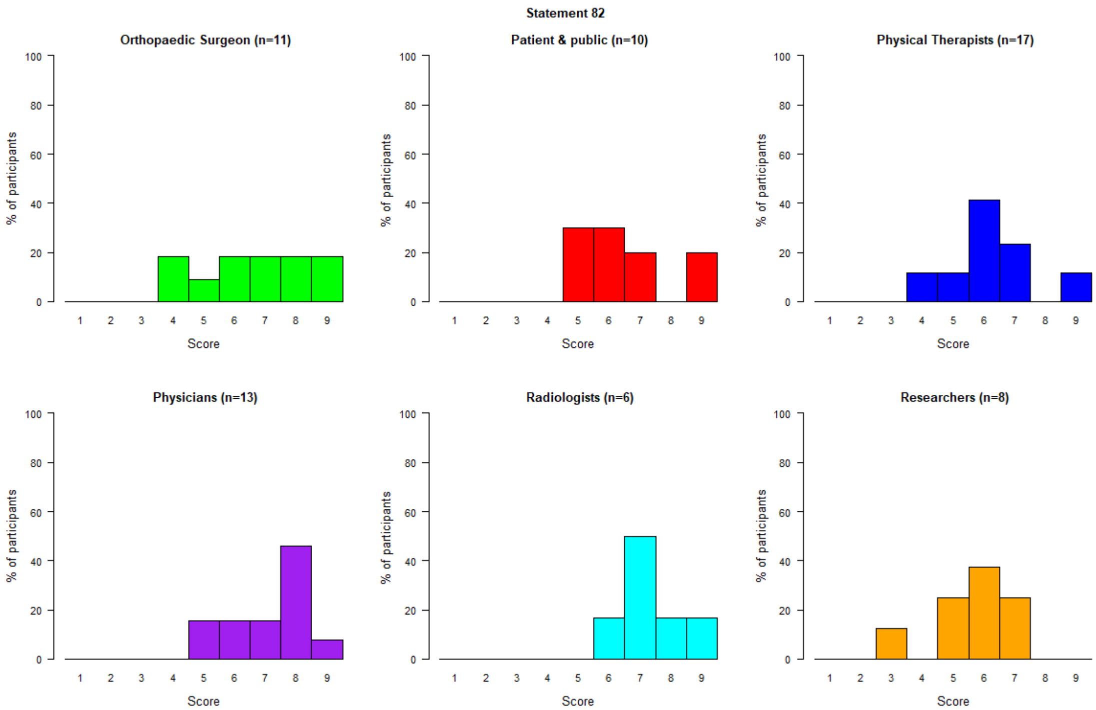
RESULTS: ROUND 1



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	5	8
Patient & Public In	6	5	7
Physical Therapists	6	6	7
Physicians	7	6	8
Radiologists	7	6	9
Researchers	4	3	7

Percentage panelists that scored the statement as critical	50.8%
Percentage panelists that scored the statement as not important	7.9%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
5	7	Still less relevant than diagnostic/prognostic studies but economics hard to avoid
3	5	influenced by scores from other respondents
3	5	Having followed webinar; I think that it is important.

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	5	8	7	5	8
Patient & Public In	6	5	7	6	5	7
Physical Therapists	6	6	7	6	6	7
Physicians	7	6	8	8	6	8
Radiologists	7	6	9	7	7	8
Researchers	4	3	7	6	5	7

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	50.8%	49.2%
Percentage panelists that scored the statement as not important	7.9%	1.5%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

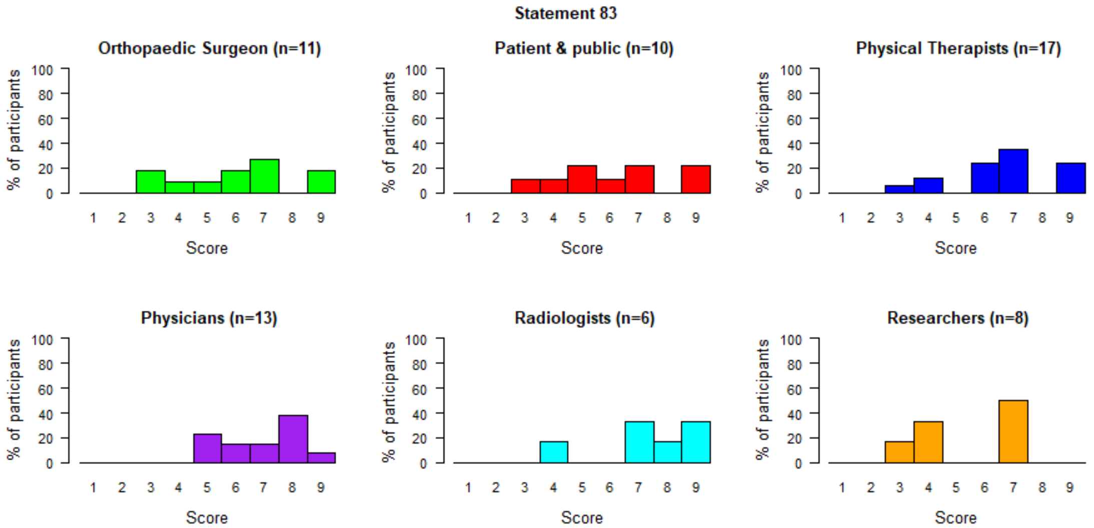
Statement 83: Studies to investigate the additional benefit of advanced imaging (e.g., magnetic resonance imaging and/ or computed tomography scan) for agreeing on an appropriate treatment strategy for hip disease presenting with hip-related pain in young and active adults

R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Reiman et al (2019) - ClinicalResearch1: Hip-related pain may be further categorised after imaging into: (1) femoroacetabularimpingement (FAI) syndrome, (2) acetabular dysplasia and/or hip instability and (3) other conditions causing hip-related pain. This last category could include soft-tissue conditions without specific bony morphology.

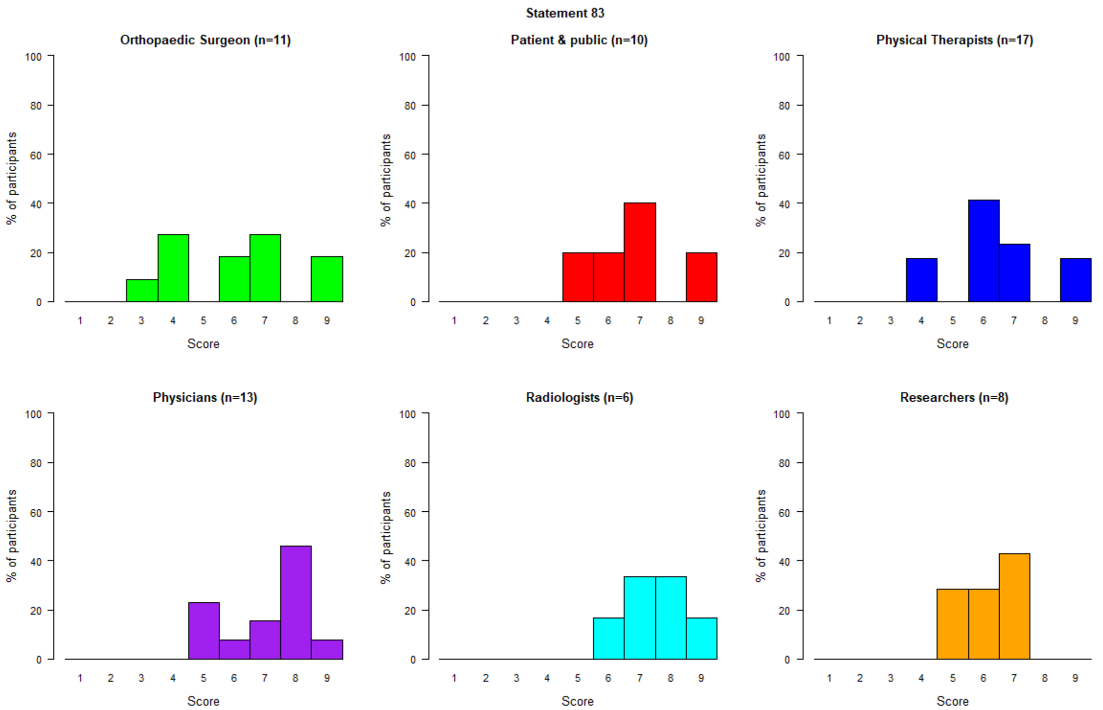
RESULTS: ROUND 1



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	6	4	7
Patient & Public In	6	5	7
Physical Therapists	7	6	7
Physicians	7	6	8
Radiologists	8	7	9
Researchers	6	4	7

Percentage panelists that scored the statement as critical	56.5%
Percentage panelists that scored the statement as not important	8.1%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	7	We need to better select treatment options for patients and imaging may assist this process
6	7	As above
3	5	influenced by scores from other respondents
3	6	Having followed webinar; I think that it is important.
7	6	minor adjustment
7	6	I do not think we should but as much effort in imaging as an important factor for prognosis.
7	4	Global view and reading more in the literature
7	6	new literature

Median, IQR

	ROUND 1			ROUND 2		
	Median	**Percentile 25**	**Percentile 75**	**Median**	**Percentile 25**	**Percentile 75**
Orthopaedic Surgeon	6	4	7	6	4	7
Patient & Public In	6	5	7	7	6	7

Physical Therapists	7	6	7	6	6	7
Physicians	7	6	8	8	6	8
Radiologists	8	7	9	8	7	8
Researchers	6	4	7	6	5	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	56.5%	54.7%
Percentage panelists that scored the statement as not important	8.1%	1.6%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Dijkstra HP, *et al. Br J Sports Med* 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

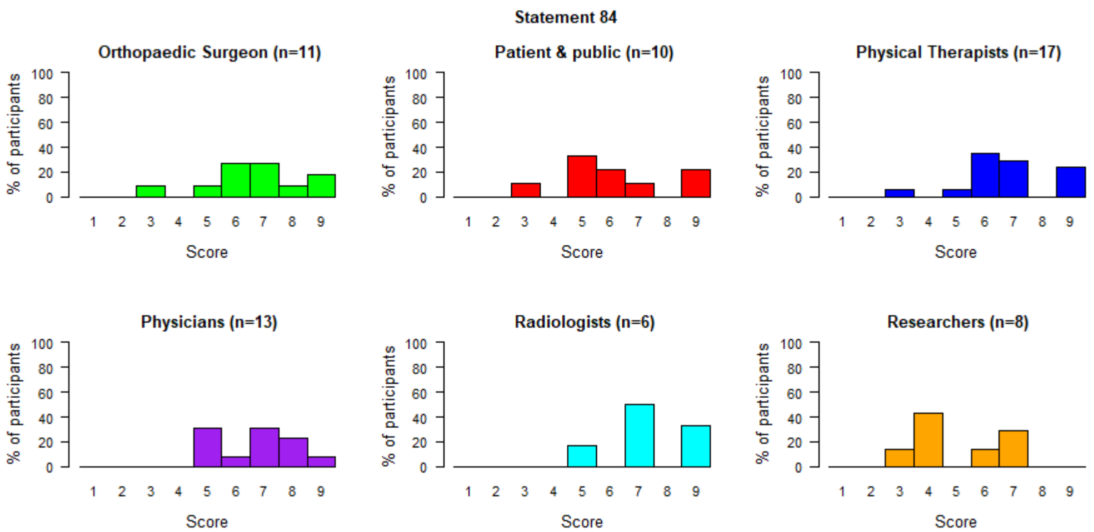
Statement 84: Studies to investigate the additional benefit of advanced imaging (e.g., magnetic resonance imaging and/ or computed tomography scan) for prognosis of hip disease presenting with hip-related pain in young and active adults

R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Reiman et al (2019) - ClinicalResearch1: Hip-related pain may be further categorised after imaging into: (1) femoroacetabularimpingement (FAI) syndrome, (2) acetabular dysplasia and/or hip instability and (3) other conditions causing hip-related pain. This last category could include soft-tissue conditions without specific bony morphology.

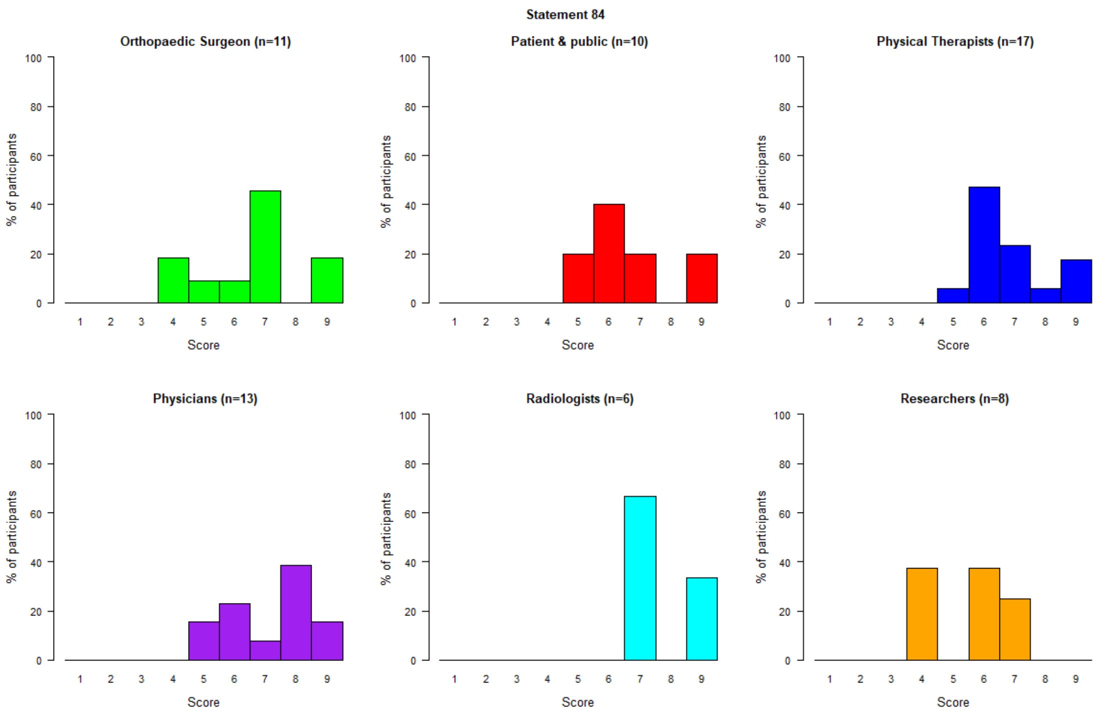
RESULTS: ROUND 1



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	7	6	8
Patient & Public In	6	5	7
Physical Therapists	7	6	7
Physicians	7	5	8
Radiologists	7	7	9
Researchers	4	4	7

Percentage panelists that scored the statement as critical	52.4%
Percentage panelists that scored the statement as not important	6.3%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
3	6	Having followed webinar; I think that it is important.
5	7	Reconsidered
3	4	influenced by scores from other respondents
7	6	minor adjustment
8	4	Global view and reading more in the literature

Median, IQR

	ROUND 1			ROUND 2		
	Median	**Percentile 25**	**Percentile 75**	**Median**	**Percentile 25**	**Percentile 75**
Orthopaedic Surgeon	7	6	8	7	5	7
Patient & Public In	6	5	7	6	6	7
Physical Therapists	7	6	7	6	6	7
Physicians	7	5	8	8	6	8
Radiologists	7	7	9	7	7	9

Researchers	4	4	7	6	4	7

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	52.4%	53.8%
Percentage panelists that scored the statement as not important	6.3%	0%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

Statement 85: Studies to investigate cost-effectiveness of different diagnostic and therapeutic approaches in conditions affecting the young person's hip

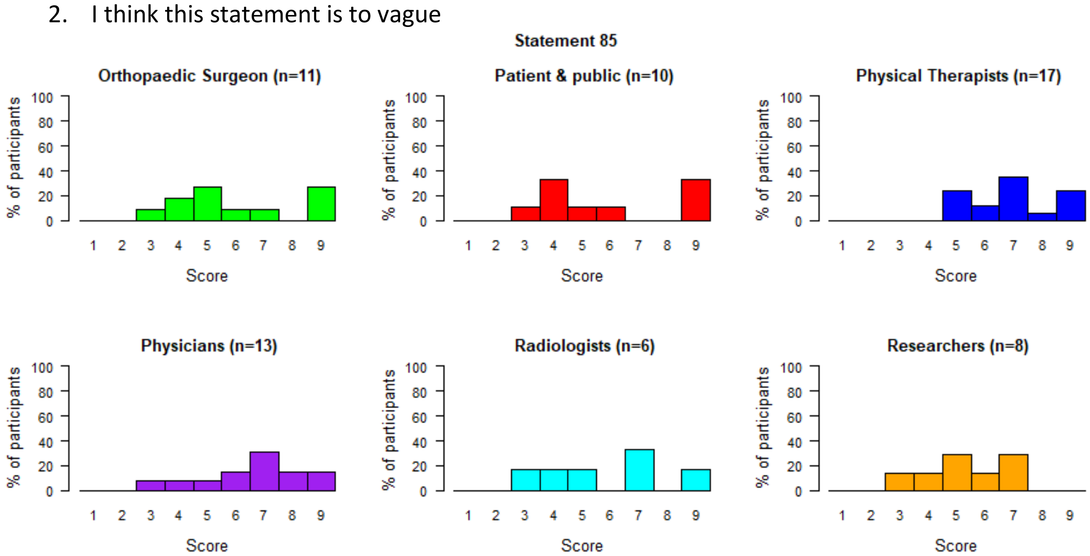
R1: NO CONSENSUS

R2: NO CONSENSUS

HELPTEXT: Griffin et al (2016) - Warwick agreement: What is the outcome of conservative treatment? Warwick agreement: Which patients respond best to conservative management? Warwick agreement: What is the most effective conservative management program? Warwick agreement: What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms? Warwick agreement: Can rehabilitation prevent FAI pain and if so, how? Warwick agreement: Does pre-operative rehabilitation improve post-operative outcomes? Warwick agreement: What are the return to sport criteria following FAI surgery [or physiotherapy directed exercise program]?

RESULTS: ROUND 1

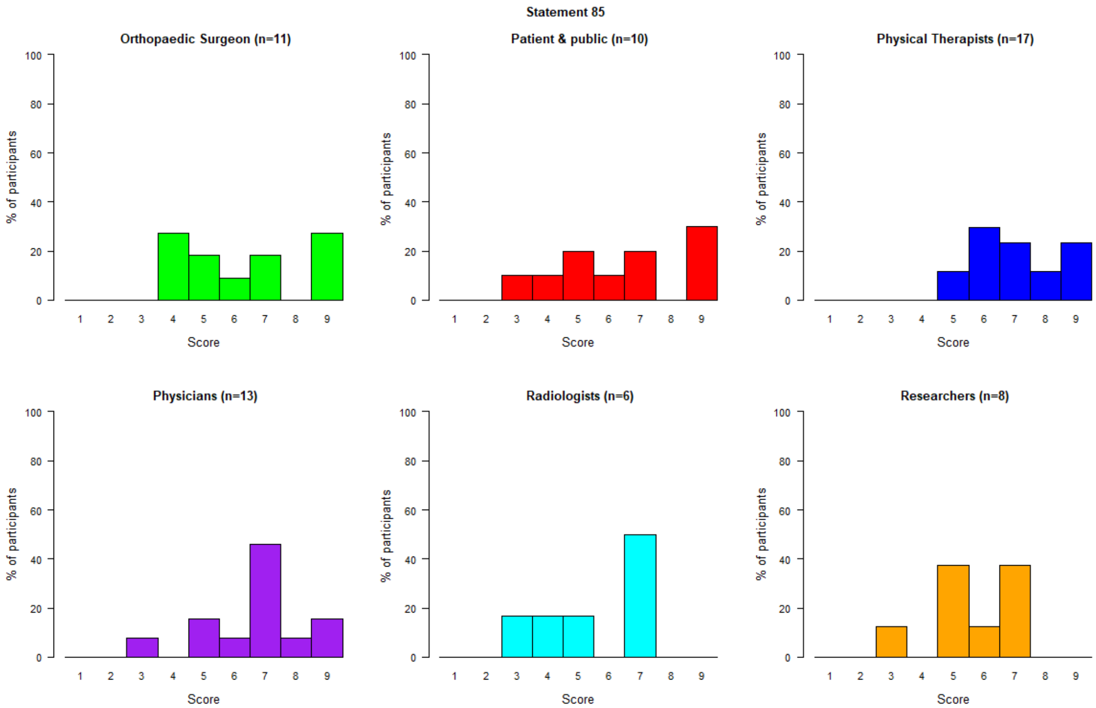
1. In one way I think cost should not come into this but in practice if it means eg an institution can/cannot afford imaging equipment that will have a huge impact on its ability to diagnose and treat patients.
2. I think this statement is to vague



	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	5	4	9
Patient & Public In	5	4	9
Physical Therapists	7	6	8
Physicians	7	6	8
Radiologists	6	4	7
Researchers	5	4	7

Percentage panelists that scored the statement as critical	49.2%
Percentage panelists that scored the statement as not important	7.9%
RESULT	**NO CONSENSUS**

RESULTS: ROUND 2



Reasons for score boundary changes between R1 and R2

R1	R2	
6	9	Second webinar informations

Median, IQR

	ROUND 1			ROUND 2		
	Median	Percentile 25	Percentile 75	Median	Percentile 25	Percentile 75
Orthopaedic Surgeon	5	4	9	6	4	9
Patient & Public In	5	4	9	7	5	9
Physical Therapists	7	6	8	7	6	8
Physicians	7	6	8	7	6	7
Radiologists	6	4	7	6	4	7
Researchers	5	4	7	6	5	7

Dijkstra HP, et al. Br J Sports Med 2022;0:1–17. doi: 10.1136/bjsports-2022-106092

	Round 1	**Round 2**
Percentage panelists that scored the statement as critical	49.2%	53.8%
Percentage panelists that scored the statement as not important	7.9%	6.2%
RESULT	**NO CONSENSUS**	**NO CONSENSUS**

UNIVERSITY OF OXFORD

Form 1: Research Priority Setting: Essential National Health Research (ENHR) Strategy

STATEMENTS 48 to 54

Research priority setting is important for "*resource allocation, to address the issue of equity, to attend to the needs of the most vulnerable groups of the population, to reinforce the links between research, action and policy, and because the research priorities set today determine the health agenda, practices and technologies of tomorrow.*" - Council on Health Research for Development - COHRED | A Manual for Research Priority Setting using the ENHR Strategy Priority Settings Manual (cohred.org (http://cohred.org))

The ENHR strategy is a unique systematic approach to identifying research priorities. It is inclusive, involve a broad range of stakeholders, has a multidisciplinary and cross-sectoral approach, and is characterised by partnership development, participatory and transparent processes, and systematic analyses of health needs.

You will be asked to rank 18 research statements (scored as critical (Likert scale 7 to 9) by ≥70% of panel members *and* not important (Likert scale 1 to 3) by <15% of panel members of the Primary Cam Morphology Delphi Study) using 4 categories:

1. CATEGORY 1: **Appropriateness** - ***Should we do it?*** *The purpose of the category is to determine if the proposed research is well suited to the target society and if it duplicates past studies. The key question is "Should we do it?"*
2. CATEGORY 2: **Relevancy** - ***Why should we do it?*** *The purpose of this category is to make sure that the proposed research is the right kind for the right people, and is pertinent to the health problem of the community without ignoring equity issues. The key question is "Why should we do it?"*
3. CATEGORY 3: **Chance of success** - ***Can we do it?*** *The purpose of this category is to evaluate the strength and resources of the prospective research team. The key question is "Can we do it?"*
4. CATEGORY 4: **Impact** of the research outcome - ***What do the stakeholders get out of it?*** *The purpose of this category is to estimate the benefit of using or implementing the research results, and assessing their merit and usefulness. The key question is "What do the stakeholders get out of it?"*

Instructions - For each statement:
1. Please read the background information and context section relevant to each statement. This will help you to make an informed judgement on the 1 to 3 Likert scale scoring (Option "0" only applies to category 1)
2. Please enter the appropriate Likert scale score for each category in the box to the left of the category subsections

3. If you feel unable to score a specific category select the "Prefer not to answer" option
4. You have the opportunity to provide optional comments relevant to each research statement

* Required

1. Stakeholder Group *

- ◯ Orthopaedic Surgeons
- ◯ Patient and Public Involvement Group
- ◯ Physical Therapists
- ◯ Physicians
- ◯ Radiologists
- ◯ Researchers

2. Name (Optional)

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SECTION 1

This section provides background information and context to help you making an informed judgement on the Likert scale scoring for statements 48 to 54.

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3. **Aetiology:** Prospective cohort studies during skeletal maturation (age 9 to16) in different cohorts (gender, especially in women's sport; different sports, including parasport; different player positions within a sport; different race/ethnic cohorts) using similar methods (e.g. serial MR imaging; similar definition for cam morphology and risk factors) to allow meaningful data sharing.

   Existing prospective studies on how primary cam morphology develops: Only a few prospective cohort studies have been published: Agricola and Van Klij (2018: Feyenoord Football Academy cohort - all males); Palmer and Fernquest (2017 & 2021: Southampton male football and mixed gender controls); Hanke (2021: Ice Hockey cohort - adolescent boys).

   Prognosis: We require long term prospective cohort studies in different cohorts to investigate the prognosis of primary cam morphology using similar methods (e.g. serial imaging) to allow meaningful sharing of data. No long-term prospective cohort studies have been published to date. Mosler et al (2017) investigated the incidence of hip-and-groin pain in a cohort of Qatar Stars League Footballers (males 18-29y with a high prevalence of cam morphology) over 2 years.

   Prediction: In future, we want to predict the athletes with primary cam morphology at a higher risk of developing symptoms/osteoarthritis. Large prospective cohort studies (and sharing research data) will help us to develop and validate 'prediction models'.

   “Prediction research is a distinct field of epidemiologic research, which should be clearly separated from aetiological research. Both prediction and aetiology make use of multivariable modelling, but the underlying research aim and interpretation of results are very different. Aetiology aims at uncovering the causal effect of a specific risk factor on an outcome, adjusting for confounding factors that are selected based on pre-existing knowledge of causal relations.

   In contrast, prediction aims at accurately predicting the risk of an outcome using multiple predictors collectively, where the final prediction model is usually based on statistically significant, but not necessarily causal, associations in the data at hand.” Van Diepen (2017)

   Some of the **challenges** associated with prospective cohort studies on primary cam morphology: Studies on primary cam morphology aetiology and prognosis involve: (1) adolescent athletes and sedentary controls, their parents, and other key role players like club management; (2) long term prospective studies with the risk of participants not completing all stages of the study (attrition); (3) serial imaging (MR imaging is expensive; radiation is a potential issue when using radiographs & CT scans); (4) large cohorts; (5) collaboration and data sharing (logistical and legal challenges); (6) countries that cannot afford this type of research (equity); (7) uniform operational definitions of anatomical, kinetic/kinematic, mechanical/biomechanical and other risk factors.

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STATEMENT 48

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4. **RESEARCH STATEMENT 48:** Prospective cohort studies to investigate risk factors (aetiological and prognostic) of primary cam morphology in different cohorts *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	◯	◯	◯	◯	◯
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	◯	◯	◯	◯	◯
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	◯	◯	◯	◯	◯

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *The burden of illness* *- What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Capacity of the system to undertake the research - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Cost justification - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Chances of implementation - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

5. **OPTIONAL COMMENTS** on Research Statement 48: Prospective cohort studies to investigate risk factors (aetiological and prognostic) of primary cam morphology in different cohorts

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STATEMENT 49

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6. **RESEARCH STATEMENT 49:** Prospective cohort studies that investigate how primary cam morphology develops in cohorts with variable loading demands (e.g., difference sports/dance/physical activity level cohorts, and sedentary cohorts) (causal inference approach to investigate load as a risk factor for primary cam morphology) *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	○	○	○	○	○
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	○	○	○	○	○
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *The burden of illness - What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Capacity of the system to undertake the research - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Cost justification - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Chances of implementation - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

7. **OPTIONAL COMMENTS** on Research Statement 49: Prospective cohort studies that investigate how primary cam morphology develops in cohorts with variable loading demands (e.g., difference sports/dance/physical activity level cohorts, and sedentary cohorts) (causal inference approach to investigate load as a risk factor for primary cam morphology)

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STATEMENT 50

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8. **RESEARCH STATEMENT 50:** Prospective cohort studies that investigate how primary cam morphology develops in <u>different sex/gender cohorts</u>, specifically women cohorts (causal inference approach to investigate gender as a risk factor for primary cam morphology) *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *<u>Ethical & moral issues</u> - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	○	○	○	○	○
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *<u>Availability of pre-existing data</u> - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	○	○	○	○	○
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *<u>Equity focus and community concern / demand</u> - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? <u>*The burden of illness*</u> *- What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? <u>*Capacity of the system to undertake the research*</u> *- How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? <u>*Cost justification*</u> *- How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? <u>*Chances of implementation*</u> *- What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

12/27/2021

	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

9. **OPTIONAL COMMENTS** on Research Statement 50: Prospective cohort studies that investigate how primary cam morphology develops in different sex/gender cohorts, specifically women cohorts (causal inference approach to investigate gender as a risk factor for primary cam morphology)

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STATEMENT 51

12/27/2021

10. **RESEARCH STATEMENT 51:** Prospective cohort studies that investigate how primary cam morphology develops in different parasport cohorts (causal inference approach to investigate load as a risk factor for primary cam morphology) *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	◯	◯	◯	◯	◯
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	◯	◯	◯	◯	◯
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	◯	◯	◯	◯	◯

12/27/2021

	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *<u>The burden of illness</u> - What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *<u>Capacity of the system to undertake the research</u> - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *<u>Cost justification</u> - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *<u>Chances of implementation</u> - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

11. **OPTIONAL COMMENTS** on Research Statement 51: Prospective cohort studies that investigate how primary cam morphology develops in different parasport cohorts (causal inference approach to investigate load as a risk factor for primary cam morphology)

12/27/2021

STATEMENT 52

12/27/2021

12. **RESEARCH STATEMENT 52:** Prospective cohort studies that investigate how primary cam morphology develops in different race/ethnic cohorts (causal inference approach to investigate race/ethnicity as a risk factor for primary cam morphology) *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	○	○	○	○	○
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	○	○	○	○	○
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *The burden of illness* *- What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Capacity of the system to undertake the research - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Cost justification - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Chances of implementation - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

13. **OPTIONAL COMMENTS** on Research Statement 52: Prospective cohort studies that investigate how primary cam morphology develops in different race/ethnic cohorts (causal inference approach to investigate race/ethnicity as a risk factor for primary cam morphology)

12/27/2021

STATEMENT 53

12/27/2021

14. **RESEARCH STATEMENT 53:** Prospective cohort studies that investigate other potential risk factors for primary cam morphology (causal inference approach to investigate the following risk factors: anatomical – spine, acetabulum, femur; kinetic and kinematic risk factors; mechanical and biomechanical; other possible risk factors that might emerge over time) *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	○	○	○	○	○
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	○	○	○	○	○
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *The burden of illness - What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Capacity of the system to undertake the research - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Cost justification - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Chances of implementation - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

15. **OPTIONAL COMMENTS** on Research Statement 53: Prospective cohort studies that investigate other potential risk factors for primary cam morphology (causal inference approach to investigate the following risk factors: anatomical – spine, acetabulum, femur; kinetic and kinematic risk factors; mechanical and biomechanical; other possible risk factors that might emerge over time)

12/27/2021

STATEMENT 54

12/27/2021

16. **RESEARCH STATEMENT 54:** Prospective cohort studies that investigate prognosis (consequences) of primary cam morphology in different cohorts *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	○	○	○	○	○
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	○	○	○	○	○
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○

12/27/2021

	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *The burden of illness* *- What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Capacity of the system to undertake the research - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Cost justification - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Chances of implementation - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

12/27/2021

	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	◯	◯	◯	◯	◯

17. **OPTIONAL COMMENTS** on **RESEARCH STATEMENT 54:** Prospective cohort studies that investigate prognosis (consequences) of primary cam morphology in different cohorts

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Form 2: Research Priority Setting: Essential National Health Research (ENHR) Strategy

STATEMENTS 55 to 59

Research priority setting is important for "*resource allocation, to address the issue of equity, to attend to the needs of the most vulnerable groups of the population, to reinforce the links between research, action and policy, and because the research priorities set today determine the health agenda, practices and technologies of tomorrow.*" - Council on Health Research for Development - COHRED | A Manual for Research Priority Setting using the ENHR Strategy Priority Settings Manual (cohred.org (http://cohred.org))

The ENHR strategy is a unique systematic approach to identifying research priorities. It is inclusive, involve a broad range of stakeholders, has a multidisciplinary and cross-sectoral approach, and is characterised by partnership development, participatory and transparent processes, and systematic analyses of health needs.

You will be asked to rank 18 research statements (scored as critical (Likert scale 7 to 9) by ≥70% of panel members *and* not important (Likert scale 1 to 3) by <15% of panel members of the Primary Cam Morphology Delphi Study) using 4 categories:

1. CATEGORY 1: **Appropriateness** - ***Should we do it?*** *The purpose of the category is to determine if the proposed research is well suited to the target society and if it duplicates past studies. The key question is "Should we do it?"*
2. CATEGORY 2: **Relevancy** - ***Why should we do it?*** *The purpose of this category is to make sure that the proposed research is the right kind for the right people, and is pertinent to the health problem of the community without ignoring equity issues. The key question is "Why should we do it?"*
3. CATEGORY 3: **Chance of success** - ***Can we do it?*** *The purpose of this category is to evaluate the strength and resources of the prospective research team. The key question is "Can we do it?"*
4. CATEGORY 4: **Impact** of the research outcome - ***What do the stakeholders get out of it?*** *The purpose of this category is to estimate the benefit of using or implementing the research results, and assessing their merit and usefulness. The key question is "What do the stakeholders get out of it?"*

Instructions - For each statement:

1. Please read the background information and context section relevant to each statement. This will help you to make an informed judgement on the 1 to 3 Likert scale scoring (Option "0" only applies to category 1)

2. Please enter the appropriate Likert scale score for each category in the box to the left of the category subsections
3. If you feel unable to score a specific category select the "Prefer not to answer" option
4. You have the opportunity to provide optional comments relevant to each research statement

* Required

1. Stakeholder Group *

- ◯ Orthopaedic Surgeons
- ◯ Patient and Public Involvement Group
- ◯ Physical Therapists
- ◯ Physicians
- ◯ Radiologists
- ◯ Researchers

2. Name (Optional)

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SECTION 1

This section provides background information and context to help you making an informed judgement on the Likert scale scoring for statements 55 to 59.

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3. **Prognosis:** We require large, long term prospective cohort studies in different cohorts to investigate the prognosis of primary cam morphology using similar methods (e.g. serial imaging) to allow meaningful sharing of data. No long-term prospective cohort studies (in athletes) have been published to date. Mosler et al (2017) investigated the incidence of hip-and-groin pain in a cohort of Qatar Stars League Footballers (males 18-29y with a high prevalence of cam morphology) over 2 years. Rintje Agricola is investigating the prognosis of primary cam morphology in a small cohort of Dutch academy-level football players.
   To date, no research to investigate how load intervention influences primary cam morphology development or prognosis has been published.

   Prediction: In future, we want to predict the athletes with primary cam morphology at a higher risk of developing symptoms/osteoarthritis. Large prospective cohort studies (and sharing research data) will help us to develop and validate 'prediction models'.

   Risk prediction models can be used to estimate the probability of either having primary cam morphology and/or pincer morphology (diagnostic model) or developing a particular disease (e.g. FAI syndrome or hip osteoarthritis) or outcome (prognostic model). We use these models in clinical practice to inform patients and guide treatment.

   Three phases are recommended before a prediction model may be used in daily practice: development, validation, and impact assessment (Hendriksen 2013)
   Development phase: the focus is on model development commonly using a multivariable logistic (diagnostic) or survival (prognostic) regression analysis. The performance of the developed model is expressed by discrimination, calibration and (re-) classification.
   Validation phase: the developed model is tested in a new set of patients using these same performance measures. This is important, as model performance is commonly poorer in a new set of patients, e.g. due to case-mix or domain differences.
   Impact phase: the ability of a prediction model to actually guide patient management is evaluated. Whereas in the development and validation phase single cohort designs are preferred, this last phase asks for comparative designs, ideally randomized designs; therapeutic management and outcomes after using the prediction model is compared to a control group not using the model (e.g. usual care).

   “Prediction research is a distinct field of epidemiologic research, which should be clearly separated from aetiological research. Both prediction and aetiology make use of multivariable modelling, but the underlying research aim and interpretation of results are very different. Aetiology aims at uncovering the causal effect of a specific risk factor on an outcome, adjusting for confounding factors that are selected based on pre-existing knowledge of causal relations.

   In contrast, prediction aims at accurately predicting the risk of an outcome using multiple predictors collectively, where the final prediction model is usually based on statistically significant, but not necessarily causal, associations in the data at hand.”
   Van Diepen (2017)

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STATEMENT 55

RESEARCH STATEMENT 55: Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology

4. **Background & Context**

Cam morphology refers to a flattening or convexity at the femoral head neck junction.
Pincer morphology refers to either global or focal overcoverage of the femoral head (ball of the hip) by the acetabulum (hip socket). (Ganz 2004)

Research recommendation from **Griffin et al (2016) -** *Warwick agreement on Femoroacetabular impingement syndrome:* What are the diagnostic criteria for Cam and Pincer morphology?

Reiman et al (2019) - *Consensus recommendations on the classification, definition and diagnostic criteria of hip-related pain in young and middle-aged active adults from the International Hip-related Pain Research Network, Zurich 2018*
Research recommendation 1: Measures of bony morphology should be reported in detail. We recommend that bony morphology outcome measures (such as the alpha angle or centre-edge angle) should be clearly defined, measured and reported (e.g., detailed methodological description, blinding, per hip/per person reporting with statistical correction as appropriate, reliability measures)
Research recommendation 2: large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions – FAI syndrome, Acetabular dysplasia and/or hip instability, other conditions causing hip-related pain. This category includes soft-tissue conditions (labrum, cartilage and ligamentum teres) without a specific bony morphology.
(For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.)
This include agreeing on the diagnostic criteria for each hi condition and determining the performance of these criteria (e.g., diagnostic accuracy of clinical and radiological examination)

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5. **RESEARCH STATEMENT 55:** Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	◯	◯	◯	◯	◯
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	◯	◯	◯	◯	◯
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	◯	◯	◯	◯	◯

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *The burden of illness* *- What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Capacity of the system to undertake the research - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Cost justification - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Chances of implementation - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

6. **OPTIONAL COMMENTS** on Research Statement 55: Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology

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STATEMENT 56

12/27/2021

7. **RESEARCH STATEMENT 56:** Studies to develop and validate diagnostic and prognostic models for primary cam morphology in young (maturing) athletes *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	◯	◯	◯	◯	◯
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	◯	◯	◯	◯	◯
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	◯	◯	◯	◯	◯

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *The burden of illness - What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Capacity of the system to undertake the research - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Cost justification - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Chances of implementation - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

8. **OPTIONAL COMMENTS** on **Research Statement 56**: Studies to develop and validate diagnostic and prognostic models for primary cam morphology in young (maturing) athletes

12/27/2021

STATEMENT 57

12/27/2021

9. **RESEARCH STATEMENT 57:** Prospective cohort studies to investigate how exercise intervention influences the development and prognosis of primary cam morphology in cohorts with variable loading demands *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	◯	◯	◯	◯	◯
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	◯	◯	◯	◯	◯
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	◯	◯	◯	◯	◯

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *The burden of illness - What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Capacity of the system to undertake the research - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Cost justification - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Chances of implementation - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

12/27/2021

	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	◯	◯	◯	◯	◯

10. **OPTIONAL COMMENTS** on Research Statement 57: Prospective cohort studies to investigate how exercise intervention influences the development and prognosis of primary cam morphology in cohorts with variable loading demands

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STATEMENT 58

12/27/2021

11. **RESEARCH STATEMENT 58:** Randomised controlled clinical trials to investigate how exercise intervention (load management) influences the development and prognosis of primary cam morphology in different demographic (e.g., sex/gender; race/ethnicity) and load (variable loading demands – e.g., different sports, dance, and physical activity level) cohorts *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	○	○	○	○	○
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	○	○	○	○	○
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○

12/27/2021

	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *<u>The burden of illness</u> - What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *<u>Capacity of the system to undertake the research</u> - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *<u>Cost justification</u> - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *<u>Chances of implementation</u> - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

12/27/2021

	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

12. **OPTIONAL COMMENTS** on Research Statement 58: Randomised controlled clinical trials to investigate how exercise intervention (load management) influences the development and prognosis of primary cam morphology in different demographic (e.g., sex/gender; race/ethnicity) and load (variable loading demands – e.g., different sports, dance, and physical activity level) cohorts

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STATEMENT 59

RESEARCH STATEMENT 59: Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes

13. **Background & Context: Harms and benefits of evidence-based screening - World Health Organisation (WHO)**
A 1968 WHO report by Wilson and Jungner remains the gold standard for **determining whether a screening programme is appropriate**. In sum: (1) *the condition should be important (2) there should be an effective means to treat it to prevent progression, mitigate its effects or, ideally, cure it (3) there should be a screening process that is effective, acceptable and affordable.*

The following text is from WHO/Europe | Cancer - Screening programmes: a short guide. Increase effectiveness, maximize benefits and minimize harm (2020)
*The **purpose of screening** is to identify people in an apparently healthy population who are at higher risk of a health problem or a condition, so that an early treatment or intervention can be offered and thereby reduce the incidence and/or mortality of the health problem or condition within the population.*
*In comparing, the **ability to benefit versus the risk of harm** should be presented in the same way. For example, if a person's ability to benefit from colorectal cancer screening is measured across their lifetime after being screened 10 times, then this must be compared to their risk of harm when they have been screened 10 times. This means that the risk of harm at each screening, including complications, anxiety etc. should be added together to fairly compare harm versus benefits.*

Who benefits? *Evidence indicates that people with high socioeconomic status and a low risk of having severe conditions tend to participate more in screening than do socioeconomically deprived people, who have a higher risk of disease (22–24). This can lead to increasing health inequalities.*
Does the context affect the balance between harm and benefits? *Each screening programme has different benefits and harm, and the balance between these depends on the screening technology, the quality of delivery of the screening services and other contextual factors such as the health of the invited population and the prevalence of the condition in the screened population. This means that a randomized control trial conducted in one country that is considered to demonstrate an overall benefit or harm for the screened population cannot necessarily be replicated when the screening programme is transposed to another country or setting.*
Ethics of screening *Policy-makers may use different ethical frameworks to help them decide whether to proceed with a screening programme. Using a utilitarian position, policy-makers could justify introducing a screening programme when its benefits outweigh its harm at a reasonable cost (25). Alternatively, a deontological perspective would state that some things cannot be morally justified regardless of their outcome; that is, harm to healthy people is not justified even though it might benefit others. A principlism perspective uses a set of principles to guide decision-making (26).*

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14. **RESEARCH STATEMENT 59:** Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	○	○	○	○	○
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	○	○	○	○	○
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *The burden of illness - What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Capacity of the system to undertake the research - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Cost justification - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Chances of implementation - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

15. **OPTIONAL COMMENTS** on Research Statement 59: Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes

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Form 3: Research Priority Setting: Essential National Health Research (ENHR) Strategy

STATEMENTS 64 to 69

Research priority setting is important for "*resource allocation, to address the issue of equity, to attend to the needs of the most vulnerable groups of the population, to reinforce the links between research, action and policy, and because the research priorities set today determine the health agenda, practices and technologies of tomorrow.*" - Council on Health Research for Development - COHRED | A Manual for Research Priority Setting using the ENHR Strategy Priority Settings Manual (cohred.org (http://cohred.org))

The ENHR strategy is a unique systematic approach to identifying research priorities. It is inclusive, involve a broad range of stakeholders, has a multidisciplinary and cross-sectoral approach, and is characterised by partnership development, participatory and transparent processes, and systematic analyses of health needs.

You will be asked to rank 18 research statements (scored as critical (Likert scale 7 to 9) by ≥70% of panel members *and* not important (Likert scale 1 to 3) by <15% of panel members of the Primary Cam Morphology Delphi Study) using 4 categories:

1. CATEGORY 1: **Appropriateness** - ***Should we do it?*** *The purpose of the category is to determine if the proposed research is well suited to the target society and if it duplicates past studies. The key question is "Should we do it?"*
2. CATEGORY 2: **Relevancy** - ***Why should we do it?*** *The purpose of this category is to make sure that the proposed research is the right kind for the right people, and is pertinent to the health problem of the community without ignoring equity issues. The key question is "Why should we do it?"*
3. CATEGORY 3: **Chance of success** - ***Can we do it?*** *The purpose of this category is to evaluate the strength and resources of the prospective research team. The key question is "Can we do it?"*
4. CATEGORY 4: **Impact** of the research outcome - ***What do the stakeholders get out of it?*** *The purpose of this category is to estimate the benefit of using or implementing the research results, and assessing their merit and usefulness. The key question is "What do the stakeholders get out of it?"*

Instructions - For each statement:

1. Please read the background information and context section relevant to each statement. This will help you to make an informed judgement on the 1 to 3 Likert scale scoring (The "0" option is only applicable to category 1)

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2. Please enter the appropriate Likert scale score for each category in the box to the left of the category subsections
3. If you feel unable to score a specific category select the "Prefer not to answer" option
4. You have the opportunity to provide optional comments relevant to each research statement

* Required

1. Stakeholder Group *

- ○ Orthopaedic Surgeons
- ○ Patient and Public Involvement Group
- ○ Physical Therapists
- ○ Physicians
- ○ Radiologists
- ○ Researchers

2. Name (Optional)

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SECTION 1

This section provides background information and context to help you making an informed judgement on the Likert scale scoring for statements 64 to 69. (femoroacetabular impingement syndrome; best practice physiotherapy; return-to-sport)

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3. **Femoroacetabular Impingement (FAI) Syndrome**
Definition: FAI syndrome is a motion-related clinical disorder of the hip with a triad of symptoms, clinical signs and imaging findings. It represents symptomatic premature contact between the proximal femur and the acetabulum. *The Warwick Agreement on femoroacetabular impingement syndrome (FAI syndrome): an international consensus statement* | BJSM (bmj.com (http://bmj.com))
Aetiology: Prospective cohort studies during skeletal maturation (age 9 to16) in different large cohorts (gender, especially in women's sport; different sports, including parasport; different player positions within a sport; different race/ethnic cohorts) using similar methods (e.g. serial MR imaging; similar definition for cam morphology and risk factors) to allow meaningful sharing of data.
Prognosis: We require long term prospective cohort studies in different cohorts to investigate the prognosis of FAI syndrome using similar methods (e.g. serial imaging) to allow meaningful sharing of data. No long-term prospective studies are published.
Prediction: In future, we want to predict the athletes with FAI syndrome and primary cam morphology at a higher risk of developing symptoms/osteoarthritis. Large prospective cohort studies (and sharing research data) will help us to develop and validate 'prediction models'.
"Prediction research is a distinct field of epidemiologic research, which should be clearly separated from aetiological research. Both prediction and aetiology make use of multivariable modelling, but the underlying research aim and interpretation of results are very different. Aetiology aims at uncovering the causal effect of a specific risk factor on an outcome, adjusting for confounding factors that are selected based on pre-existing knowledge of causal relations.
In contrast, prediction aims at accurately predicting the risk of an outcome using multiple predictors collectively, where the final prediction model is usually based on statistically significant, but not necessarily causal, associations in the data at hand."
Van Diepen (2017)
Treatment: A recent statement paper on FAI syndrome and labral tears identified 14 randomised controlled trials for treatment of FAI syndrome. Prescribed physiotherapy (hip strengthening, hip joint manual therapy techniques, functional activity-specific retraining and education) showed a small to medium effect size compared with a combination of passive modalities, stretching and advice (very low to low quality of evidence; interpretation of evidence: very uncertain, but may slightly improve outcomes). Prescribed physiotherapy was, however, inferior to hip arthroscopy (small effect size; moderate quality of evidence; interpretation of evidence: hip arthroscopy probably increases outcome slightly). For both domains, the overall quality of evidence ranged from very low to moderate indicating that future research on diagnosis and treatment may alter the conclusions from this review - Ishoi (2021)
Some of the **challenges** associated with prospective studies on FAI syndrome: Studies on aetiology, prognosis, treatment involve: (1) adolescent &adult athletes and sedentary controls, their parents, and other key role players like club management; (2) long term prospective studies with the risk of participants not completing all stages of the study (attrition); (3) serial imaging (MR imaging is expensive; radiation is a potential issue when using radiographs & CT scans); (4) large cohorts; (5) collaboration and data sharing (logistical and legal challenges); (6) countries that cannot afford this type of research (equity); (7) uniform operational

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definitions of load, anatomical-, kinetic/kinematic-, mechanical/biomechanical- & other risk factors

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STATEMENT 64

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4. **RESEARCH STATEMENT 64:** Prospective cohort studies to investigate risk factors for the development and prognosis of femoroacetabular impingement (FAI) syndrome in different cohorts *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	○	○	○	○	○
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	○	○	○	○	○
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *The burden of illness* *- What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Capacity of the system to undertake the research - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Cost justification - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Chances of implementation - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	◯	◯	◯	◯	◯

5. **OPTIONAL COMMENTS** on **Research Statement 64:** Prospective cohort studies to investigate risk factors for the development and prognosis of femoroacetabular impingement (FAI) syndrome in different cohorts

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STATEMENT 65

RESEARCH STATEMENT 65: Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of femoroacetabular impingement syndrome in cohorts with variable loading demands

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6. **Background information and context.**
Griffin et al (2016) - *Warwick agreement on FAI syndrome* recommended research to answer the following questions:
- What is the outcome of conservative treatment?
- Which patients respond best to conservative management?
- What is the most effective conservative management program?
- What is the role of hip muscle dysfunction and movement patterns in FAI morphology and symptoms?
- Can rehabilitation prevent FAI pain and if so, how?
- What are the best outcome measures to show change following treatment?
- What are the return to sport criteria following FAI surgery [or physiotherapy directed exercise program]?

Reiman et al (2019) - *Consensus recommendations on the classification, definition and diagnostic criteria of hip-related pain in young and middle-aged active adults from the International Hip-related Pain Research Network, Zurich 2018* *https://bjsm.bmj.com/content/early/2020/01/20/bjsports-2019-101453 (https://bjsm.bmj.com/content/early/2020/01/20/bjsports-2019-101453)*
The most common hip conditions in young and middle-aged active adults presenting with hip-related pain are: (1) femoroacetabular impingement (FAI) syndrome, (2) acetabular dysplasia and/or hip instability and (3) other conditions without a distinct osseous morphology (labral, chondral and/or ligamentum teres conditions).
Research recommendation 2: We recommend large-scale, interdisciplinary research on aetiology and prognosis for each of the listed hip-related pain conditions. (For example: (1) The relationship between bony morphology and other factors related to these conditions or (2) Movement-related factors relative to each hip-related pain condition.)
Kemp et al (2019) – *Physiotherapist-led treatment for young to middle-aged active adults with hip-related pain: consensus recommendations from the International Hip-related Pain Research Network, Zurich 2018*
http://bjsm.bmj.com/lookup/doi/10.1136/bjsports-2019-101458 (http://bjsm.bmj.com/lookup/doi/10.1136/bjsports-2019-101458)
Research Recommendation 1. Reporting of exercise programmes. Exercise descriptors such as load magnitude, number of repetitions and sets, duration of whole programme, duration of contractile element of exercise, duration of one repetition, time under tension, rest between repetitions, range of motion through which the exercise is performed and rest between exercise sessions should be considered and reported. The primary goal of studies examining physiotherapist-led exercise therapies for hip-related pain is to develop and then test the most effective exercises for the condition. When developing effective and tailored treatment programmes, the mechanistic effect of particular elements of the exercises on the target muscles and surrounding tissues is considered.
Research Recommendation 2. Development of high-quality exercise programmes. Research should investigate the optimal frequency, intensity, time, type, volume and progression of exercise therapy. Exercise-based programmes used in clinical research should include patient input in their design and be appropriately constructed to gain maximal improvements in outcomes. In strength-based treatments, exercise programme require adequate load to gain a strength effect. The frequency, intensity, time, type, volume and progression of exercise therapy may need to be manipulated

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to gain the desired effect. The expert group recommended that guidelines, such as those developed by the American College of Sports Medicine (ACSM), should be used with the development of strength-based treatments. The group also indicated that fidelity and adherence of exercise programmes were often not suitable to gain the desired effect. Studies evaluating the effectiveness of physiotherapist-led exercise programmes should ensure that treatments are developed and reported using these principles.

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7. **RESEARCH STATEMENT 65:** Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of femoroacetabular impingement syndrome in cohorts with variable loading demands *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	○	○	○	○	○
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	○	○	○	○	○
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *<u>The burden of illness</u> - What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *<u>Capacity of the system to undertake the research</u> - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *<u>Cost justification</u> - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *<u>Chances of implementation</u> - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

8. **OPTIONAL COMMENTS** on **Research Statement 65**: Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of femoroacetabular impingement syndrome in cohorts with variable loading demands

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STATEMENT 66

RESEARCH STATEMENT 66: Randomised controlled clinical trials to investigate best practice physiotherapy vs arthroscopic hip surgery, vs sham surgery, in cohorts with variable loading demands diagnosed with femoroacetabular impingement syndrome

9. A recent statement paper on FAI syndrome and labral tears identified 14 randomised controlled trials for treatment of FAI syndrome. Prescribed physiotherapy (hip strengthening, hip joint manual therapy techniques, functional activity-specific retraining and education) showed a small to medium effect size compared with a combination of passive modalities, stretching and advice (very low to low quality of evidence; interpretation of evidence: very uncertain, but may slightly improve outcomes). Prescribed physiotherapy was, however, inferior to hip arthroscopy (small effect size; moderate quality of evidence; interpretation of evidence: hip arthroscopy probably increases outcome slightly). For both domains, the overall quality of evidence ranged from very low to moderate indicating that future research on diagnosis and treatment may alter the conclusions from this review - Ishoi (2021) - *Femoroacetabular impingement syndrome and labral injuries: grading the evidence on diagnosis and non-operative treatment-a statement paper commissioned by the Danish Society of Sports Physical Therapy (DSSF) - PubMed (nih.gov (http://nih.gov))*

   In an editorial published in BJSM (Kemp et al - 2019 - *Is exercise therapy for femoroacetabular impingement in or out of FASHIoN? We need to talk about current best practice for the non-surgical management of FAI syndrome*; https://bjsm.bmj.com/content/early/2019/01/09/bjsports-2018-100173 (https://bjsm.bmj.com/content/early/2019/01/09/bjsports-2018-100173)), the authors question whether the non-surgical treatment programmes evaluated in the recent RCTs (comparing arthroscopic hip surgery with physiotherapy) included the type, dose and progression of exercises needed to generate a meaningful change in strength and function. In both studies, the physiotherapist-led groups did show some improvement (14% in both studies); however, patients still remained impaired at the conclusion of the programmes. More studies (RCTs) are required

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10. **RESEARCH STATEMENT 66:** Randomised controlled clinical trials to investigate best practice physiotherapy vs arthroscopic hip surgery, vs sham surgery, in cohorts with variable loading demands diagnosed with femoroacetabular impingement syndrome *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues* - *Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	○	○	○	○	○
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data* - *How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	○	○	○	○	○
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand* - *How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? <u>*The burden of illness*</u> *- What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? <u>*Capacity of the system to undertake the research*</u> *- How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? <u>*Cost justification*</u> *- How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? <u>*Chances of implementation*</u> *- What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

11. **OPTIONAL COMMENTS** on **Research Statement 66:** Randomised controlled clinical trials to investigate best practice physiotherapy vs arthroscopic hip surgery, vs sham surgery, in cohorts with variable loading demands diagnosed with femoroacetabular impingement syndrome

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STATEMENT 67

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12. **RESEARCH STATEMENT 67:** Prospective cohort studies to investigate the prognosis after best practice physiotherapy and/or arthroscopic hip surgery in different sport/dance/physical activity level cohorts with femoroacetabular impingement syndrome *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	○	○	○	○	○
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	○	○	○	○	○
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? <u>*The burden of illness*</u> *- What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? <u>*Capacity of the system to undertake the research*</u> *- How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? <u>*Cost justification*</u> *- How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? <u>*Chances of implementation*</u> *- What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

13. **OPTIONAL COMMENTS** on **Research Statement 67**: Prospective cohort studies to investigate the prognosis after best practice physiotherapy and/or arthroscopic hip surgery in different sport/dance/physical activity level cohorts with femoroacetabular impingement syndrome

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STATEMENT 68

RESEARCH STATEMENT 68: Randomised controlled clinical trials to investigate what best practice physiotherapy is (e.g., in different populations and settings; pre- and post-surgery)

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14. **This summary provides background information and context to Statement 68.**

Kemp et al (2019) - *Standardised measurement of physical capacity in young and middle-aged active adults with hip-related pain: recommendations from the first International Hip-related Pain Research Network (IHiPRN) meeting, Zurich, 2018* https://bjsm.bmj.com/content/early/2019/12/24/bjsports-2019-101457 (https://bjsm.bmj.com/content/early/2019/12/24/bjsports-2019-101457)

Research Recommendation 1. Reporting of exercise programmes. Exercise descriptors such as load magnitude, number of repetitions and sets, duration of whole programme, duration of contractile element of exercise, duration of one repetition, time under tension, rest between repetitions, range of motion through which the exercise is performed and rest between exercise sessions should be considered and reported. The primary goal of studies examining physiotherapist-led exercise therapies for hip-related pain is to develop and then test the most effective exercises for the condition. When developing effective and tailored treatment programmes, the mechanistic effect of particular elements of the exercises on the target muscles and surrounding tissues is considered.

Research Recommendation 2. Development of high-quality exercise programmes. Research should investigate the optimal frequency, intensity, time, type, volume and progression of exercise therapy. Exercise-based programmes used in clinical research should include patient input in their design and be appropriately constructed to gain maximal improvements in outcomes. In strength-based treatments, exercise programme require adequate load to gain a strength effect. The frequency, intensity, time, type, volume and progression of exercise therapy may need to be manipulated to gain the desired effect. The expert group recommended that guidelines, such as those developed by the American College of Sports Medicine (ACSM), should be used with the development of strength-based treatments. The group also indicated that fidelity and adherence of exercise programmes were often not suitable to gain the desired effect. Studies evaluating the effectiveness of physiotherapist-led exercise programmes should ensure that treatments are developed and reported using these principles.

Other ongoing and published studies:

Kemp: The physiotherapy for Femoroacetabular Impingement Rehabilitation STudy (PhysioFIRST): A participant and assessor blinded randomised controlled trial of physiotherapy to reduce pain and improve function for hip impingement (ongoing)

Harris-Hayes (2020) - Movement pattern training compared with standard strengthening and flexibility among patients with hip-related groin pain: results of a pilot multicentre randomised clinical trial (Concluded that that a larger, multicentre RCT is feasible).

Harris-Hayes (2021) One-year outcomes following physical therapist-led intervention for chronic hip-related groin pain: Ancillary analysis of a pilot multicenter randomized clinical trial (Conclusion: In patients with chronic hip related groin pain, both movement pattern training (MoveTrain) and traditional strength/flexibility (Standard) resulted in improved outcomes, sustained 12 months after treatment. Further investigation in a larger sample is needed to confirm findings.

Koch (2021) Comparison between movement pattern training and strengthening on muscle volume, muscle fat, and strength in patients with hip-related groin pain (HRGP): An exploratory analysis (Concluded that movement pattern training or a

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program of strength/flexibility training may be effective at improving hip abductor strength & reducing fatty infiltration in the gluteal musculature among those with HRGP. More research needed to better understand etiology of strength changes & effect of exercise on muscle structure & function)

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15. **RESEARCH STATEMENT 68:** Randomised controlled clinical trials to investigate what best practice physiotherapy is (e.g., in different populations and settings; pre- and post-surgery) *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	○	○	○	○	○
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	○	○	○	○	○
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *The burden of illness* - *What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Capacity of the system to undertake the research - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Cost justification - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Chances of implementation - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

16. **OPTIONAL COMMENTS** on **Research Statement 68**: Randomised controlled clinical trials to investigate what best practice physiotherapy is (e.g., in different populations and settings; pre- and post-surgery)

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STATEMENT 69

RESEARCH STATEMENT 69: Studies to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain

17. **Background & context:**

There are three relevant recommendations regarding RTS from the consensus paper by **Mosler et al (2019)** - *Standardised measurement of physical capacity in young and middle-aged active adults with hip-related pain: recommendations from the first International Hip-related Pain Research Network (IHiPRN) meeting, Zurich, 2018*

https://bjsm.bmj.com/content/early/2019/12/24/bjsports-2019-101457 (https://bjsm.bmj.com/content/early/2019/12/24/bjsports-2019-101457)

Three relevant recommendations from this paper:

Research recommendation 5: The Return To Sport (RTS) continuum recommended by the 2016 RTS consensus paper (Ardern et al) should be used in future research. Definitions used in studies examining RTS following management of hip-related pain often consider RTS as a dichotomous variable (yes/no) and fail to distinguish between the differing levels of RTS or consider whether the athlete has successfully returned to their preinjury sporting performance.

Research recommendation 6: Future research is required to quantify, and report return to physical activity (including sport and occupation) following management of hip-related pain.

Research recommendation 7: Research is recommended to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain. Several studies have reported RTS criteria following hip arthroscopy
But there have been no reports of RTS criteria following non-surgical management of hip-related pain.
Psychological readiness to RTS should take into account the individual patient and the physical and psychological demands of the sport.
A significant gap exists in the literature with respect to standardised RTS criteria following management of hip-related pain, and this was identified as a future research priority by the IHiPRN participants

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18. **RESEARCH STATEMENT 69:** Studies to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain *

	3	2	1	0	Cannot answer
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Ethical & moral issues - Is the planned research ethically and morally acceptable?* (**3:** No foreseeable problem; **2:** Sensitive issue; **1:** Debatable, Equivocal; **0:** Unacceptable)	○	○	○	○	○
CATEGORY 1: APPROPRIATENESS - SHOULD WE DO IT? *Availability of pre-existing data - How adequate is any available research-based information on this topic?* (**3:** None in existence; **2:** Scarce, Inadequate; **1:** Fair, moderate; **0:** Abundance)	○	○	○	○	○
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *Equity focus and community concern / demand - How much does research in this area contribute to better equity in health and serve the community concern or demand?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 2: RELEVANCY - WHY SHOULD WE DO IT? *The burden of illness - What is the size and severity of the problem?* (**3:** High; **2:** Moderate; **1:** Low or None)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Capacity of the system to undertake the research - How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 3: THE CHANCE OF SUCCESS - CAN WE DO IT? *Cost justification - How justifiable is the cost of running this research project?* (**3:** excellent; **2:** Good; **1:** Fair or Poor)	○	○	○	○	○
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Chances of implementation - What are the chances of the recommendations being implemented?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

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	3	2	1	0	Cannot answer
CATEGORY 4: IMPACT OF THE RESEARCH OUTCOME. WHAT DO THE STAKEHOLDERS GET OUT OF IT? *Overall reduction of the burden, including cost - How much impact will this research have on health of the population?* (**3:** High; **2:** Fair, Moderate; **1:** Low or None)	○	○	○	○	○

19. **OPTIONAL COMMENTS** on **Research Statement 69**: Studies to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain

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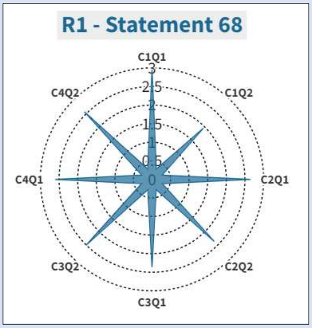
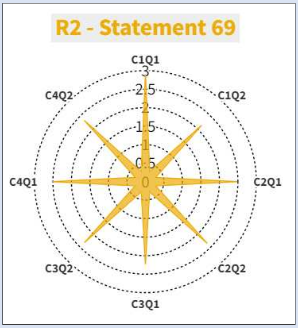
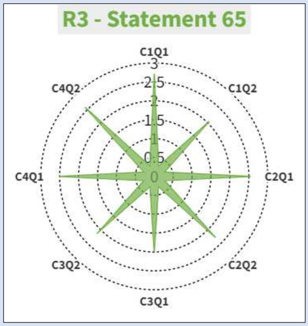
SUPPLEMENTARY FILE 9
*ENHR ranking exercise: average criterium scores for statements 68, 69 and 65, ranked 1st to 3rd of 18

Statement Detail	C1Q1	C1Q2	C2Q1	C2Q2	C3Q1	C3Q2	C4Q1	C4Q2	Rank
R1 - Statement 68: Randomised controlled clinical trials to investigate what best practice physiotherapy is (e.g. in different populations and settings; pre- and post-surgery)	2.95	1.95	2.64	2.36	2.36	2.51	2.60	2.57	1
R2 - Statement 69: Studies to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain	2.90	2.15	2.48	2.36	2.23	2.33	2.50	2.34	2
R3 - Statement 65: Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of femoroacetabular impingement syndrome in cohorts with variable loading demands	2.71	2.05	2.55	2.29	2.00	2.15	2.51	2.59	3





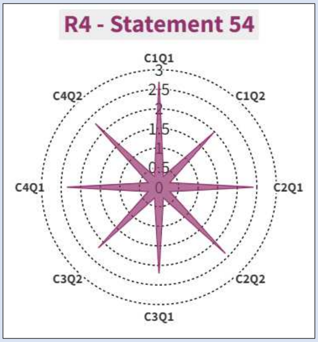


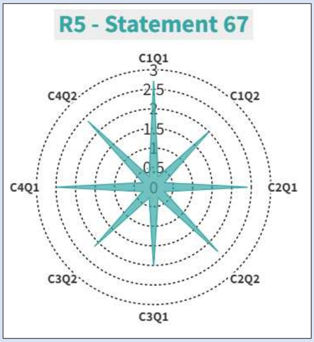
Category (C)	Question (Q)
1. Appropriateness: should we do the research?	1. Is the planned research ethically and morally acceptable? (C1Q1)
	2. How adequate is any available research-based information on the topic? (C1Q2)
2. Relevancy: why should we do the research?	1. How much does research in this area contribute to better equity in health and serve the community concern or demand? (C2Q1)
	2. What is the size and severity of the problem? (C2Q2)
3. The chances of success: can we do the research?	1. How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources? (C3Q1)
	2. How justifiable is the cost running this project? (C3Q2)
4. Impact of the research outcome: what do the stakeholders get out of the research?	1. What are the chances of the recommendations being implemented? (C4Q1)
	2. How much impact will this research have on health of the population? (C4Q2)

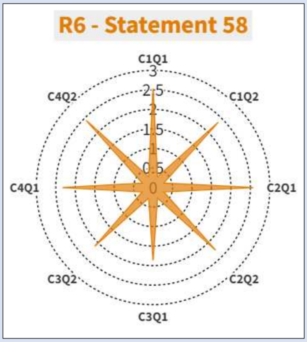
* Essential National Health Research

*ENHR ranking exercise: average criterium scores for statements 54, 67 and 68, ranked 4th to 6th of 18

Statement Detail	C1Q1	C1Q2	C2Q1	C2Q2	C3Q1	C3Q2	C4Q1	C4Q2	Rank
R4 - Statement 54: Prospective cohort studies that investigate prognosis (consequences) of primary cam morphology in different cohorts	2.69	1.98	2.41	2.40	2.2	2.19	2.35	2.29	4
R5 - Statement 67: Prospective cohort studies to investigate the prognosis after best practice physiotherapy and/ or arthroscopic hip surgery in different sport/ dance/ physical activity level cohorts with femoroacetabular impingement syndrome	2.71	2.02	2.4	2.33	2.02	2.15	2.48	2.38	5
R6 - Statement 68: Randomised controlled clinical trials to investigate what best practice physiotherapy is (e.g. in different populations and settings; pre- and post-surgery)	2.53	2.36	2.57	2.27	1.86	2.12	2.32	2.43	6





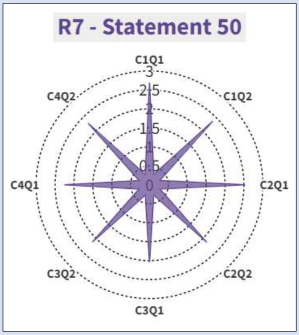


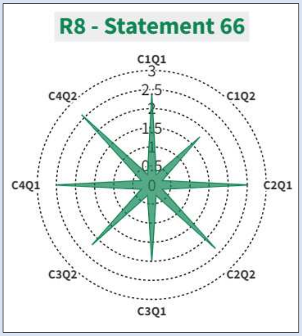
Category (C)	Question (Q)
1. Appropriateness: should we do the research?	1. Is the planned research ethically and morally acceptable? (C1Q1)
	2. How adequate is any available research-based information on the topic? (C1Q2)
2. Relevancy: why should we do the research?	1. How much does research in this area contribute to better equity in health and serve the community concern or demand? (C2Q1)
	2. What is the size and severity of the problem? (C2Q2)
3. The chances of success: can we do the research?	1. How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources? (C3Q1)
	2. How justifiable is the cost running this project? (C3Q2)
4. Impact of the research outcome: what do the stakeholders get out of the research?	1. What are the chances of the recommendations being implemented? (C4Q1)
	2. How much impact will this research have on health of the population? (C4Q2)

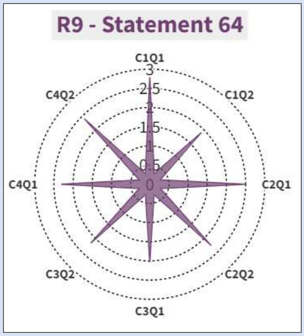
* Essential National Health Research

*ENHR ranking exercise: average criterium scores for statements 50, 66 and 64, ranked 7th to 9th of 18

Statement Detail	C1Q1	C1Q2	C2Q1	C2Q2	C3Q1	C3Q2	C4Q1	C4Q2	Rank
R7 - Statement 50: Prospective cohort studies that investigate how primary cam morphology develops in different sex/ gender cohorts, specifically women cohorts (causal inference approach to investigate gender as a risk factor for primary cam morphology)	2.69	2.37	2.53	2.15	2.04	2.13	2.25	2.29	7
R8 - Statement 66: Randomised controlled clinical trials to investigate best practice physiotherapy vs arthroscopic hip surgery vs sham surgery in cohorts with variable loading demands diagnosed with femoroacetabular impingement syndrome	2.38	1.78	2.52	2.36	1.98	2.22	2.52	2.60	8
R9 - Statement 64: Prospective cohort studies to investigate risk factors for the development and prognosis of femoroacetabular impingement (FAI) syndrome in different cohorts	2.79	1.90	2.48	2.26	2.03	2.17	2.31	2.41	9







Category (C)	Question (Q)
1. Appropriateness: should we do the research?	1. Is the planned research ethically and morally acceptable? (C1Q1)
	2. How adequate is any available research-based information on the topic? (C1Q2)
2. Relevancy: why should we do the research?	1. How much does research in this area contribute to better equity in health and serve the community concern or demand? (C2Q1)
	2. What is the size and severity of the problem? (C2Q2)
3. The chances of success: can we do the research?	1. How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources? (C3Q1)
	2. How justifiable is the cost running this project? (C3Q2)
4. Impact of the research outcome: what do the stakeholders get out of the research?	1. What are the chances of the recommendations being implemented? (C4Q1)
	2. How much impact will this research have on health of the population? (C4Q2)

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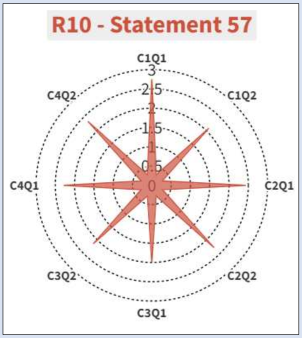
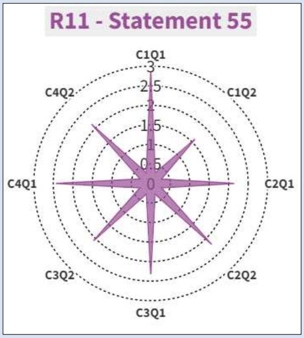
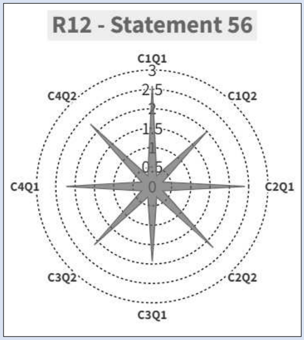
*ENHR ranking exercise: average criterium scores for statements 57, 55 and 56, ranked 10th to 12th of 18

Statement Detail	C1Q1	C1Q2	C2Q1	C2Q2	C3Q1	C3Q2	C4Q1	C4Q2	Rank
R10 - Statement 57: Prospective cohort studies to investigate how exercise intervention influences the development and prognosis of primary cam morphology in cohorts with variable loading demands	2.75	2.09	2.43	2.28	2.00	2.14	2.28	2.34	10
R11 - Statement 55: Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology	2.84	1.60	2.14	2.21	2.32	2.07	2.43	2.14	11
R12 - Statement 56: Studies to develop and validate diagnostic and prognostic models for primary cam morphology in young (maturing) athletes	2.59	1.98	2.40	2.23	1.93	2.12	2.23	2.27	12







Category (C)	Question (Q)
1. Appropriateness: should we do the research?	1. Is the planned research ethically and morally acceptable? (C1Q1)
	2. How adequate is any available research-based information on the topic? (C1Q2)
2. Relevancy: why should we do the research?	1. How much does research in this area contribute to better equity in health and serve the community concern or demand? (C2Q1)
	2. What is the size and severity of the problem? (C2Q2)
3. The chances of success: can we do the research?	1. How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources? (C3Q1)
	2. How justifiable is the cost running this project? (C3Q2)
4. Impact of the research outcome: what do the stakeholders get out of the research?	1. What are the chances of the recommendations being implemented? (C4Q1)
	2. How much impact will this research have on health of the population? (C4Q2)

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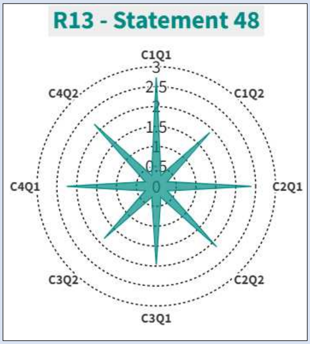
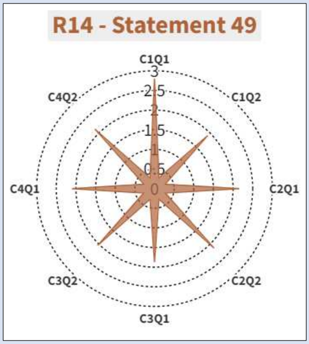
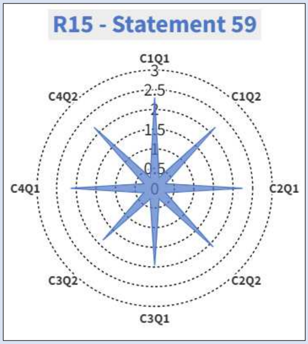
***ENHR ranking exercise: average criterium scores for statements 48, 49 and 59, ranked 13th to 15th of 18**

Statement Detail	C1Q1	C1Q2	C2Q1	C2Q2	C3Q1	C3Q2	C4Q1	C4Q2	Rank
R13 - Statement 48: Prospective cohort studies to investigate risk factors (aetiological and prognostic) of primary cam morphology in different cohorts	2.73	1.90	2.39	2.15	1.96	1.85	2.25	2.20	13
R14 - Statement 49: Prospective cohort studies that investigate how primary cam morphology develops in cohorts with variable loading demands (e.g. difference sports/ dance/ physical activity level cohorts and sedentary cohorts) (causal inference approach to investigate load as a risk factor for primary cam morphology)	2.80	1.91	2.16	2.14	1.87	2.04	2.10	2.14	14
R15 - Statement 59: Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes	2.30	2.19	2.24	2.10	1.95	1.86	2.14	2.19	15







Category (C)	Question (Q)
1. Appropriateness: should we do the research?	1. Is the planned research ethically and morally acceptable? (C1Q1)
	2. How adequate is any available research-based information on the topic? (C1Q2)
2. Relevancy: why should we do the research?	1. How much does research in this area contribute to better equity in health and serve the community concern or demand? (C2Q1)
	2. What is the size and severity of the problem? (C2Q2)
3. The chances of success: can we do the research?	1. How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources? (C3Q1)
	2. How justifiable is the cost running this project? (C3Q2)
4. Impact of the research outcome: what do the stakeholders get out of the research?	1. What are the chances of the recommendations being implemented? (C4Q1)
	2. How much impact will this research have on health of the population? (C4Q2)

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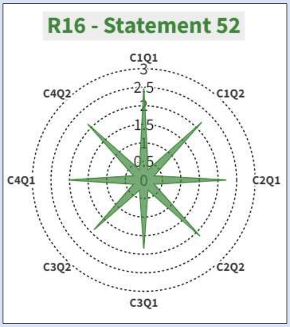
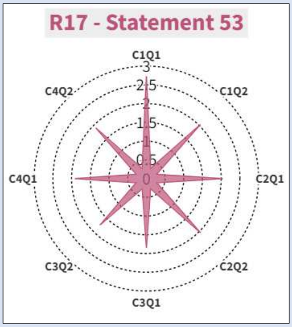
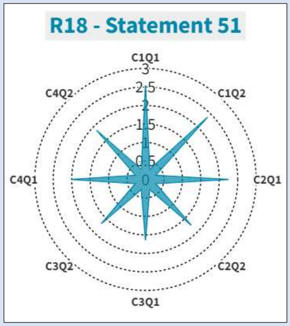
***ENHR ranking exercise: average criterium scores for statements 52, 53 and 51, ranked 16th to 18th of 18**

Statement Detail	C1Q1	C1Q2	C2Q1	C2Q2	C3Q1	C3Q2	C4Q1	C4Q2	Rank
R16 - Statement 52: Prospective cohort studies that investigate how primary cam morphology develops in different race/ ethnic cohorts (causal inference approach to investigate race/ ethnicity as a risk factor for primary cam morphology)	2.47	2.20	2.22	2.13	1.85	1.89	2.02	2.13	16
R17 - Statement 53: Prospective cohort studies that investigate other potential risk factors for primary cam morphology (causal inference approach to investigate the following risk factors: anatomical-spine; acetabulum; femur; kinetic and kinematic risk factors; mechanical and biomechanical; other possible risk factors that might emerge over time)	2.73	2.04	2.04	2.04	1.85	1.76	1.91	1.91	17
R18 - Statement 51: Prospective cohort studies that investigate how primary cam morphology develops in different parasport cohorts (causal inference approach to investigate load as a risk factor for primary cam morphology)	2.54	2.38	2.25	1.75	1.64	1.69	2.00	1.87	18







Category (C)	Question (Q)
1. Appropriateness: should we do the research?	1. Is the planned research ethically and morally acceptable? (C1Q1)
	2. How adequate is any available research-based information on the topic? (C1Q2)
2. Relevancy: why should we do the research?	1. How much does research in this area contribute to better equity in health and serve the community concern or demand? (C2Q1)
	2. What is the size and severity of the problem? (C2Q2)
3. The chances of success: can we do the research?	1. How adequate is the capacity of the system to undertake the research in terms of competency, infrastructure, support system, mechanisms and resources? (C3Q1)
	2. How justifiable is the cost running this project? (C3Q2)
4. Impact of the research outcome: what do the stakeholders get out of the research?	1. What are the chances of the recommendations being implemented? (C4Q1)
	2. How much impact will this research have on health of the population? (C4Q2)

* Essential National Health Research

SUPPLEMENTARY FILE 10: Panellists' qualitative feedback for research priorities (Delphi Domain 5) for Delphi rounds 1 and 2, and Essential National Health Research (ENHR) ranking exercise

Table of Contents

Statement and qualitative feedback (including reasons for score boundary changes between Round 1 and Round 2) – Consensus statements in GREEN and non-consensus on YELLOW

No	RESEARCH PRIORITIES
48	48_Prospective cohort studies to investigate risk factors (aetiological and prognostic) of primary cam morphology in different cohorts Qualitative feedback • I do not agree that the concept of Primary and secondary CAM is commonly agreed and established • The impact depends on identifying individuals at risk of developing cam morphology, and then having an acceptable intervention to reduce this risk, which is challenging when we wish to promote exercise in youth. • In the long term as most cam morphology does not seem to cause problems - finding out about its aetiology would not be top priority for me - also if its due to athletic loading - how to then deal with this - we don't want to make kids inactive! • For the category APPROPRIATENESS - SHOULD WE DO IT? People might be unaware of the data available. For example, we are now working in Generation R, which is a prospective general population study in children on which we have prospective follow-up imaging data of the hip of around 3000 children at ages 9, 13 and 17 years (the latter is ongoing) • Are the best study design, but have ethical and economic issues • Multicentre studies would really improve knowledge and patient care • Some questions are challenging to be answered. For example Category 3 question 1: infrastructure and supporting systems are different and varying between countries (for the particular International study). My respond is 'Cannot answer based' on the above comment. My personal view as someone who is privileged to live in a country with great supportive mechanisms and capacity would be excellent 3. I am sorry of I am not able to help with this. Category 4, question 2: Is it the impact on health of the general population or the athletic population? I will base my answer re: the impact the research would have for the athletic population (and overall my answers for category 4). Challenging questions to answer. Thank you • Although I agree hugely with the statement that there is a need for prospective cohort studies, the implications of incidental findings and how imaging outcomes are communicated needs to be developed further • More a general comment. It is clear that well-conducted cohort studies are the first option, but also well-conducted case-control are informative. There are a lot of studies in epidemiology properly done including simulations showing that when appropriately conducted and designed the results are comparable to cohort studies. In the end, a case-control nested in a cohort is a good option especially if the event is rare. It is also true that the bad reputation of case-control derives from the past poor studies and, unfortunately, the majority of the epi studies in sports medicine are poor (methodologically speaking). This is to say that the methodology is important and more important than the design itself. My two cents.
49	49_Prospective cohort studies that investigate how primary cam morphology develops in cohorts with variable loading demands (e.g.; difference sports/dance/physical activity level cohorts; and sedentary cohorts) (causal inference approach to investigate load as a risk factor for primary cam morphology) Qualitative feedback • I do not agree that the concept of Primary and secondary CAM is commonly agreed and established • Several studies suggested the relation between loading and cam morphology development; but which loading threshold exactly triggers this is unknown. Therefore I changed it to 7 (critical). • The effect of different loading patterns is the salient question, as it may be possible to modify loading in specific athletic populations, but perhaps not in general population cohorts. • Training loads are difficult to accurately capture and future buy-in will be tough. Not sure the field should start here. • This may be challenging given we hope most youth would be involved in multiple sports (avoiding specialization) and/or multiple loading patterns over time. There may be a role for looking at specialization vs not - i.e. would a ice hockey player who plays year round develop cam morphology at higher rate than an age-matched individual participating in several sports? • As per the previous statement re need to develop how findings are communicated. Although I agree that we need to investigate CAM in different cohorts, perhaps a starting point should be something like youth football given its resources and size. It would allow a pooling of attention/research skills and work out from there?

- My concern with this is in how "load" gets defined in the research. If this is simply step count or impact loading, it may not be as informative as understanding directions of loading.
- It depends on the sports of course, but as an example, there is no way that disciplines such as dance will change something in terms of load to prevent the development of health problems. That's why I indicated fair to moderate in the last question. I balanced the potential impact in relation to the capacity of the sports discipline to implement any recommendations. For some is probably easier than others.

50

50_Prospective cohort studies that investigate how primary cam morphology develops in different sex/ gender cohorts; specifically women cohorts (causal inference approach to investigate gender as a risk factor for primary cam morphology)

Qualitative feedback

- I do not agree that the concept of Primary and secondary CAM is commonly agreed and established
- The challenge will be suggesting activity modification in general population cohorts when we should be promoting activity for cardiovascular benefits.
- On the one hand we know little about females - but what we do no would suggest lower prevalence - so even larger groups and costs needed to study!
- Straight forward and needs to be done
- It feels like there is an ethical imperative to ensure there is more research in this space around females given the lack of current data.
- As we have no data on the problem, the size and severity of the problem is difficult to quantify.
- Burden of illness seems to be higher in females (>50% of surgeries, and worse outcomes).

51

51_Prospective cohort studies that investigate how primary cam morphology develops in different parasport cohorts (causal inference approach to investigate load as a risk factor for primary cam morphology)

Qualitative feedback

- non modifiable
- I do not agree that the concept of Primary and secondary CAM is commonly agreed and established
- I do not know the extent of hip-related pain in parasports. This would influence the relevance of further research
- In all my years of treating FAIS very very few Para sporters
- Difficult population to study because infrastructure to support isn't as strong. BUT incredibly important.
- Big challenge is to have a large enough sample size, for sure this has to be an IPC supported activity
- Currently no data for Category 2, so not sure how to respond to that one
- I realize I don't know much about the current research etc in parasport so I ended up answering "cannot answer" a lot.
- Adequate sample size and planning for dropout seem to be challenge to meet this Research Statement.

52

52_Prospective cohort studies that investigate how primary cam morphology develops in different race/ethnic cohorts (causal inference approach to investigate race/ethnicity as a risk factor for primary cam morphology)

Qualitative feedback

- non modifiable
- I do not agree that the concept of Primary and secondary CAM is commonly agreed and established
- It will be important to have people of diverse races/ethnicities respond to this question
- As race is non-modifiable I would not make this a priority
- I rated this lower simply as I consider the other longitudinal studies of greater importance as a specific Q. Although a sub-group analyses to assess for race/ethnic differences should/could be part of the bigger study.
- Hot topic right now - important one. Will require infrastructure to adequately sample diverse populations
- Comment to category 2 is the same as the previous one.
- "Race" is a difficult construct, especially when treated categorically. I would challenge, what is it that you are categorizing on? And why? Is this about genetic differences (which, well, aren't really about race) or about behavioural differences or socioeconomic differences?

	• In the US, recruitment for medical studies based on race has challenges based on historical mis-steps.
53	53_Prospective cohort studies that investigate other potential risk factors for primary cam morphology (causal inference approach to investigate the following risk factors: anatomical-spine; acetabulum; femur; kinetic and kinematic risk factors; mechanical and biomechanical; other possible risk factors that might emerge over time) Qualitative feedback • unclear how this differs from the first statement --but with more focus • I do not agree that the concept of Primary and secondary CAM is commonly agreed and established • Although it is an important question, there is no guarantee that studies will successfully answer this research question. • Good to explore other factors - most of the time attention goes to load • I think this isn't a current priority but a future one • Although I agree with the idea perhaps focussing attention on the big players first before we extend out to "other" risk factors? • Examining the mentioned potential risk factor using appropriate methods of causal inference requires a lot of data and some are difficult to collect prospectively on a relatively large scale. Feasibility is in my opinion very low.
54	54_Prospective cohort studies that investigate prognosis (consequences) of primary cam morphology in different cohorts Qualitative feedback • I do not agree that the concept of Primary and secondary CAM is commonly agreed and established • Although we may be able to prognosticate, need better evidence for interventions to modify disease trajectory. • Really difficult to do these types of studies --but vitally important. Funding always an issue • Lower chance of success, in my opinion, due to the time frame necessary (years).
55	55_Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology Qualitative feedback • The question is unclear to me. If referring to the clinical diagnosis of CAM; I think this potential is limited and research less relevant. • Diagnostic criteria are very important. Better quality studies investigating this will improve diagnostic criteria however, like so many other diagnostic criteria, FAIs is a complex 3D dynamic problem and I'm not sure if we can put this all together into a set of very clear diagnostic criteria for FAIs. However, it is certainly worth the effort trying to capture and diagnose at least the 'average' patient with FAIs • Considering agreement on cam morphology being a finding and not a diagnosis, I suggest rephrasing diagnostic accuracy - possibly to measurement accuracy and cut-off values or something in that line. • Agree a consensus is needed re a gold standard diagnostic tool if possible. But would urge caution here and this research needs to be carefully developed/investigated by focusing not only on imaging outcomes but correlation with clinical outcomes • More recently, I've been appreciating the challenge of this "dichotomous" definition of both cam and pincer. Either you have the morphology or you don't, but really, it is about degrees (literally) of risk. So "diagnostic criteria" may focus too much on a dichotomous view.
56	56_Studies to develop and validate diagnostic and prognostic models for primary cam morphology in young (maturing) athletes Qualitative feedback • This will be important in the future; but I don't think the field is ready right now. Seems identification of risk factors (e.g. explanatory analyses) is more important right now than risk stratification (e.g. prediction) • I averaged the rating. I would not combine prognostic and diagnostic in the same question. For me it is more critical prognostic. • I do not agree that the concept of Primary and secondary CAM is commonly agreed and established • Studies in the youth may be a sensitive issue

	• Considering agreement on cam morphology being a finding and not a diagnosis, I suggest rephrasing the statement to "develop and validate measurement methods and prognostic models.." • Again similar to statements 48-54 when developing prognosis models it is important to discuss communication strategies around such models
57	57_Prospective cohort studies to investigate how exercise intervention influences the development and prognosis of primary cam morphology in cohorts with variable loading demands Qualitative feedback • I do not think we are at this stage yet! • I do not agree that the concept of Primary and secondary CAM is commonly agreed and established • This can't be effectively done until prospective cohort studies are complete and interventions are developed • We must focus more on exercise intervention (and then well described programs (type of exercise; repetitions; load)); particularly in the pre surgery phase. Most important to me first is conservative treatment with exercise for symptomatic patients. • It may be difficult to determine variable loading demands in different sport disciplines. One may need to consider load outside of the structured sporting environment, e.g. people may do other sports/training participation outside of a structured programme? • I'm not a fan of using cohort study design to study the effects of interventions. • I am not sure about this statement after reading it again - in my opinion, exercise "interventions" is ill-defined. For me exercise interventions are interventions for existing conditions, are we really looking at load management strategies to mitigate risk as opposed to exercise interventions? Or are we are talking about exercise interventions (strength, flexibility etc?) to mitigate risk? Sorry for being pedantic
58	58_Randomised controlled clinical trials to investigate how exercise intervention (load management) influences the development and prognosis of primary cam morphology in different demographic (e.g. sex/ gender; race/ ethnicity) and load (variable loading demands - e.g. different sports; dance; and physical activity level) cohorts Qualitative feedback • I am unsure how randomised controlled clinical trials would differ from prospective cohort studies. In any case; this item seems worthy of further research; however that is done. • Feasibility for an appropriate RCT seems to me low. • Well defined exercise intervention in asymptomatic and symptomatic patients. • I would take an RCT over a cohort study. • The demographic differences may be a sensitive issue. • Would be massive study required with huge costs to crack this nut - and at the end of the day - very hard to get people to change behaviour regarding sports activities • Current knowledge doesn't lend itself to RCTs • So, I clicked back to see if I had missed something in the previous statement, here exercise intervention is defined as load management, in the previous it isn't. Are they meant to be the same? Agree with the need for load management interventions - but I would define them as thus instead of exercise interventions?
59	59_Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes Qualitative feedback • I do not agree that the concept of Primary and secondary CAM is commonly agreed and established • This isn't as important as some of the other research priorities but I value the desire to study benefit/harm trade-offs • I think screening is not useful • Very few people are now screened - those that are come from elite sports backgrounds - and those setting are unlikely to change practice - low priority one for me • Absolutely agree, this is something that should be taken very seriously and involve all stakeholders • I cannot really answer because this basically depends on the previously mentioned potential studies

60	60_Studies involving economic evaluation to determine the cost-effectiveness of different diagnostic; prognostic; and therapeutic approaches to primary cam morphology Qualitative feedback • Maybe once we've established more information; then we can worry about optimising costs of associated treatments; etc. • I do not agree that the concept of Primary and secondary CAM is commonly agreed and established • I think more of the mechanistic studies will be most helpful to initially move this field forward; though important down the road
61	61_Qualitative / Mixed-methods studies to investigate the perspectives/preferences/attitudes/concerns/experiences of primary cam morphology stakeholders (e.g. but not limited to: athletes/parents/coaches/patients with hip disease/clinicians/researchers) Qualitative feedback • I do not agree that the concept of Primary and secondary CAM is commonly agreed and established • I think understanding the science behind primary cam morphology has greatest potential for impact; but value stakeholder experiences
62	62_Prospective cohort studies that investigate how pincer morphology develops in different cohorts Qualitative feedback • We can't do RCTs so this is a good method
63	63_Prospective cohort studies that investigate pincer morphology prognosis in different cohorts Qualitative feedback • More important than how: whether it actually matters - i.e. prognosis
64	64_Prospective cohort studies to investigate risk factors for the development and prognosis of femoroacetabular impingement (FAI) syndrome in different cohorts Qualitative feedback • I've scored this higher as it includes CAM; and my understanding is that this is more likely to lead to symptomatic concerns; but I feel the more specific questions asked earlier on are more critical • Development and prognosis is different (or at least not clear here). • Capacity of the system mainly relates to financial implications. Will funding agencies/governments see this as a priority for funding? • The impact on stakeholders and their involvement is a crucial tenant in this statement
65	65_Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of femoroacetabular impingement syndrome in cohorts with variable loading demands Qualitative feedback • One first need to determine the extent of the problem before moving on to RCTs • I have never had surgery so may be a bit biased towards non-surgical treatments • Huge studies and thus huge costs - would be great - but again the crux may then be getting people to modify behaviour or do something preventive - low chance of this impacting real life • I don't think I understand the statement correctly. Development of FAI - prior to FAI. Prognosis of FAI - after FAI i.e. treatment. I would answer differently to these, therefore answers to these combined is difficult. • Agree with the need for studies on this, again as outlined in an earlier statement perhaps pooling of resources/skills to start with one sport/cohort and do this well before extending outwards
66	66_Randomised controlled clinical trials to investigate best practice physiotherapy vs arthroscopic hip surgery vs sham surgery in cohorts with variable loading demands diagnosed with femoroacetabular impingement syndrome

	Qualitative feedback • Or what happens if we leave it - i.e. true control/no treatment • We already have 3 trials • Before one need to establish what best practice physiotherapy is • One first need to determine the extent of the problem before moving on to RCTs • The expertise is there but funding will be a challenge given comparison with other research priorities in this population • THE CHANCE OF SUCCESS - CAN WE DO IT? The more studies on this topic are being done and published, the more difficult it becomes to get funding (and these RCTs are generally costly).
67	67_Prospective cohort studies to investigate the prognosis after best practice physiotherapy and/or arthroscopic hip surgery in different sport/dance/physical activity level cohorts with femoroacetabular impingement syndrome Qualitative feedback • Researching best practices is somewhat important. • Are we ready for this? Do we know best practice yet such that we can test it in different cohorts? • Better with RCT • I feel this is already covered under an earlier statement on variable loads. • I doubt the concept/idea is controversial but the methods used to capture outcomes has been to date. Need for consensus here on appropriate outcome measures, time points for capture etc
68	68_Randomised controlled clinical trials to investigate what best practice physiotherapy is (e.g. in different populations and settings; pre- and post-surgery) Qualitative feedback • Strongly agree w this. My experience of physiotherapy as an elite athlete was v mixed - some good; some poor • RCTs are gold standard but not sure the field is ready for them • This would be my number 1 priority • Taking my bias out of the equation for a minute, if we are going to insist in sham surgery trials should we perhaps do so for best practice PT too? E.g. Best practice vs sham (advice? generic stretching?)
69	69_Studies to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain Qualitative feedback • As an elite athlete worries about RTS (which was my living) caused major anxiety for me so this is important. • It is difficult to answer. It is a quite generic statement • Important but other issues may be more important
70	70_Studies to investigate; report and improve the psychometric properties of tests of (1) range of motion; (2) muscle strength (3) functional performance (4) Quality of Life (QOL) and other psychological outcomes for studies on aetiology; diagnosis; treatment and prognosis Qualitative feedback • Methodological work is underpinning of strong science • This question is unclear to me • These are patient outcomes that I deem important to study but clinicians may feel more strongly about some of the other research topics
71	71_Studies to investigate the relationship among movement-related parameters (biomechanics; muscle function), symptoms, function, quality of life, and imaging and intra-articular hip findings in individuals with hip-related pain

	Qualitative feedback • These could be valuable in that primary cam morphology is most likely multifactorial
72	72_Studies (randomised controlled clinical trials; cohort studies; cross sectional studies; qualitative studies) to investigate the clinical effectiveness of other treatments used in people with hip-related pain (hip joint intra-articular injections; analgesic and anti-inflammatory medications; manual therapy adjunctive techniques such as taping; bracing and orthotics) Qualitative feedback • Agree - I always saw surgery as a last resort • Happy that this is needed - prefer to leave level of priority to the ENHR process
73	73_Studies to investigate cost-effectiveness of different diagnostic, prognostic. and therapeutic approaches to femoroacetabular impingement syndrome and primary cam morphology Qualitative feedback • I think understanding cost-effectiveness is an important aspect to assessing diagnostic; therapeutic interventions • Cost-effectiveness is less important to me at this stage; but I value its importance to clinicians
74	74_Qualitative studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of femoroacetabular impingement syndrome (including FAI syndrome and primary cam morphology) stakeholders (e.g. but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers) Qualitative feedback • In principle I am in favour of including these kinds of stakeholders. But in reality some have whacky views (like anti-vaxxers) which may not helpfully inform clinical progress. • I do not agree that the concept of Primary and secondary CAM is commonly agreed and established • Again; this type of research is important but don't think it is where we should focus research priorities currently. Moved up to indicate importance
75	75_Education intervention studies (pilot studies; RCT) in individuals with hip-related pain to assess the specific effect of patient education (in addition to other interventions; e.g. exercise intervention) on pre-defined patient-related outcomes. For education intervention consider content, modes of delivery and the use of innovative technologies to enhance education benefits. Qualitative feedback • Strongly in favour of patient education. As an elite athlete receiving treatment I always felt insufficiently educated about injuries I was having to recover from and scientific jargon from specialists can be bewildering. • Happy that this is needed - prefer to leave level of priority to the ENHR process • Input from clinical or research opinion • Same as above - patient education is important but are we ready to provide them with evidence based guidance? Other research questions more important. Moved closer to center to align with importance of topic • Minor adjustment • Not my cup of tea but since the webinar patients perspective is important and also to teach
76	76_Studies to investigate the performance of the diagnostic criteria for hip disease presenting with hip-related pain in young and active adults Qualitative feedback • This seems like it should be a major priority to ensure accurate and appropriate diagnosis
77	77_Core outcome set (COS) development studies for each of the conditions related to hip disease/hip-related pain in young and active adults

Qualitative feedback

There were no qualitative feedback

78 **78**_Research studies into the utility of HAGOS and iHOT instruments in a non-surgical treatment context

Qualitative feedback

- I am not sure if I understand this question properly. The HAGOS questionnaire has adequate measurement qualities for active patients with long-standing hip and/or groin pain. We have used both questioners for non-surgical and surgical pts
- Not confident that I fully understood the question

79 **79**_Studies to analyse of content and structural validity, and the relationship between individual measurement error and the minimal clinically important change for the recommended PROMs.

Qualitative feedback

- Need to validate the PROMs first
- This is linked to need for education for patients above - if patients are better educated; they may produce better self-reporting.
- Happy that this is needed - prefer to leave level of priority to the ENHR process
- Influenced by scores from other respondents
- Having followed webinar; I think that it is important.
- I am not sure; the MIC is that important. I am more into PASS
- Important perspective of other colleagues to more clearly delineate

80 **80**_Studies to investigate the impact of the diagnostic components of a specific hip condition on diagnostic or prognostic thinking (e.g. stratifying patients into high and low risk) in young and active adults

Qualitative feedback

- Stratifying patients in this way has some methodological challenges
- I think the diagnostic and prognostic thinking needs further improvement prior to this
- Influenced by scores from other respondents
- I was worried that the stratification process can falsely label patients as potential non-responders until we have clear prognostic indicators I would prefer to avoid stratification research.

81 **81**_Studies to develop and validate diagnostic and prognostic models for the different hip diseases presenting with hip-related pain in young persons

Qualitative feedback

- Important in the future- not yet
- influenced by scores from other respondents
- Having followed webinar; I think that it is important.
- Other issues more important.

82 **82**_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/ or computed tomography scan) for diagnosis of hip disease presenting with hip-related pain in young and active adults

Qualitative feedback

- Still less relevant than diagnostic/prognostic studies but economics hard to avoid
- Influenced by scores from other respondents
- Having followed webinar; I think that it is important.

83	83_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/ or computed tomography scan) for agreeing on an appropriate treatment strategy for hip disease presenting with hip-related pain in young and active adults Qualitative feedback • We need to better select treatment options for patients and imaging may assist this process • Influenced by scores from other respondents • Having followed webinar; I think that it is important. • Minor adjustment • I do not think we should but as much effort in imaging as an important factor for prognosis. • Global view and reading more in the literature • New literature
84	84_Studies to investigate the additional benefit of advanced imaging (e.g.; magnetic resonance imaging and/or computed tomography scan) for prognosis of hip disease presenting with hip-related pain in young and active adults Qualitative feedback • Having followed webinar; I think that it is important. • Reconsidered • Influenced by scores from other respondents • Minor adjustment • Global view and reading more in the literature
85	85_Studies to investigate cost-effectiveness of different diagnostic and therapeutic approaches in conditions affecting the young person's hip Qualitative feedback • In one way I think cost should not come into this but in practice if it means eg an institution can/cannot afford imaging equipment that will have a huge impact on its ability to diagnose and treat patients. • I think this statement is to vague • Second webinar information

SUPPLEMENTARY FILE 11: Oxford Delphi consensus study – Dissent analysis (Domain 5 – research priorities)

Although the main aim of the Delphi method is to structure a group communication process that might lead to consensus, we were also interested in panel dissent. To explore possible dissent, we applied *dissent analyses* including outlier analysis, bipolarity analysis, and stakeholder group analysis. In addition we performed a thematic analysis of panellists' comments, including tension and dissent, as described. [1,2]

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Outlier analysis

Outliers can have a substantial effect on variables (e.g., Interquartile range), and statistical consensus. The existence of outliers is therefore an important potential explanation for dissent. We identified low outliers as data points that fall more than 1.5 times the Interquartile range below the first quartile, and high outliers as data points that fall more than 1.5 times the Interquartile range above the third quartile. In addition, we visually inspected histograms of Round 2 stakeholder group scoring for outliers. We re-analysed consensus after eliminating outliers for all statements with marginal non-consensus to test if these had an impact on the group's consensus.

Research priorities – Delphi domain 5

Figures 1a and 1b present the Round 2 outlier scores for 38 research priority statements. Because none of the research priority statements with outliers achieved marginal non-consensus, data were not re-analysed after eliminating outliers.

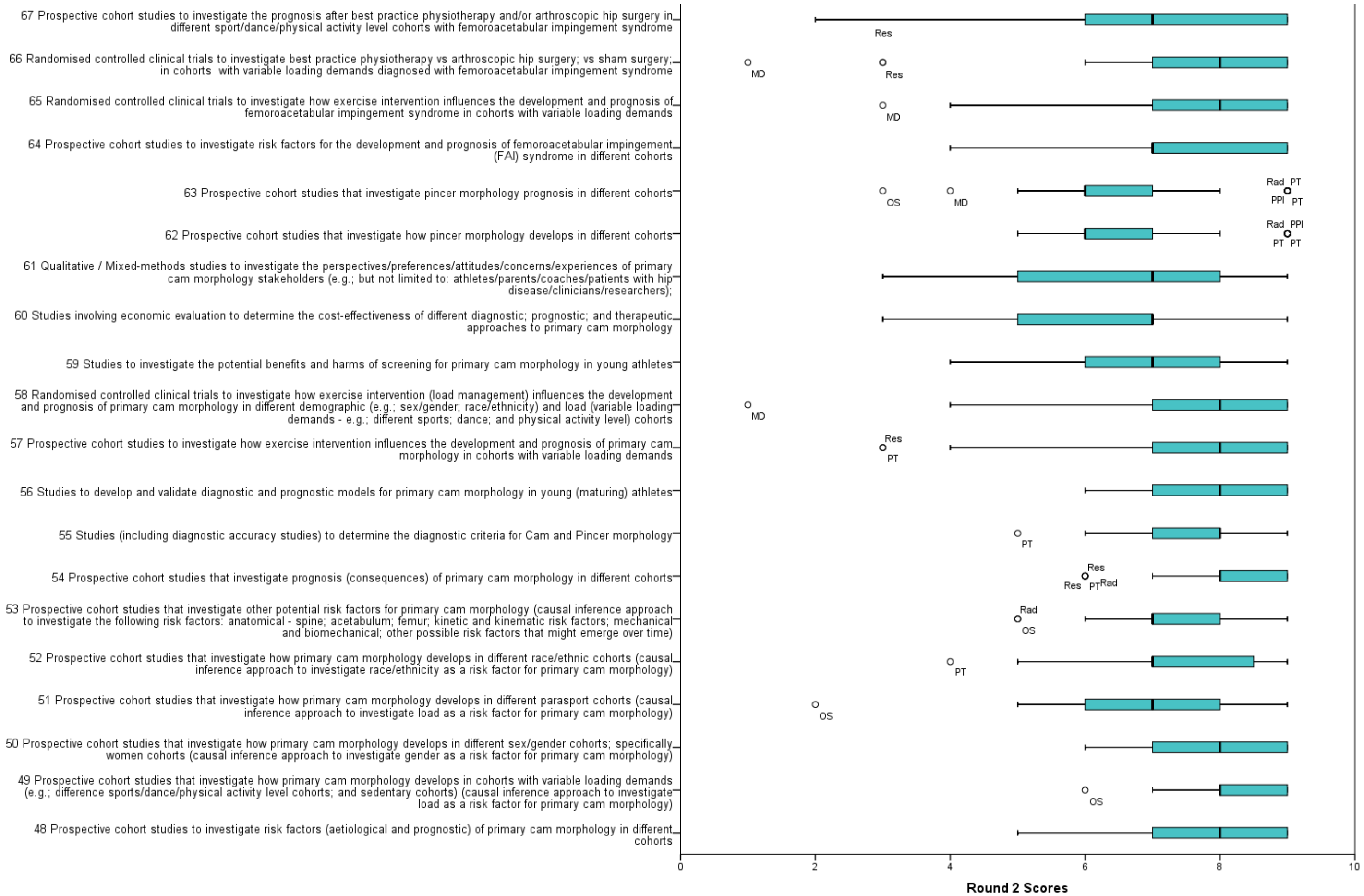


Figure SF11-1a Outliers for statements 48 to 67 (OS: Orthopaedic Surgeon; PPI: Patient & Public Involvement group member; MD: Physian; PT: Physical Therapist; Rad: Radiologist; Res: Researcher)

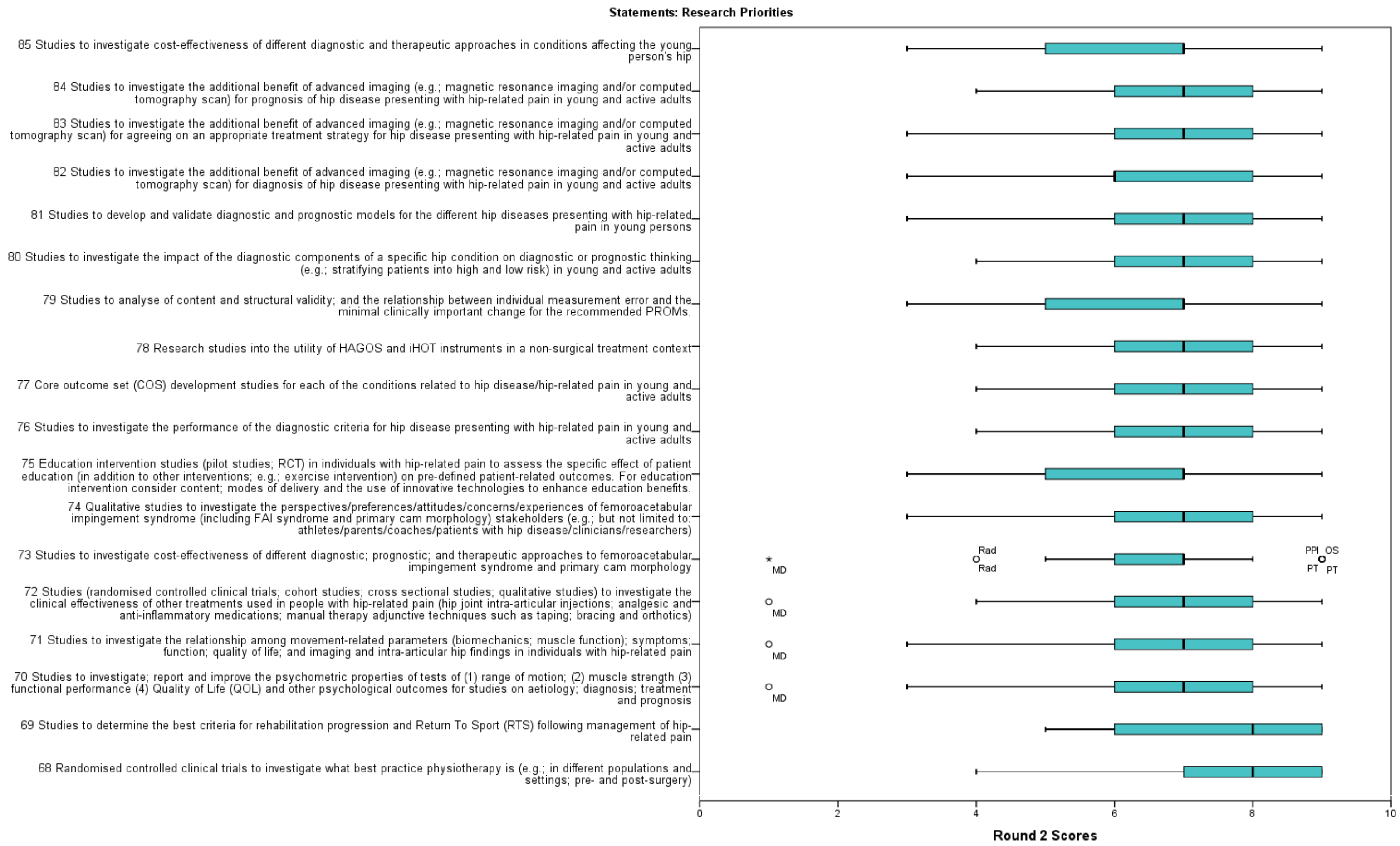


Figure SF11-1b Outliers for statements 68 to 85 (OS: Orthopaedic Surgeon; PPI: Patient & Public Involvement group member; MD: Physian; PT: Physical Therapist; Rad: Radiologist; Res: Researcher)

Bipolarity analysis

Opposing groups of experts with an important and insoluble cleft of opinion, might result in non-consensus. Bipolar data distribution is therefore a possible explanation for dissent. To test for bipolarity, we investigated potential bimodal distribution (two or more answer options had the same mode frequency) and visually inspected histograms for round 2 scores of each statement. [1]

Research priorities – Delphi domain 5

There were no bimodal distribution in the overall scoring of research priorities statements in round 2. (Figure SF11-2)

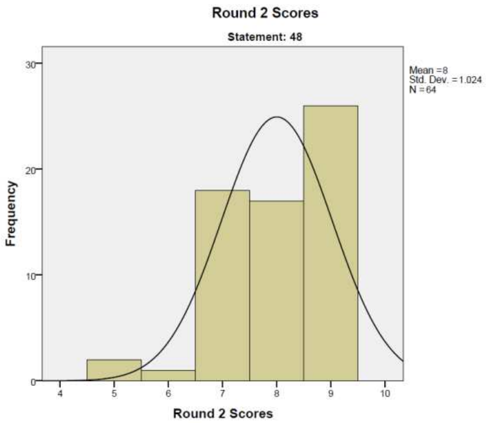


Figure 2a Statement 48

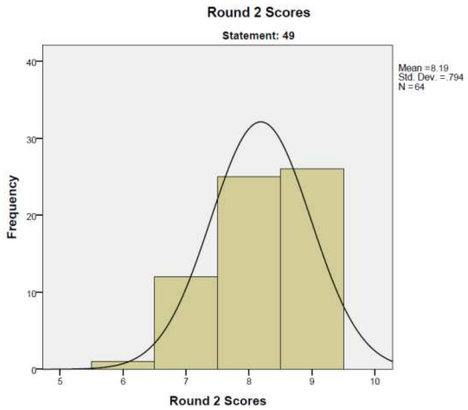


Figure 2b Statement 49

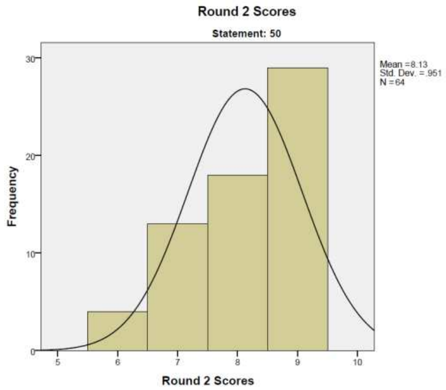


Figure 2c Statement 50

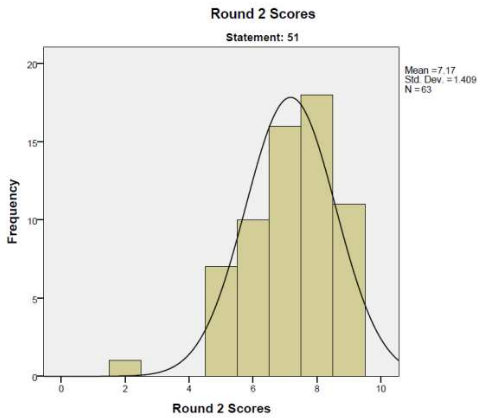


Figure 2d Statement 51

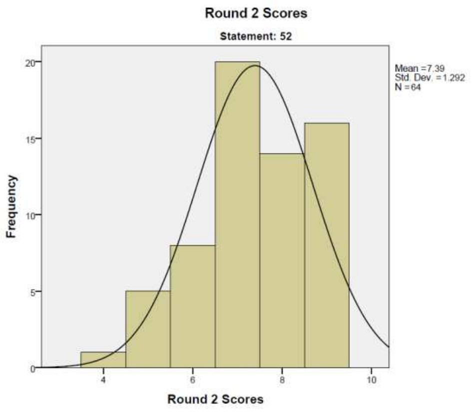


Figure 2e Statement 52

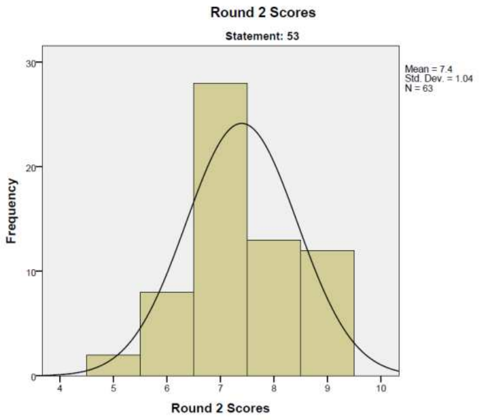


Figure 2f Statement 54

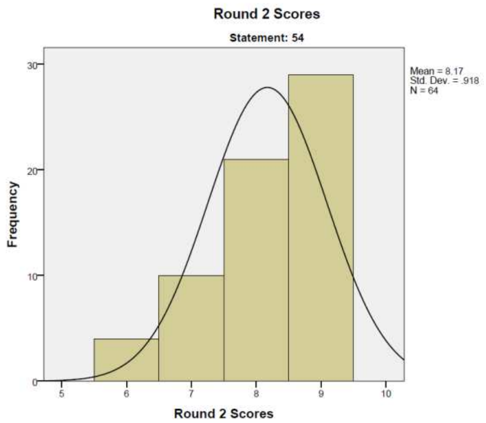


Figure 2g Statement 54

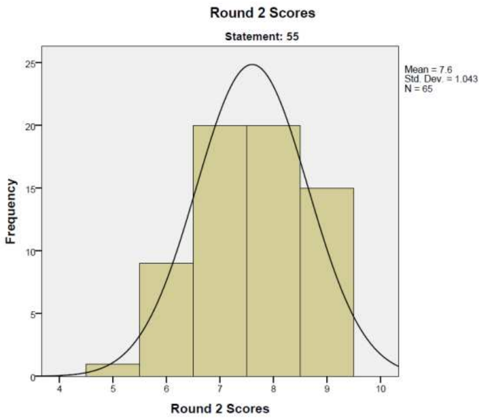


Figure 2h Statement 55

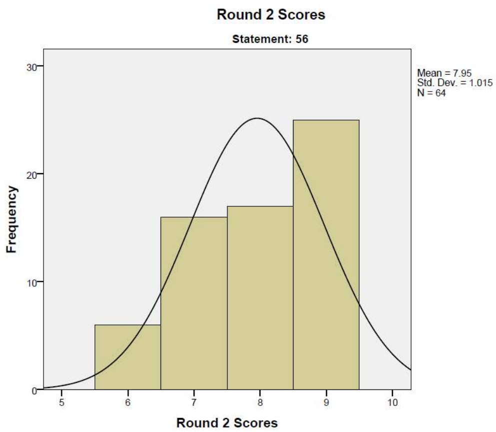


Figure 2i Statement 56

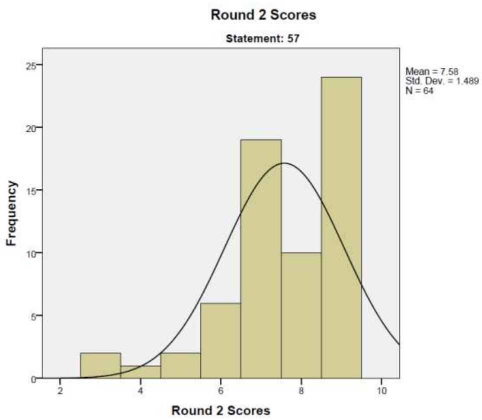


Figure 2j Statement 57

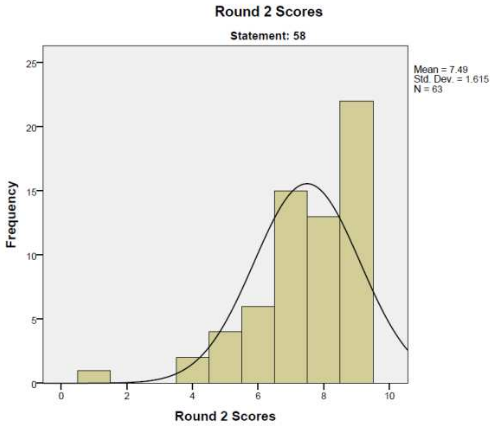


Figure 2k Statement 58

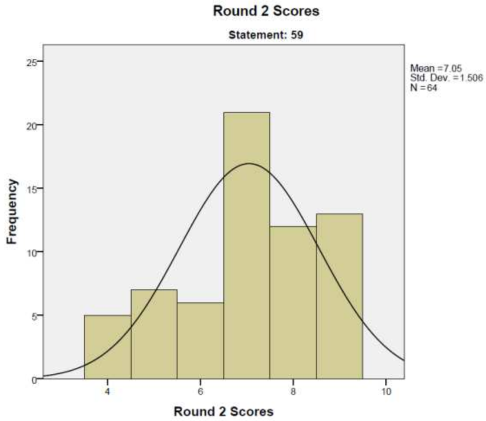


Figure 2l Statement 59

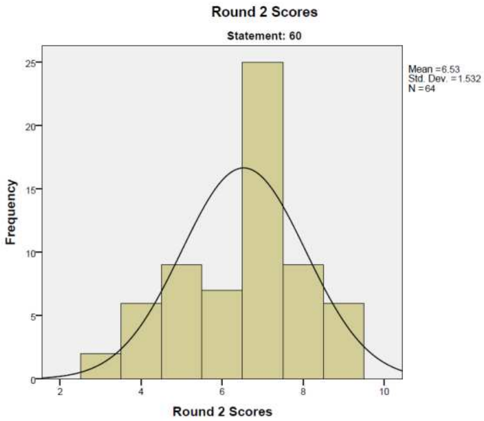


Figure 2m Statement 60

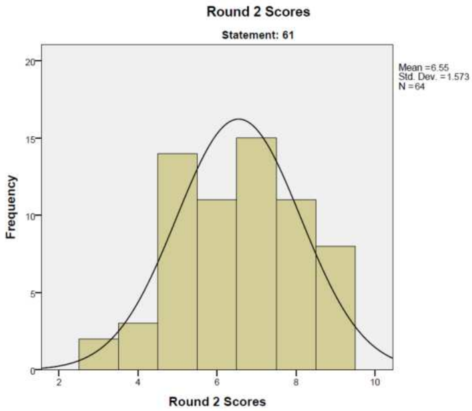


Figure 2n Statement 61

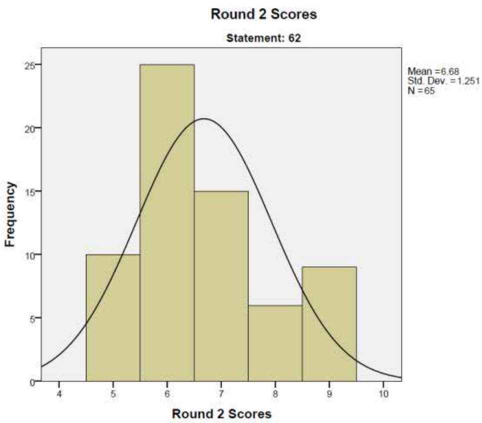


Figure 2o Statement 62

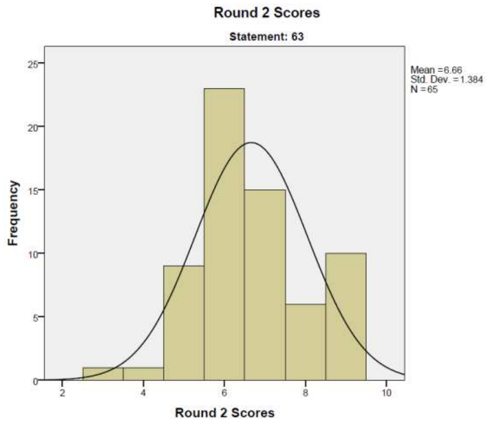


Figure 2p Statement 63

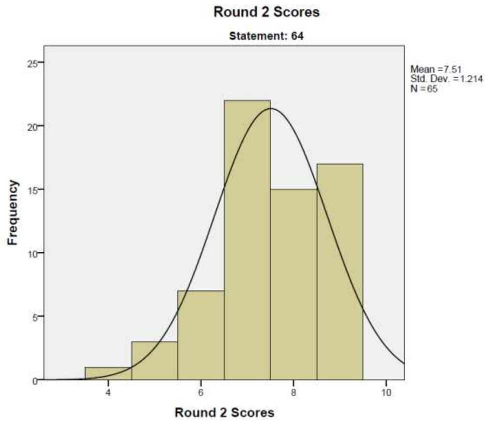
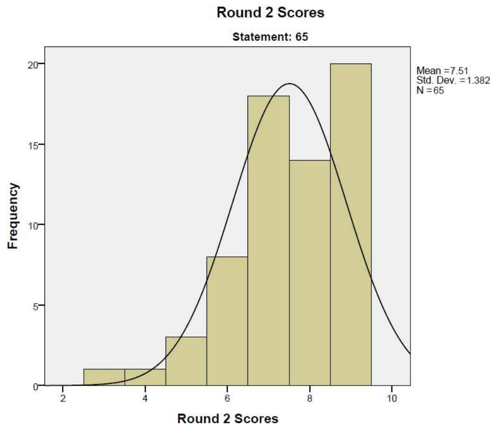


Figure 2q Statement 64



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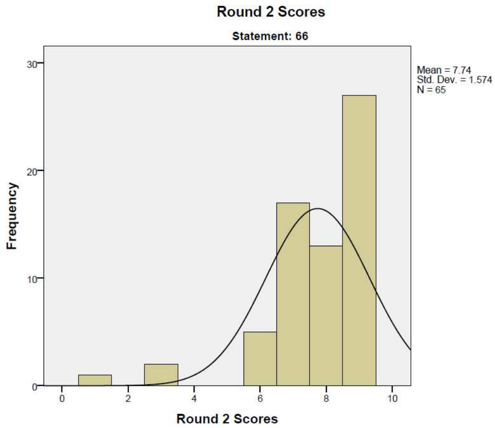

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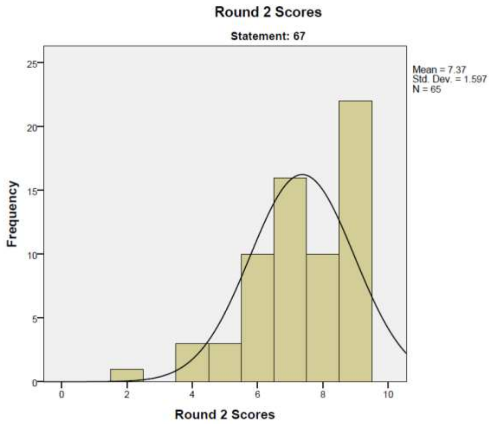

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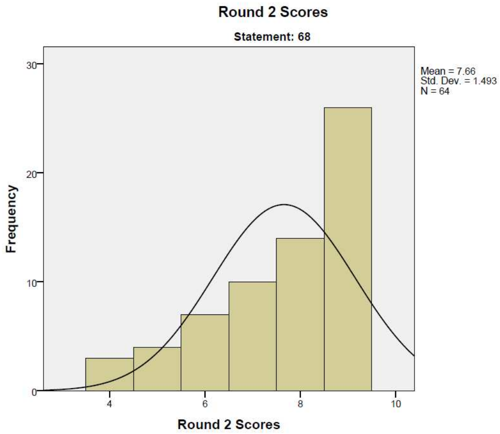
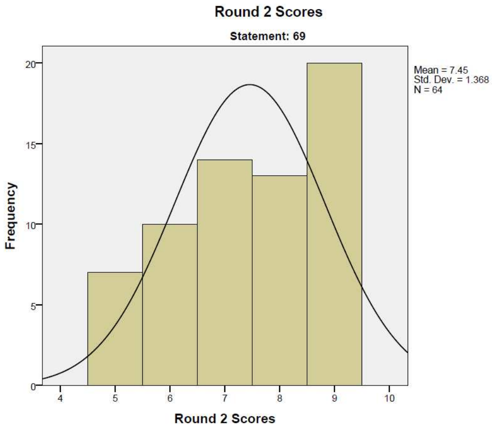


Figure 2u Statement 68



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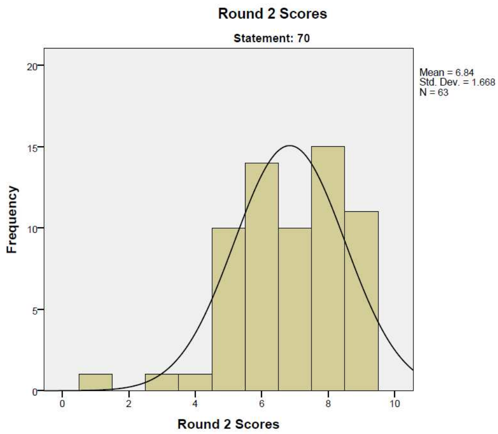

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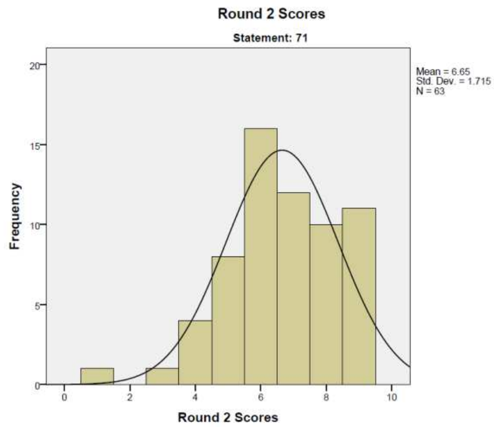
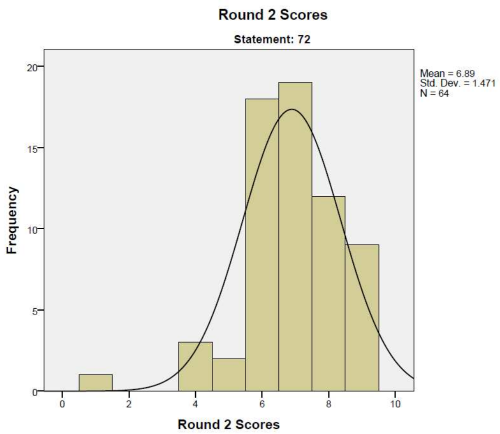


Figure 2x Statement 71



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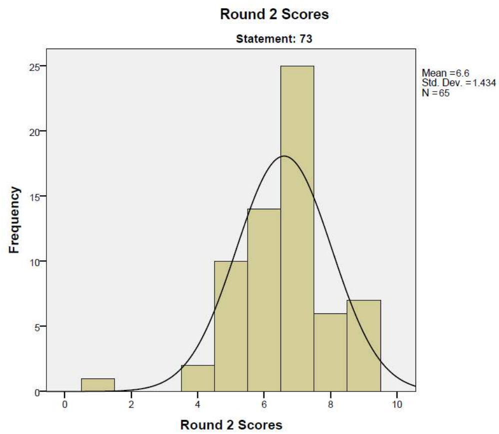

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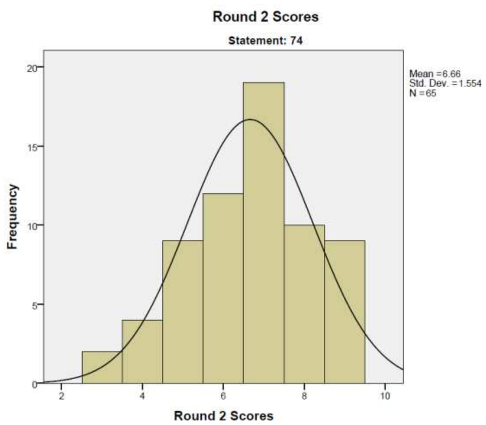


Figure 2aa Statement 74

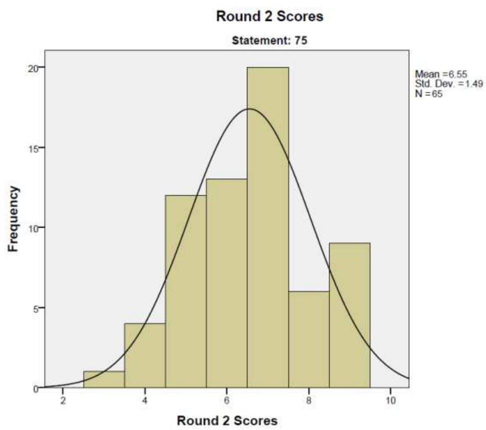
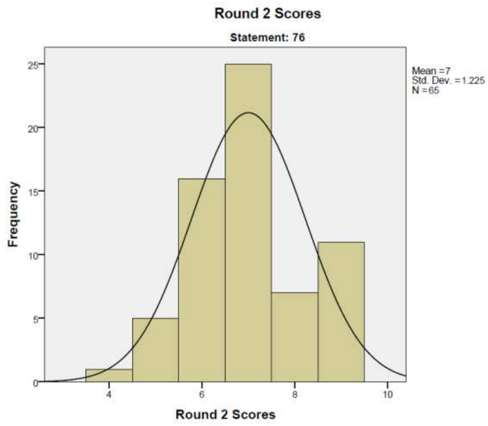


Figure 2ab Statement 75



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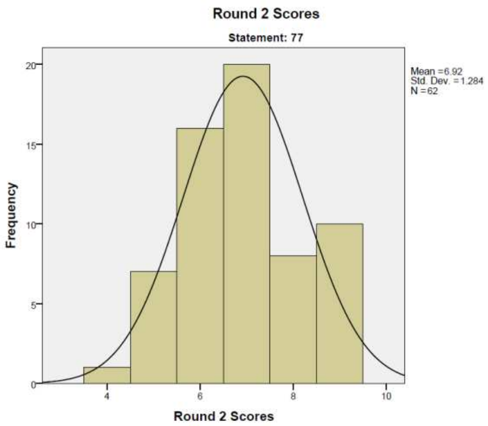


Figure 2ad Statement 77

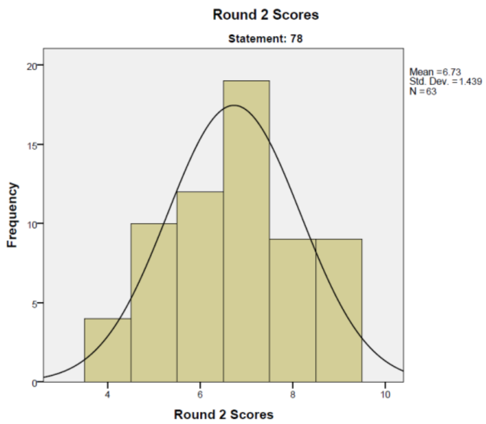
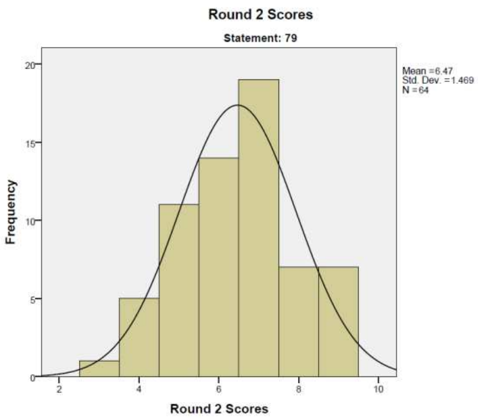


Figure 2ae Statement 78



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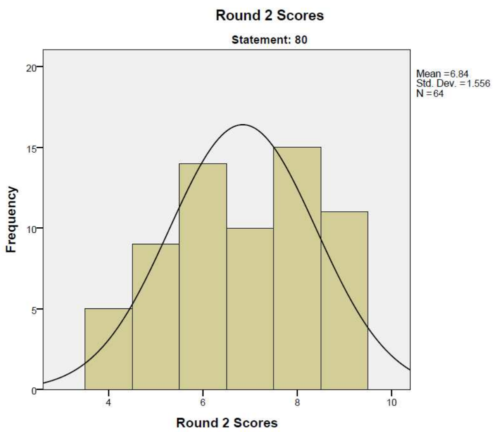
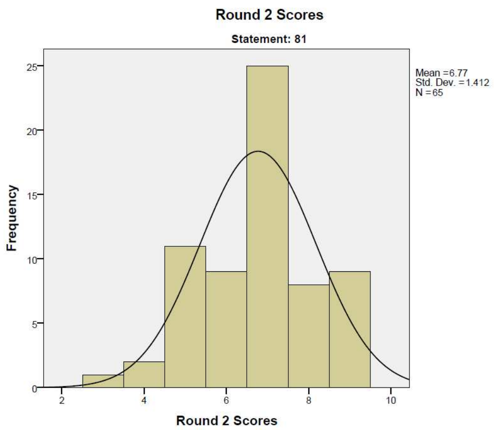


Figure 2ag Statement 80



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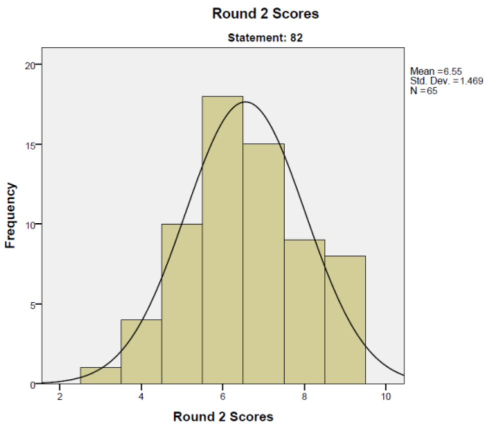

Figure 2ai Statement 82

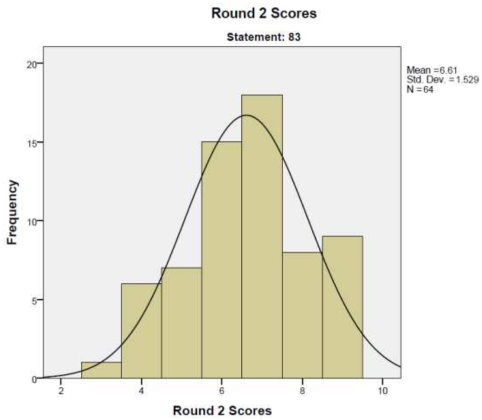

Figure 2aj Statement 83

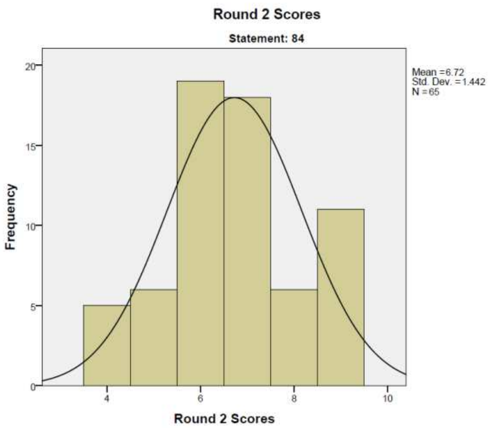

Figure 2ak Statement 84

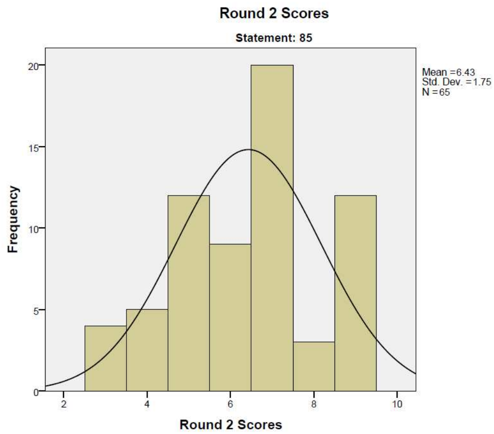

Figure 2al Statement 85

Figure SF2 Histograms of Likert Scale score frequencies for statements 48 to 85

Stakeholder Group analysis

Stakeholder group analysis: Stakeholder group analysis, a classical dissent analysis, is important to identify opposing views. To compare the scores from Round 2 between the six stakeholder groups, we performed non-parametric Kruskal-Wallis test (not assuming a normal distribution of the underlying data). To account for multiple post hoc comparisons, we adjusted the statistical significance threshold p-value to 0.003 according to Bonferroni method. However, agreeing with the general view that "a declaration of 'statistical significance' has today become meaningless", [3] substantial stakeholder group differences ($p<0.0033$) prompted us to further scrutinise individual- and group opinions for the specific statement.

Research priorities – Delphi domain 5

The average Round 2 scores were statistically significant different for the physical therapist stakeholder group compared to the radiologist stakeholder group for statements 61 ($p<0.001$), 74 ($p<0.001$) and 75 ($p<0.003$), for the physical therapist stakeholder group compared to researcher stakeholder group for statements 58 ($p<0.0033$), 61 ($p<0.0033$), 65 ($p<0.001$), 68 ($p<0.001$), and 74 ($p<0.001$), and physician stakeholder group compared to radiologist stakeholder group for statement 61 ($p<0.003$) and 74 ($p<0.0033$).

Table SF11-1 Kruskal-Wallis test to compare Orthopaedic Surgeons vs other stakeholder groups (p-values)

	Orthopaedic surgeons vs PPI		Orthopaedic surgeons vs physical therapists		Orthopaedic surgeons vs physicians		Orthopaedic surgeons vs radiologists		Orthopaedic surgeons vs researchers	
Delphi Round	1	2	1	2	1	2	1	2	1	2
Statement										
48_Prospective cohort studies to investigate risk factors (aetiological and prognostic) of primary cam morphology in different cohorts	.258	.155	.772	.874	.671	.735	.795	.875	.924	.896
49_Prospective cohort studies that investigate how primary cam morphology develops in cohorts with variable loading demands (e.g. difference sports/ dance/ physical activity level cohorts and sedentary cohorts) (causal inference approach to investigate load as a risk factor for primary cam morphology)	.077	.047	.118	.024	.405	.203	.678	.595	.806	.487
50_Prospective cohort studies that investigate how primary cam morphology develops in different sex/ gender cohorts specifically women cohorts (causal inference approach to investigate gender as a risk factor for primary cam morphology)	.437	.235	.190	.131	.804	.457	.079	.565	.399	.638

51_Prospective cohort studies that investigate how primary cam morphology develops in different parasport cohorts (causal inference approach to investigate load as a risk factor for primary cam morphology)	.156	.392	.311	.568	.857	.783	.135	.069	.710	.763
52_Prospective cohort studies that investigate how primary cam morphology develops in different race/ ethnic cohorts (causal inference approach to investigate race/ethnicity as a risk factor for primary cam morphology)	.262	.449	.778	.479	.905	.694	.108	.081	.325	.158
53_Prospective cohort studies that investigate other potential risk factors for primary cam morphology (causal inference approach to investigate the following risk factors: anatomical-spine; acetabulum; femur; kinetic and kinematic risk factors; mechanical and biomechanical; other possible risk factors that might emerge over time)	.160	.596	.216	.954	.382	.716	.682	.955	.963	.503
54_Prospective cohort studies that investigate prognosis (consequences) of primary cam morphology in different cohorts	.287	.246	.836	.506	.582	.351	.748	.473	.450	.226
55_Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology	.139	.046	.631	.169	.222	.151	.049	.012	.709	.965
56_Studies to develop and validate diagnostic and prognostic models for primary cam morphology in young (maturing) athletes	.910	.638	.252	.502	.600	.754	.213	.459	.203	.276
57_Prospective cohort studies to investigate how exercise intervention influences the development and prognosis of primary cam morphology in cohorts with variable loading demands	.209	.185	.362	.294	.654	.401	.496	.619	.287	.185
58_Randomised controlled clinical trials to investigate how exercise intervention (load management) influences the development and prognosis of primary cam morphology in different demographic (e.g.; sex/ gender; race/ ethnicity) and load (variable loading demands - e.g. different sports, dance, and physical activity level) cohorts	.601	.287	.584	.246	.611	.928	.676	.465	.053	.052
59_Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes	.324	.423	.697	.701	.478	.810	.242	.219	.038	.065
60_Studies involving economic evaluation to determine the cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to primary cam morphology	.830	.829	.418	.119	.420	.419	.102	.174	.043	.241
61_ Qualitative / Mixed-methods studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of primary cam morphology	.111	.264	.027	.030	.574	.407	.038	.076	.462	.933

stakeholders (e.g. but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers)										
62_Prospective cohort studies that investigate how pincer morphology develops in different cohorts	.913	.941	.613	.425	.065	.102	.753	.872	.258	.138
63_Prospective cohort studies that investigate pincer morphology prognosis in different cohorts	.943	.942	.829	.828	.154	.172	.837	.792	.305	.185
64_Prospective cohort studies to investigate risk factors for the development and prognosis of femoroacetabular impingement (FAI) syndrome in different cohorts	.754	.443	.376	.476	.929	.976	.917	.958	.430	.232
65_Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of femoroacetabular impingement syndrome in cohorts with variable loading demands	.937	.741	.124	.087	.169	.351	.154	.273	.005	.004
66_Randomised controlled clinical trials to investigate best practice physiotherapy vs arthroscopic hip surgery vs sham surgery in cohorts with variable loading demands diagnosed with femoroacetabular impingement syndrome	.017	.034	.055	.007	.382	.185	.279	.673	.139	.829
67_Prospective cohort studies to investigate the prognosis after best practice physiotherapy and/ or arthroscopic hip surgery in different sport/ dance/ physical activity level cohorts with femoroacetabular impingement syndrome	.155	.162	.166	.401	.613	.653	.379	.672	.060	.141
68_ Randomised controlled clinical trials to investigate what best practice physiotherapy is (e.g. in different populations and settings; pre- and post-surgery)	.175	.153	.023	.016	.552	.593	.861	.907	.142	.167
69_Studies to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain	.031	.143	.027	.033	.248	.244	.377	.273	.301	.399
70_Studies to investigate; report and improve the psychometric properties of tests of (1) range of motion; (2) muscle strength (3) functional performance (4) Quality of Life (QOL) and other psychological outcomes for studies on aetiology, diagnosis, treatment and prognosis	.008	.012	.031	.049	.195	.275	.894	.841	.745	.735
71_Studies to investigate the relationship among movement-related parameters (biomechanics; muscle function), symptoms, function, quality of life, and imaging and intra-articular hip findings in individuals with hip-related pain	.059	.068	.132	.179	.393	.441	.642	.908	.643	.642

72_ Studies (randomised controlled clinical trials, cohort studies, cross sectional studies, qualitative studies) to investigate the clinical effectiveness of other treatments used in people with hip-related pain (hip joint intra-articular injections; analgesic and anti-inflammatory medications; manual therapy adjunctive techniques such as taping; bracing and orthotics)	.265	.490	.280	.189	.437	.310	.354	.219	.927	.734
73_ Studies to investigate cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to femoroacetabular impingement syndrome and primary cam morphology	.291	.208	.306	.195	.880	.255	.051	.083	.002	.018
74_Qualitative studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of femoroacetabular impingement syndrome (including FAI syndrome and primary cam morphology) stakeholders (e.g. but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers)	.043	.052	.017	.012	.262	.250	.104	.049	.679	.581
75_Education intervention studies (pilot studies; RCT) in individuals with hip-related pain to assess the specific effect of patient education (in addition to other interventions e.g. exercise intervention) on pre-defined patient-related outcomes. For education intervention consider content, modes of delivery and the use of innovative technologies to enhance education benefits	.130	.197	.028	.035	.172	.206	.405	.294	.747	.832
76_Studies to investigate the performance of the diagnostic criteria for hip disease presenting with hip-related pain in young and active adults	.125	.178	.753	.389	.417	.541	.874	.871	.780	.671
77_Core outcome set (COS) development studies for each of the conditions related to hip disease/ hip-related pain in young and active adults	.846	.785	.787	.401	.949	.973	.087	.177	.196	.353
78_Research studies into the utility of HAGOS and iHOT instruments in a non-surgical treatment context	.135	.248	.427	.682	.126	.355	.756	.640	.398	.351
79_Studies to analyse of content and structural validity; and the relationship between individual measurement error and the minimal clinically important change for the recommended PROMs	.333	.496	.321	.619	.491	.397	.507	.304	.382	.516
80_Studies to investigate the impact of the diagnostic components of a specific hip condition on diagnostic or prognostic thinking (e.g. stratifying patients into high and low risk) in young and active adults	.969	.886	.565	.563	.930	.976	.508	.759	.155	.127
81_Studies to develop and validate diagnostic and prognostic models for the different hip diseases presenting with hip-related pain in young persons	.229	.389	.115	.325	.881	.788	.331	.414	.645	.611

82_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/or computed tomography scan) for diagnosis of hip disease presenting with hip-related pain in young and active adults	.672	.802	.736	.484	.812	.494	.574	.473	.090	.208
83_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/ or computed tomography scan) for agreeing on an appropriate treatment strategy for hip disease presenting with hip-related pain in young and active adults	.938	.347	.397	.662	.264	.149	.166	.124	.642	.852
84_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/or computed tomography scan) for prognosis of hip disease presenting with hip-related pain in young and active adults	.394	.828	.922	.922	.976	.361	.407	.154	.088	.133
85_Studies to investigate cost-effectiveness of different diagnostic and therapeutic approaches in conditions affecting the young person's hip	.785	.857	.170	.250	.428	.513	.878	.503	.612	.642

Table SF11-2 Kruskal Wallis test to compare Patient & Public Involvement Group (PPI) vs other stakeholder groups

	PPI vs Orthopaedic surgeons		PPI vs physical therapists		PPI vs physicians		PPI vs radiologists		PPI vs researchers	
Delphi round	1	2	1	2	1	2	1	2	1	2
Statement										
48_Prospective cohort studies to investigate risk factors (aetiological and prognostic) of primary cam morphology in different cohorts	.258	.155	.176	.103	.289	.167	.243	.185	.395	.216
49_Prospective cohort studies that investigate how primary cam morphology develops in cohorts with variable loading demands (e.g. difference sports/ dance/ physical activity level cohorts and sedentary cohorts) (causal inference approach to investigate load as a risk factor for primary cam morphology)	.077	.047	.629	.974	.210	.135	.109	.226	.126	.092
50_Prospective cohort studies that investigate how primary cam morphology develops in different sex/ gender cohorts specifically women cohorts (causal inference approach to investigate gender as a risk factor for primary cam morphology)	.437	.235	.626	.896	.549	.414	.012	.087	.097	.080
51_Prospective cohort studies that investigate how primary cam morphology develops in different parasport cohorts (causal inference approach to investigate load as a risk factor for primary cam morphology)	.156	.392	.547	.667	.113	.214	.093	.127	.339	.493
52_Prospective cohort studies that investigate how primary cam morphology develops in different race/ ethnic cohorts (causal inference approach to investigate race/ethnicity as a risk factor for primary cam morphology)	.262	.449	.181	.159	.110	.094	.039	.053	.055	.039
53_Prospective cohort studies that investigate other potential risk factors for primary cam morphology (causal inference approach to investigate the following risk factors: anatomical-spine; acetabulum; femur; kinetic and	.160	.596	.666	.579	.349	.697	.273	.497	.166	.289

kinematic risk factors; mechanical and biomechanical; other possible risk factors that might emerge over time)										
54_Prospective cohort studies that investigate prognosis (consequences) of primary cam morphology in different cohorts	.287	.246	.251	.540	.444	.483	.561	.950	.083	.022
55_Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology	.139	.046	.166	.201	.532	.164	.898	.905	.351	.080
56_Studies to develop and validate diagnostic and prognostic models for primary cam morphology in young (maturing) athletes	.910	.638	.231	.149	.714	.733	.215	.150	.200	.100
57_Prospective cohort studies to investigate how exercise intervention influences the development and prognosis of primary cam morphology in cohorts with variable loading demands	.209	.185	.567	.728	.327	.470	.056	.068	.032	.020
58_Randomised controlled clinical trials to investigate how exercise intervention (load management) influences the development and prognosis of primary cam morphology in different demographic (e.g.; sex/ gender; race/ ethnicity) and load (variable loading demands - e.g. different sports, dance, and physical activity level) cohorts	.601	.287	.947	.822	.263	.111	.839	.607	.030	.011
59_Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes	.324	.423	.314	.169	.057	.230	.073	.106	.016	.023
60_Studies involving economic evaluation to determine the cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to primary cam morphology	.830	.829	.591	.280	.606	.633	.273	.324	.132	.432
61_ Qualitative / Mixed-methods studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of primary cam morphology stakeholders (e.g. but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers)	.111	.264	.978	.551	.130	.309	.006	.006	.042	.103

62_Prospective cohort studies that investigate how pincer morphology develops in different cohorts	.913	.941	.737	.368	.302	.290	.823	.955	.515	.252
63_Prospective cohort studies that investigate pincer morphology prognosis in different cohorts	.943	.942	.878	1.000	.303	.249	.781	.734	.396	.217
64_Prospective cohort studies to investigate risk factors for the development and prognosis of femoroacetabular impingement (FAI) syndrome in different cohorts	.754	.443	.735	.695	.583	.321	.902	.648	.305	.092
65_Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of femoroacetabular impingement syndrome in cohorts with variable loading demands	.937	.741	.329	.366	.375	.369	.394	.425	.041	.011
66_Randomised controlled clinical trials to investigate best practice physiotherapy vs arthroscopic hip surgery vs sham surgery in cohorts with variable loading demands diagnosed with femoroacetabular impingement syndrome	.017	.034	.375	.928	.062	.143	.019	.047	.010	.056
67_Prospective cohort studies to investigate the prognosis after best practice physiotherapy and/ or arthroscopic hip surgery in different sport/ dance/ physical activity level cohorts with femoroacetabular impingement syndrome	.155	.162	.814	.479	.187	.163	.058	.065	.005	.006
68_ Randomised controlled clinical trials to investigate what best practice physiotherapy is (e.g. in different populations and settings; pre- and post-surgery)	.175	.153	.478	.433	.233	.152	.160	.119	.014	.008
69_Studies to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain	.031	.143	.763	.500	.201	.670	.012	.025	.012	.035
70_Studies to investigate; report and improve the psychometric properties of tests of (1) range of motion; (2) muscle strength (3) functional performance (4) Quality of Life (QOL) and other psychological outcomes for studies on aetiology, diagnosis, treatment and prognosis	.008	.012	.219	.252	.024	.021	.076	.094	.014	.011

71_Studies to investigate the relationship among movement-related parameters (biomechanics; muscle function), symptoms, function, quality of life, and imaging and intra-articular hip findings in individuals with hip-related pain	.059	.068	.292	.354	.147	.149	.375	.147	.013	.014
72_ Studies (randomised controlled clinical trials, cohort studies, cross sectional studies, qualitative studies) to investigate the clinical effectiveness of other treatments used in people with hip-related pain (hip joint intra-articular injections; analgesic and anti-inflammatory medications; manual therapy adjunctive techniques such as taping; bracing and orthotics)	.265	.490	.877	.635	.539	.677	.707	.525	.452	.349
73_ Studies to investigate cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to femoroacetabular impingement syndrome and primary cam morphology	.291	.208	.071	.060	.280	.086	.268	.343	.040	.238
74_Qualitative studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of femoroacetabular impingement syndrome (including FAI syndrome and primary cam morphology) stakeholders (e.g. but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers)	.043	.052	.639	.358	.087	.231	.003	.001	.052	.042
75_Education intervention studies (pilot studies; RCT) in individuals with hip-related pain to assess the specific effect of patient education (in addition to other interventions e.g. exercise intervention) on pre-defined patient-related outcomes. For education intervention consider content, modes of delivery and the use of innovative technologies to enhance education benefits	.130	.197	.912	.661	.269	.417	.041	.027	.083	.094
76_Studies to investigate the performance of the diagnostic criteria for hip disease presenting with hip-related pain in young and active adults	.125	.178	.097	.162	.136	.061	.115	.045	.074	.029

77_Core outcome set (COS) development studies for each of the conditions related to hip disease/ hip-related pain in young and active adults	.846	.785	.475	.844	.443	.637	.063	.108	.119	.222
78_Research studies into the utility of HAGOS and iHOT instruments in a non-surgical treatment context	.135	.248	.355	.381	.599	.679	.368	.135	.039	.087
79_Studies to analyse of content and structural validity; and the relationship between individual measurement error and the minimal clinically important change for the recommended PROMs	.333	.496	.979	.938	.800	.950	.554	.296	.164	.211
80_Studies to investigate the impact of the diagnostic components of a specific hip condition on diagnostic or prognostic thinking (e.g. stratifying patients into high and low risk) in young and active adults	.969	.886	.564	.681	.837	.899	.510	.656	.096	.060
81_Studies to develop and validate diagnostic and prognostic models for the different hip diseases presenting with hip-related pain in young persons	.229	.389	.955	1.000	.144	.074	.854	1.000	.071	.057
82_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/or computed tomography scan) for diagnosis of hip disease presenting with hip-related pain in young and active adults	.672	.802	.699	.815	.391	.254	.332	.163	.197	.382
83_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/ or computed tomography scan) for agreeing on an appropriate treatment strategy for hip disease presenting with hip-related pain in young and active adults	.938	.347	.472	.499	.325	.525	.253	.262	.506	.356
84_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/or computed tomography scan) for prognosis of hip disease presenting with hip-related pain in young and active adults	.394	.828	.244	.559	.431	.373	.182	.070	.283	.196

85_Studies to investigate cost-effectiveness of different diagnostic and therapeutic approaches in conditions affecting the young person's hip	.785	.857	.178	.427	.457	.702	1.000	.437	.830	.466

Table SF11-3 Kruskal-Wallis test to compare Physical Therapists vs other stakeholder groups (p-values)

	Physical Therapists vs Orthopaedic surgeons		Physical therapists vs PPI		Physical Therapists vs physicians		Physical Therapists vs radiologists		Physical Therapists vs researchers	
Delphi rounds	1	2	1	2	1	2	1	2	1	2
Statement										
48_Prospective cohort studies to investigate risk factors (aetiological and prognostic) of primary cam morphology in different cohorts	.772	.874	.176	.103	.450	.488	.847	1.000	.776	.739
49_Prospective cohort studies that investigate how primary cam morphology develops in cohorts with variable loading demands (e.g. difference sports/ dance/ physical activity level cohorts and sedentary cohorts) (causal inference approach to investigate load as a risk factor for primary cam morphology)	.118	.024	.629	.974	.361	.092	.143	.181	.213	.061
50_Prospective cohort studies that investigate how primary cam morphology develops in different sex/ gender cohorts specifically women cohorts (causal inference approach to investigate gender as a risk factor for primary cam morphology)	.190	.131	.626	.896	.089	.204	.002	.031	.018	.022
51_Prospective cohort studies that investigate how primary cam morphology develops in different parasport cohorts (causal inference approach to investigate load as a risk factor for primary cam morphology)	.311	.568	.547	.667	.163	.249	.056	.040	.586	.711
52_Prospective cohort studies that investigate how primary cam morphology develops in different race/ ethnic cohorts (causal inference approach to investigate race/ethnicity as a risk factor for primary cam morphology)	.778	.479	.181	.159	.929	.698	.148	.191	.429	.409
53_Prospective cohort studies that investigate other potential risk factors for primary cam morphology (causal inference approach to investigate the following risk factors: anatomical-spine; acetabulum; femur; kinetic and kinematic risk factors; mechanical and biomechanical; other possible risk factors that might emerge over time)	.216	.954	.666	.579	.581	.745	.378	.785	.204	.480
54_Prospective cohort studies that investigate prognosis (consequences) of primary cam morphology in different cohorts	.836	.506	.251	.540	.625	1.000	.816	.625	.267	.050

55_Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology	.631	.169	.166	.201	.366	.947	.058	.122	.974	.235
56_Studies to develop and validate diagnostic and prognostic models for primary cam morphology in young (maturing) athletes	.252	.502	.231	.149	.050	.137	.789	.668	.538	.323
57_Prospective cohort studies to investigate how exercise intervention influences the development and prognosis of primary cam morphology in cohorts with variable loading demands	.362	.294	.567	.728	.648	.627	.090	.111	.053	.029
58_Randomised controlled clinical trials to investigate how exercise intervention (load management) influences the development and prognosis of primary cam morphology in different demographic (e.g. sex/ gender, race/ ethnicity) and load (variable loading demands - e.g. different sports, dance, and physical activity level) cohorts	.584	.246	.947	.822	.189	.079	.845	.633	.012	.003
59_Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes	.697	.701	.314	.169	.314	.764	.210	.287	.007	.073
60_Studies involving economic evaluation to determine the cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to primary cam morphology	.418	.119	.591	.280	.062	.426	.014	.017	.003	.007
61_ Qualitative / Mixed-methods studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of primary cam morphology stakeholders (e.g. but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers)	.027	.030	.978	.551	.008	.012	.000	.000	.001	.003
62_Prospective cohort studies that investigate how pincer morphology develops in different cohorts	.613	.425	.737	.368	.302	.540	.476	.371	.578	.469
63_Prospective cohort studies that investigate pincer morphology prognosis in different cohorts	.829	.828	.878	1.000	.089	.100	.914	.857	.205	.097
64_Prospective cohort studies to investigate risk factors for the development and prognosis of femoroacetabular impingement (FAI) syndrome in different cohorts	.376	.476	.735	.695	.336	.389	.336	.484	.093	.029
65_Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of femoroacetabular impingement syndrome in cohorts with variable loading demands	.124	.087	.329	.366	.008	.005	.022	.010	.001	.000

66_Randomised controlled clinical trials to investigate best practice physiotherapy vs arthroscopic hip surgery vs sham surgery in cohorts with variable loading demands diagnosed with femoroacetabular impingement syndrome	.055	.007	.375	.928	.235	.089	.028	.015	.011	.022
67_Prospective cohort studies to investigate the prognosis after best practice physiotherapy and/ or arthroscopic hip surgery in different sport/ dance/ physical activity level cohorts with femoroacetabular impingement syndrome	.166	.401	.814	.479	.247	.434	.056	.189	.003	.017
68_ Randomised controlled clinical trials to investigate what best practice physiotherapy is (e.g. in different populations and settings; pre- and post-surgery)	.023	.016	.478	.433	.031	.006	.029	.008	.001	.000
69_Studies to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain	.027	.033	.763	.500	.291	.178	.006	.007	.006	.008
70_Studies to investigate; report and improve the psychometric properties of tests of (1) range of motion; (2) muscle strength (3) functional performance (4) Quality of Life (QOL) and other psychological outcomes for studies on aetiology, diagnosis, treatment and prognosis	.031	.049	.219	.252	.184	.246	.177	.231	.070	.067
71_Studies to investigate the relationship among movement-related parameters (biomechanics; muscle function), symptoms, function, quality of life, and imaging and intra-articular hip findings in individuals with hip-related pain	.132	.179	.292	.354	.608	.606	.616	.318	.025	.032
72_ Studies (randomised controlled clinical trials, cohort studies, cross sectional studies, qualitative studies) to investigate the clinical effectiveness of other treatments used in people with hip-related pain (hip joint intra-articular injections; analgesic and anti-inflammatory medications; manual therapy adjunctive techniques such as taping; bracing and orthotics)	.280	.189	.877	.635	.683	.965	.719	.626	.348	.109
73_ Studies to investigate cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to femoroacetabular impingement syndrome and primary cam morphology	.306	.195	.071	.060	.368	.425	.017	.014	.001	.003
74_Qualitative studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of femoroacetabular impingement syndrome (including FAI syndrome and primary cam morphology)	.017	.012	.639	.358	.008	.005	.001	.000	.004	.000

stakeholders (e.g. but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers)										
75_Education intervention studies (pilot studies; RCT) in individuals with hip-related pain to assess the specific effect of patient education (in addition to other interventions e.g. exercise intervention) on pre-defined patient-related outcomes. For education intervention consider content, modes of delivery and the use of innovative technologies to enhance education benefits	.028	.035	.912	.661	.063	.057	.006	.002	.008	.008
76_Studies to investigate the performance of the diagnostic criteria for hip disease presenting with hip-related pain in young and active adults	.753	.389	.097	.162	.617	.685	.639	.178	.648	.198
77_Core outcome set (COS) development studies for each of the conditions related to hip disease/ hip-related pain in young and active adults	.787	.401	.475	.844	.556	.180	.011	.010	.071	.054
78_Research studies into the utility of HAGOS and iHOT instruments in a non-surgical treatment context	.427	.682	.355	.381	.303	.423	.571	.256	.080	.196
79_Studies to analyse of content and structural validity; and the relationship between individual measurement error and the minimal clinically important change for the recommended PROMs	.321	.619	.979	.938	.709	.645	.042	.035	.051	.131
80_Studies to investigate the impact of the diagnostic components of a specific hip condition on diagnostic or prognostic thinking (e.g. stratifying patients into high and low risk) in young and active adults	.565	.563	.564	.681	.550	.684	.188	.429	.022	.022
81_Studies to develop and validate diagnostic and prognostic models for the different hip diseases presenting with hip-related pain in young persons	.115	.325	.955	1.00	.039	.037	.770	1.000	.012	.029
82_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/or computed tomography scan) for diagnosis of hip disease presenting with hip-related pain in young and active adults	.736	.484	.699	.815	.357	.069	.345	.054	.102	.412
83_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/ or computed tomography scan) for agreeing on an appropriate treatment strategy for hip disease presenting with hip-related pain in young and active adults	.397	.662	.472	.499	.717	.224	.311	.096	.230	.766

84_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/or computed tomography scan) for prognosis of hip disease presenting with hip-related pain in young and active adults	.922	.922	.244	.559	.881	.516	.382	.078	.050	.057
85_Studies to investigate cost-effectiveness of different diagnostic and therapeutic approaches in conditions affecting the young person's hip	.170	.250	.178	.427	.747	.730	.247	.099	.033	.046

Table SF11-4 Kruskal-Wallis test to compare Physicians vs other stakeholder groups (p-values)

	Physicians vs Orthopaedic surgeons		Physicians vs PPI		Physicians vs Physical Therapists		Physicians vs radiologists		Physicians vs researchers	
Delphi rounds	1	2	1	2	1	2	1	2	1	2
Statement										
48_Prospective cohort studies to investigate risk factors (aetiological and prognostic) of primary cam morphology in different cohorts	.671	.735	.289	.167	.450	.488	.676	.706	.868	.787
49_Prospective cohort studies that investigate how primary cam morphology develops in cohorts with variable loading demands (e.g. difference sports/ dance/ physical activity level cohorts and sedentary cohorts) (causal inference approach to investigate load as a risk factor for primary cam morphology)	.405	.203	.210	.135	.361	.092	.359	.692	.577	.523
50_Prospective cohort studies that investigate how primary cam morphology develops in different sex/ gender cohorts specifically women cohorts (causal inference approach to investigate gender as a risk factor for primary cam morphology)	.804	.457	.549	.414	.089	.204	.002	.061	.066	.054
51_Prospective cohort studies that investigate how primary cam morphology develops in different parasport cohorts (causal inference approach to investigate load as a risk factor for primary cam morphology)	.857	.783	.113	.214	.163	.249	.261	.342	.564	.464
52_Prospective cohort studies that investigate how primary cam morphology develops in different race/ ethnic cohorts (causal inference approach to investigate race/ethnicity as a risk factor for primary cam morphology)	.905	.694	.110	.094	.929	.698	.192	.157	.362	.262
53_Prospective cohort studies that investigate other potential risk factors for primary cam morphology (causal inference approach to investigate the following risk factors: anatomical-spine; acetabulum; femur; kinetic and kinematic risk factors; mechanical and biomechanical; other possible risk factors that might emerge over time)	.382	.716	.349	.697	.581	.745	.785	.747	.462	.340
54_Prospective cohort studies that investigate prognosis (consequences) of primary cam morphology in different cohorts	.582	.351	.444	.483	.625	1.000	.963	.490	.170	.019
55_Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology	.222	.151	.532	.164	.366	.947	.232	.074	.433	.206

56_Studies to develop and validate diagnostic and prognostic models for primary cam morphology in young (maturing) athletes	.600	.754	.714	.733	.050	.137	.053	.113	.062	.063
57_Prospective cohort studies to investigate how exercise intervention influences the development and prognosis of primary cam morphology in cohorts with variable loading demands	.654	.401	.327	.470	.648	.627	.207	.122	.135	.031
58_Randomised controlled clinical trials to investigate how exercise intervention (load management) influences the development and prognosis of primary cam morphology in different demographic (e.g.; sex/ gender; race/ ethnicity) and load (variable loading demands - e.g. different sports, dance, and physical activity level) cohorts	.611	.928	.263	.111	.189	.079	.298	.348	.168	.029
59_Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes	.478	.810	.057	.230	.314	.764	.500	.317	.098	.117
60_Studies involving economic evaluation to determine the cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to primary cam morphology	.420	.419	.606	.633	.062	.426	.056	.040	.019	.031
61_ Qualitative / Mixed-methods studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of primary cam morphology stakeholders (e.g. but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers)	.574	.407	.130	.309	.008	.012	.002	.002	.088	.212
62_Prospective cohort studies that investigate how pincer morphology develops in different cohorts	.065	.102	.302	.290	.302	.540	.064	.141	.611	.810
63_Prospective cohort studies that investigate pincer morphology prognosis in different cohorts	.154	.172	.303	.249	.089	.100	.207	.130	.900	.757
64_Prospective cohort studies to investigate risk factors for the development and prognosis of femoroacetabular impingement (FAI) syndrome in different cohorts	.929	.976	.583	.321	.336	.389	1.000	.851	.490	.136
65_Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of femoroacetabular impingement syndrome in cohorts with variable loading demands	.169	.351	.375	.369	.008	.005	.855	.600	.067	.017
66_Randomised controlled clinical trials to investigate best practice physiotherapy vs arthroscopic hip surgery vs sham surgery in cohorts with variable loading demands diagnosed with femoroacetabular impingement syndrome	.382	.185	.062	.143	.235	.089	.176	.188	.096	.293

67_Prospective cohort studies to investigate the prognosis after best practice physiotherapy and/ or arthroscopic hip surgery in different sport/ dance/ physical activity level cohorts with femoroacetabular impingement syndrome	.613	.653	.187	.163	.247	.434	.152	.256	.012	.035
68_ Randomised controlled clinical trials to investigate what best practice physiotherapy is (e.g. in different populations and settings; pre- and post-surgery)	.552	.593	.233	.152	.031	.006	.383	.307	.052	.034
69_Studies to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain	.248	.244	.201	.670	.291	.178	.096	.098	.080	.063
70_Studies to investigate; report and improve the psychometric properties of tests of (1) range of motion; (2) muscle strength (3) functional performance (4) Quality of Life (QOL) and other psychological outcomes for studies on aetiology, diagnosis, treatment and prognosis	.195	.275	.024	.021	.184	.246	.325	.323	.351	.315
71_Studies to investigate the relationship among movement-related parameters (biomechanics; muscle function), symptoms, function, quality of life, and imaging and intra-articular hip findings in individuals with hip-related pain	.393	.441	.147	.149	.608	.606	.954	.446	.069	.046
72_ Studies (randomised controlled clinical trials, cohort studies, cross sectional studies, qualitative studies) to investigate the clinical effectiveness of other treatments used in people with hip-related pain (hip joint intra-articular injections; analgesic and anti-inflammatory medications; manual therapy adjunctive techniques such as taping; bracing and orthotics)	.437	.310	.539	.677	.683	.965	.362	.475	.712	.156
73_ Studies to investigate cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to femoroacetabular impingement syndrome and primary cam morphology	.880	.255	.280	.086	.368	.425	.067	.020	.006	.006
74_Qualitative studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of femoroacetabular impingement syndrome (including FAI syndrome and primary cam morphology) stakeholders (e.g. but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers)	.262	.250	.087	.231	.008	.005	.007	.003	.534	.267
75_Education intervention studies (pilot studies; RCT) in individuals with hip-related pain to assess the specific effect of patient education (in addition to other interventions e.g. exercise intervention) on pre-defined patient-	.172	.206	.269	.417	.063	.057	.022	.008	.082	.088

related outcomes. For education intervention consider content, modes of delivery and the use of innovative technologies to enhance education benefits										
76_Studies to investigate the performance of the diagnostic criteria for hip disease presenting with hip-related pain in young and active adults	.417	.541	.136	.061	.617	.685	.335	.236	.386	.375
77_Core outcome set (COS) development studies for each of the conditions related to hip disease/ hip-related pain in young and active adults	.949	.973	.443	.637	.556	.180	.033	.064	.178	.298
78_Research studies into the utility of HAGOS and iHOT instruments in a non-surgical treatment context	.126	.355	.599	.679	.303	.423	.245	.085	.018	.106
79_Studies to analyse of content and structural validity; and the relationship between individual measurement error and the minimal clinically important change for the recommended PROMs	.491	.397	.800	.950	.709	.645	.032	.023	.071	.087
80_Studies to investigate the impact of the diagnostic components of a specific hip condition on diagnostic or prognostic thinking (e.g. stratifying patients into high and low risk) in young and active adults	.930	.976	.837	.899	.550	.684	.297	.385	.029	.032
81_Studies to develop and validate diagnostic and prognostic models for the different hip diseases presenting with hip-related pain in young persons	.881	.788	.144	.074	.039	.037	.356	.186	.102	.426
82_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/or computed tomography scan) for diagnosis of hip disease presenting with hip-related pain in young and active adults	.812	.494	.391	.254	.357	.069	.718	.964	.015	.021
83_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/ or computed tomography scan) for agreeing on an appropriate treatment strategy for hip disease presenting with hip-related pain in young and active adults	.264	.149	.325	.525	.717	.224	.500	.646	.060	.094
84_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/or computed tomography scan) for prognosis of hip disease presenting with hip-related pain in young and active adults	.976	.361	.431	.373	.881	.516	.412	.529	.029	.024
85_Studies to investigate cost-effectiveness of different diagnostic and therapeutic approaches in conditions affecting the young person's hip	.428	.513	.457	.702	.747	.730	.447	.178	.098	.110

Table SF11-5 Kruskal-Wallis test to compare Radiologists vs other stakeholder groups (p-values)

	Radiologists vs Orthopaedic surgeons		Radiologists vs PPI		Radiologists vs Physical Therapists		Radiologists vs Physicians		Radiologists vs Researchers	
Delphi rounds	1	2	1	2	1	2	1	2	1	2
Statement										
48_Prospective cohort studies to investigate risk factors (aetiological and prognostic) of primary cam morphology in different cohorts	.795	.875	.243	.185	.847	1.00	.676	.706	.711	.839
49_Prospective cohort studies that investigate how primary cam morphology develops in cohorts with variable loading demands (e.g. difference sports/ dance/ physical activity level cohorts and sedentary cohorts) (causal inference approach to investigate load as a risk factor for primary cam morphology)	.678	.595	.109	.226	.143	.181	.359	.692	.553	1.000
50_Prospective cohort studies that investigate how primary cam morphology develops in different sex/ gender cohorts specifically women cohorts (causal inference approach to investigate gender as a risk factor for primary cam morphology)	.079	.565	.012	.087	.002	.031	.002	.061	.237	.785
51_Prospective cohort studies that investigate how primary cam morphology develops in different parasport cohorts (causal inference approach to investigate load as a risk factor for primary cam morphology)	.135	.069	.093	.127	.056	.040	.261	.342	.267	.275
52_Prospective cohort studies that investigate how primary cam morphology develops in different race/ ethnic cohorts (causal inference approach to investigate race/ethnicity as a risk factor for primary cam morphology)	.108	.081	.039	.053	.148	.191	.192	.157	.422	.508
53_Prospective cohort studies that investigate other potential risk factors for primary cam morphology (causal inference approach to investigate the following risk factors: anatomical-spine; acetabulum; femur; kinetic and kinematic risk factors; mechanical and biomechanical; other possible risk factors that might emerge over time)	.682	.955	.273	.497	.378	.785	.785	.747	.884	.841
54_Prospective cohort studies that investigate prognosis (consequences) of primary cam morphology in different cohorts	.748	.473	.561	.950	.816	.625	.963	.490	.331	.093
55_Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology	.049	.012	.898	.905	.058	.122	.232	.074	.103	.022

56_Studies to develop and validate diagnostic and prognostic models for primary cam morphology in young (maturing) athletes	.213	.459	.215	.150	.789	.668	.053	.113	.715	.541
57_Prospective cohort studies to investigate how exercise intervention influences the development and prognosis of primary cam morphology in cohorts with variable loading demands	.496	.619	.056	.068	.090	.111	.207	.122	.466	.345
58_Randomised controlled clinical trials to investigate how exercise intervention (load management) influences the development and prognosis of primary cam morphology in different demographic (e.g. sex/ gender; race/ ethnicity) and load (variable loading demands - e.g. different sports, dance, and physical activity level) cohorts	.676	.465	.839	.607	.845	.633	.298	.348	.050	.017
59_Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes	.242	.219	.073	.106	.210	.287	.500	.317	.943	.792
60_Studies involving economic evaluation to determine the cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to primary cam morphology	.102	.174	.273	.324	.014	.017	.056	.040	.512	.893
61_ Qualitative / Mixed-methods studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of primary cam morphology stakeholders (e.g. but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers)	.038	.076	.006	.006	.000	.000	.002	.002	.124	.036
62_Prospective cohort studies that investigate how pincer morphology develops in different cohorts	.753	.872	.823	.955	.476	.371	.064	.141	.182	.155
63_Prospective cohort studies that investigate pincer morphology prognosis in different cohorts	.837	.792	.781	.734	.914	.857	.207	.130	.300	.158
64_Prospective cohort studies to investigate risk factors for the development and prognosis of femoroacetabular impingement (FAI) syndrome in different cohorts	.917	.958	.902	.648	.336	.484	1.000	.851	.557	.310
65_Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of femoroacetabular impingement syndrome in cohorts with variable loading demands	.154	.273	.394	.425	.022	.010	.855	.600	.102	.044
66_Randomised controlled clinical trials to investigate best practice physiotherapy vs arthroscopic hip surgery vs sham surgery in cohorts	.279	.673	.019	.047	.028	.015	.176	.188	.471	.947

with variable loading demands diagnosed with femoroacetabular impingement syndrome										
67_Prospective cohort studies to investigate the prognosis after best practice physiotherapy and/ or arthroscopic hip surgery in different sport/ dance/ physical activity level cohorts with femoroacetabular impingement syndrome	.379	.672	.058	.065	.056	.189	.152	.256	.309	.261
68_ Randomised controlled clinical trials to investigate what best practice physiotherapy is (e.g. in different populations and settings; pre- and post-surgery)	.861	.907	.160	.119	.029	.008	.383	.307	.319	.363
69_Studies to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain	.377	.273	.012	.025	.006	.007	.096	.098	.863	.820
70_Studies to investigate; report and improve the psychometric properties of tests of (1) range of motion; (2) muscle strength (3) functional performance (4) Quality of Life (QOL) and other psychological outcomes for studies on aetiology, diagnosis, treatment and prognosis	.894	.841	.076	.094	.177	.231	.325	.323	.848	.859
71_Studies to investigate the relationship among movement-related parameters (biomechanics; muscle function), symptoms, function, quality of life, and imaging and intra-articular hip findings in individuals with hip-related pain	.642	.908	.375	.147	.616	.318	.954	.446	.560	.671
72_ Studies (randomised controlled clinical trials, cohort studies, cross sectional studies, qualitative studies) to investigate the clinical effectiveness of other treatments used in people with hip-related pain (hip joint intra-articular injections; analgesic and anti-inflammatory medications; manual therapy adjunctive techniques such as taping; bracing and orthotics)	.354	.219	.707	.525	.719	.626	.362	.475	.323	.155
73_ Studies to investigate cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to femoroacetabular impingement syndrome and primary cam morphology	.051	.083	.268	.343	.017	.014	.067	.020	.755	.785
74_Qualitative studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of femoroacetabular impingement syndrome (including FAI syndrome and primary cam morphology) stakeholders (e.g. but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers)	.104	.049	.003	.001	.001	.000	.007	.003	.047	.005

75_Education intervention studies (pilot studies; RCT) in individuals with hip-related pain to assess the specific effect of patient education (in addition to other interventions e.g. exercise intervention) on pre-defined patient-related outcomes. For education intervention consider content, modes of delivery and the use of innovative technologies to enhance education benefits	.405	.294	.041	.027	.006	.002	.022	.008	.559	.328
76_Studies to investigate the performance of the diagnostic criteria for hip disease presenting with hip-related pain in young and active adults	.874	.871	.115	.045	.639	.178	.335	.236	1.000	1.000
77_Core outcome set (COS) development studies for each of the conditions related to hip disease/ hip-related pain in young and active adults	.087	.177	.063	.108	.011	.010	.033	.064	.942	.740
78_Research studies into the utility of HAGOS and iHOT instruments in a non-surgical treatment context	.756	.640	.368	.135	.571	.256	.245	.085	.247	.563
79_Studies to analyse of content and structural validity; and the relationship between individual measurement error and the minimal clinically important change for the recommended PROMs	.507	.304	.554	.296	.042	.035	.032	.023	.842	1.000
80_Studies to investigate the impact of the diagnostic components of a specific hip condition on diagnostic or prognostic thinking (e.g. stratifying patients into high and low risk) in young and active adults	.508	.759	.510	.656	.188	.429	.297	.385	.310	.142
81_Studies to develop and validate diagnostic and prognostic models for the different hip diseases presenting with hip-related pain in young persons	.331	.414	.854	1.000	.770	1.000	.356	.186	.085	.102
82_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/or computed tomography scan) for diagnosis of hip disease presenting with hip-related pain in young and active adults	.574	.473	.332	.163	.345	.054	.718	.964	.049	.019
83_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/ or computed tomography scan) for agreeing on an appropriate treatment strategy for hip disease presenting with hip-related pain in young and active adults	.166	.124	.253	.262	.311	.096	.500	.646	.065	.038
84_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/or computed tomography scan) for	.407	.154	.182	.070	.382	.078	.412	.529	.026	.007

prognosis of hip disease presenting with hip-related pain in young and active adults										
85_Studies to investigate cost-effectiveness of different diagnostic and therapeutic approaches in conditions affecting the young person's hip	.878	.503	1.000	.437	.247	.099	.447	.178	.661	.946

Table SF11-6 Kruskal-Wallis test to compare Researchers vs other stakeholder groups (p-values)

	Researchers vs Orthopaedic surgeons		Researchers vs PPI		Researchers vs Physical Therapists		Researchers vs Physicians		Researchers vs Radiologists	
Delphi rounds	1	2	1	2	1	2	1	2	1	2
Statement										
48_Prospective cohort studies to investigate risk factors (aetiological and prognostic) of primary cam morphology in different cohorts	.924	.896	.395	.216	.776	.739	.868	.787	.711	.839
49_Prospective cohort studies that investigate how primary cam morphology develops in cohorts with variable loading demands (e.g. difference sports/ dance/ physical activity level cohorts and sedentary cohorts) (causal inference approach to investigate load as a risk factor for primary cam morphology)	.806	.487	.126	.092	.213	.061	.577	.523	.553	1.00
50_Prospective cohort studies that investigate how primary cam morphology develops in different sex/ gender cohorts specifically women cohorts (causal inference approach to investigate gender as a risk factor for primary cam morphology)	.399	.638	.097	.080	.018	.022	.066	.054	.237	.785
51_Prospective cohort studies that investigate how primary cam morphology develops in different parasport cohorts (causal inference approach to investigate load as a risk factor for primary cam morphology)	.710	.763	.339	.493	.586	.711	.564	.464	.267	.275
52_Prospective cohort studies that investigate how primary cam morphology develops in different race/ ethnic cohorts (causal inference approach to investigate race/ethnicity as a risk factor for primary cam morphology)	.325	.158	.055	.039	.429	.409	.362	.262	.422	.508
53_Prospective cohort studies that investigate other potential risk factors for primary cam morphology (causal inference approach to investigate the following risk factors: anatomical-spine; acetabulum; femur; kinetic and kinematic risk factors; mechanical and biomechanical; other possible risk factors that might emerge over time)	.963	.503	.166	.289	.204	.480	.462	.340	.884	.841
54_Prospective cohort studies that investigate prognosis (consequences) of primary cam morphology in different cohorts	.450	.226	.083	.022	.267	.050	.170	.019	.331	.093

55_Studies (including diagnostic accuracy studies) to determine the diagnostic criteria for Cam and Pincer morphology	.709	.965	.351	.080	.974	.235	.433	.206	.103	.022
56_Studies to develop and validate diagnostic and prognostic models for primary cam morphology in young (maturing) athletes	.203	.276	.200	.100	.538	.323	.062	.063	.715	.541
57_Prospective cohort studies to investigate how exercise intervention influences the development and prognosis of primary cam morphology in cohorts with variable loading demands	.287	.185	.032	.020	.053	.029	.135	.031	.466	.345
58_Randomised controlled clinical trials to investigate how exercise intervention (load management) influences the development and prognosis of primary cam morphology in different demographic (e.g.; sex/ gender; race/ ethnicity) and load (variable loading demands - e.g. different sports, dance, and physical activity level) cohorts	.053	.052	.030	.011	.012	.003	.168	.029	.050	.017
59_Studies to investigate the potential benefits and harms of screening for primary cam morphology in young athletes	.038	.065	.016	.023	.007	.073	.098	.117	.943	.792
60_Studies involving economic evaluation to determine the cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to primary cam morphology	.043	.241	.132	.432	.003	.007	.019	.031	.512	.893
61_ Qualitative / Mixed-methods studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of primary cam morphology stakeholders (e.g. but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers)	.462	.933	.042	.103	.001	.003	.088	.212	.124	.036
62_Prospective cohort studies that investigate how pincer morphology develops in different cohorts	.258	.138	.515	.252	.578	.469	.611	.810	.182	.155
63_Prospective cohort studies that investigate pincer morphology prognosis in different cohorts	.305	.185	.396	.217	.205	.097	.900	.757	.300	.158
64_Prospective cohort studies to investigate risk factors for the development and prognosis of femoroacetabular impingement (FAI) syndrome in different cohorts	.430	.232	.305	.092	.093	.029	.490	.136	.557	.310
65_Randomised controlled clinical trials to investigate how exercise intervention influences the development and prognosis of femoroacetabular impingement syndrome in cohorts with variable loading demands	.005	.004	.041	.011	.001	.000	.067	.017	.102	.044

66_Randomised controlled clinical trials to investigate best practice physiotherapy vs arthroscopic hip surgery vs sham surgery in cohorts with variable loading demands diagnosed with femoroacetabular impingement syndrome	.139	.829	.010	.056	.011	.022	.096	.293	.471	.947
67_Prospective cohort studies to investigate the prognosis after best practice physiotherapy and/ or arthroscopic hip surgery in different sport/ dance/ physical activity level cohorts with femoroacetabular impingement syndrome	.060	.141	.005	.006	.003	.017	.012	.035	.309	.261
68_ Randomised controlled clinical trials to investigate what best practice physiotherapy is (e.g. in different populations and settings; pre- and post-surgery)	.142	.167	.014	.008	.001	.000	.052	.034	.319	.363
69_Studies to determine the best criteria for rehabilitation progression and Return To Sport (RTS) following management of hip-related pain	.301	.399	.012	.035	.006	.008	.080	.063	.863	.820
70_Studies to investigate; report and improve the psychometric properties of tests of (1) range of motion; (2) muscle strength (3) functional performance (4) Quality of Life (QOL) and other psychological outcomes for studies on aetiology, diagnosis, treatment and prognosis	.745	.735	.014	.011	.070	.067	.351	.315	.848	.859
71_Studies to investigate the relationship among movement-related parameters (biomechanics; muscle function), symptoms, function, quality of life, and imaging and intra-articular hip findings in individuals with hip-related pain	.643	.642	.013	.014	.025	.032	.069	.046	.560	.671
72_ Studies (randomised controlled clinical trials, cohort studies, cross sectional studies, qualitative studies) to investigate the clinical effectiveness of other treatments used in people with hip-related pain (hip joint intra-articular injections; analgesic and anti-inflammatory medications; manual therapy adjunctive techniques such as taping; bracing and orthotics)	.927	.734	.452	.349	.348	.109	.712	.156	.323	.155
73_ Studies to investigate cost-effectiveness of different diagnostic, prognostic, and therapeutic approaches to femoroacetabular impingement syndrome and primary cam morphology	.002	.018	.040	.238	.001	.003	.006	.006	.755	.785

74_Qualitative studies to investigate the perspectives/ preferences/ attitudes/ concerns/ experiences of femoroacetabular impingement syndrome (including FAI syndrome and primary cam morphology) stakeholders (e.g. but not limited to: athletes/ parents/ coaches/ patients with hip disease/ clinicians/ researchers)	.679	.581	.052	.042	.004	.000	.534	.267	.047	.005
75_Education intervention studies (pilot studies; RCT) in individuals with hip-related pain to assess the specific effect of patient education (in addition to other interventions e.g. exercise intervention) on pre-defined patient-related outcomes. For education intervention consider content, modes of delivery and the use of innovative technologies to enhance education benefits	.747	.832	.083	.094	.008	.008	.082	.088	.559	.328
76_Studies to investigate the performance of the diagnostic criteria for hip disease presenting with hip-related pain in young and active adults	.780	.671	.074	.029	.648	.198	.386	.375	1.000	1.000
77_Core outcome set (COS) development studies for each of the conditions related to hip disease/ hip-related pain in young and active adults	.196	.353	.119	.222	.071	.054	.178	.298	.942	.740
78_Research studies into the utility of HAGOS and iHOT instruments in a non-surgical treatment context	.398	.351	.039	.087	.080	.196	.018	.106	.247	.563
79_Studies to analyse of content and structural validity; and the relationship between individual measurement error and the minimal clinically important change for the recommended PROMs	.382	.516	.164	.211	.051	.131	.071	.087	.842	1.000
80_Studies to investigate the impact of the diagnostic components of a specific hip condition on diagnostic or prognostic thinking (e.g. stratifying patients into high and low risk) in young and active adults	.155	.127	.096	.060	.022	.022	.029	.032	.310	.142
81_Studies to develop and validate diagnostic and prognostic models for the different hip diseases presenting with hip-related pain in young persons	.645	.611	.071	.057	.012	.029	.102	.426	.085	.102
82_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/or computed tomography scan) for diagnosis of hip disease presenting with hip-related pain in young and active adults	.090	.208	.197	.382	.102	.412	.015	.021	.049	.019

83_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/ or computed tomography scan) for agreeing on an appropriate treatment strategy for hip disease presenting with hip-related pain in young and active adults	.642	.852	.506	.356	.230	.766	.060	.094	.065	.038
84_Studies to investigate the additional benefit of advanced imaging (e.g. magnetic resonance imaging and/or computed tomography scan) for prognosis of hip disease presenting with hip-related pain in young and active adults	.088	.133	.283	.196	.050	.057	.029	.024	.026	.007
85_Studies to investigate cost-effectiveness of different diagnostic and therapeutic approaches in conditions affecting the young person’s hip	.612	.642	.830	.466	.033	.046	.098	.110	.661	.946

References

1 Beiderbeck D, Frevel N, von der Gracht HA, *et al.* Preparing, conducting, and analyzing Delphi surveys: Cross-disciplinary practices, new directions, and advancements. *MethodsX* 2021;**8**:101401. doi:10.1016/j.mex.2021.101401

2 Beiderbeck D, Frevel N, von der Gracht HA, *et al.* The impact of COVID-19 on the European football ecosystem – A Delphi-based scenario analysis. *Technol Forecast Soc Change* 2021;**165**:120577. doi:10.1016/j.techfore.2021.120577

3 Wasserstein RL, Schirm AL, Lazar NA. Moving to a World Beyond “p < 0.05”. *Am Stat* 2019;**73**:1–19. doi:10.1080/00031305.2019.1583913

SUPPLEMENTARY FILE 12: Interacting Group Process – Delphi exercise domain 5. Mixed stakeholder group online Zoom meeting: 23 September 2021

Table of Contents

Agenda

Young Athlete's Hip Research (YAHiR) Collaboration

Towards an international agreement on primary cam morphology research to increase value and reduce waste

#OxfordHip2021

Overall Objectives

The purpose of this consensus is to:

1. ascertain level of agreement between experts on taxonomy, terminology, and definitions for primary cam morphology (including imaging outcome measures for research on primary cam morphology)
2. work towards agreement on a set of research priorities on conditions affecting the young person's hip (focussing on primary cam morphology and its consequences in athletes)

VERSION: September 2021 (2)

WEBINAR 10 - WEBINAR REGISTRATION LINK: https://medsci.zoom.us/webinar/register/WN_m2UedGjjRUuVb5oPJtagRw
22 September consensus discussion - Zoom meeting link: https://medsci.zoom.us/j/92697337840?pwd=WEdMY2p0UkdEZG54M1h3VXhkWDk2UT09
WEBINAR 11 – WEBINAR 11 REGISTRATION LINK: https://medsci.zoom.us/webinar/register/WN_mdKVnM7rReaQg-M1QzjSrA
23 September consensus discussion - Zoom meeting link: https://medsci.zoom.us/j/97928325865?pwd=S2RNV3N6RHlDa3ZLQkZ5VU45ZDlJQT09

Objectives – To:	Type of consensus meeting	Date
1. ascertain level of agreement between experts on taxonomy, terminology, and definitions for primary cam morphology (including imaging outcome measures for research on primary cam morphology)	Virtual consensus meeting (Zoom)	22 September 2021 12-4pm BST
2. work towards agreement on a set of research priorities on conditions affecting the young person's hip (focussing on primary cam morphology and its consequences in athletes)	Virtual consensus meeting (Zoom)	23 September 2021 12-4.30pm BST

Delphi Study Steering Committee	H Paul Dijkstra[1 2], Sean Mc Auliffe[3], Andreas Serner[4], Andrea Mosler[5], Joanne Kemp[5], Clare L Ardern[5 6], Amy Price[7], Paul Blazey[8 9], Sally Hopewell[10], Jason Oke[11], Karim M Khan[12], Sion Glyn-Jones[13], Mike Clarke[14], Trisha Greenhalgh[15] **Affiliations** [1] Department of Medical Education, Aspetar, Qatar Orthopaedic and Sports Medicine Hospital, Doha, Qatar [2] Department for Continuing Education, University of Oxford, Oxford, UK [3] Department of Physical Therapy & Rehabilitation Science, College of Health Sciences, Qatar University, Doha, Qatar [4] Aspetar Sports Groin Pain Centre, Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar [5] La Trobe Sport and Exercise Medicine Research Centre, School of Allied Health, Human Services and Sport, La Trobe University, Melbourne, Victoria, Australia [6] Musculoskeletal and Sports Injury Epidemiology Centre, Department of Health Promotion Science, Sophiahemmet University, Stockholm, Sweden [7] Stanford Anesthesia, Informatics and Media Lab, Stanford School of Medicine, Department of Anesthesia, Stanford University [8] Centre for Hip Health and Mobility, University of British Columbia, Vancouver, Canada [9] Department of Physical Therapy, Faculty of Medicine, University of British Columbia, Vancouver, Canada [10] Centre for Statistics in Medicine, Oxford Clinical Trials Research Unit, Medical Sciences Division, University of Oxford [11] NIHR Oxford Biomedical Research Centre, Oxford University Hospitals NHS Foundation Trust [12] Department of Family Practice and School of Kinesiology, University of British Columbia, Vancouver, Canada [13] Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford [14] Northern Ireland Methodology Hub, Centre for Public Health, Queen's University Belfast, UK [15] Nuffield Department of Primary Care Health Sciences, University of Oxford, Oxford, UK;

23 September 2021, 12pm BST - Online consensus meeting
Young Athlete's Hip Research (YAHiR) Collaboration consensus meeting to agree on a priority setting for research on conditions affecting the young person's hip (focussing on primary cam morphology in athletes)
Towards a more rigorous, inclusive, and evidence-based approach to research on primary cam morphology to increase value and reduce waste

Webinar 11: Young Athlete's Hip Research Collaboration: Prioritising rigorous, inclusive, and evidence-based research on conditions affecting the young person's hip (focussing on primary cam morphology and its consequences in athletes)

WEBINAR REGISTRATION LINK:
https://medsci.zoom.us/webinar/register/WN_mdKVnM7rReaQg-M1QzjSrA

Faculty: Mike Clarke, Stephanie Kliethermes, Trish Greenhalgh, Karim Khan, Clare Ardern, Joanne Kemp, Paul Dijkstra
Objectives
Following this session participants will be able to:
1. Summarise the key elements of study design to investigate how primary cam morphology develops
2. Review measures to avoid selection bias in research on how primary cam morphology develops
3. Discuss examples of high-quality research on how primary cam morphology develops (focussing on how to define, measure and report risk factors)
4. Discuss some of the important questions only qualitative research can answer

12.00	Introduction	Clare Ardern, Joanne Kemp and Paul Dijkstra
12.10	What are the best populations to investigate how primary cam morphology develops? (Including top 5 tips to avoid selection bias)	Andrea Mosler
12.25	What is an Individual Participant Data (IPD) Meta-analysis?	Mike Clarke
12.40	Cohort study planning, conducting and data sharing for future IPD meta-analyses – is it possible?	Stephanie Kliethermes
13.00	We should go beyond numbers and meta-analyses; there are important questions that only qualitative research can answer	Trish Greenhalgh
13.25	Short break	
13.30	Summary of the Delphi exercise to agree on a prioritised research agenda for conditions affecting the young person's hip	Paul Dijkstra
13.50	Discussion	All with Siôn Glyn-Jones and Karim Khan
14.30	Break – end of webinar 11	

Online mixed stakeholder group discussion and feedback Zoom meeting link: https://medsci.zoom.us/j/97928325865?pwd=S2RNV3N6RHlDa3ZLQkZ5VU45ZDlJQT09		
14.45	**Consensus group refining discussion**: *4-6 groups of 6-8 individuals representing each of the 6 Delphi Study stakeholder groups)* *Discussion: Delphi exercise domain 1-4 results and areas of tension and dissent*	Chairs: Paul Dijkstra, Clare Ardern and Karim Khan Stakeholder group leads: Group 1: Andrea Mosler and Amy Price Group 2: Joanne Kemp & Sion Glyn-Jones Group 3: Karim Khan & Dawn Richards Group 4: Sean McAuliffe & Eugene McNally Group 5: Paul Blazey & Rich Willy Group 6: Andreas Serner & Mike Clarke
15.30	Break	
15.40	Feedback: 5 min per group Summary and next steps towards effective and efficient implementation: • Research collaboration: steering committee, administrative, management, • YAHiR Website: education material (patients & public, clinicians and researchers), templates and • Research funding • YAHiR Collaboration Symposium (22-23 September 2022, Worcester College, Oxford)	Paul Dijkstra, Clare Ardern and Karim Khan
16.30	Closing remarks	Paul Dijkstra

Discussion topics

Primary Cam Morphology Delphi Study
Young Athlete's Hip Research (YAHiR) Collaboration
Improving research quality on primary cam morphology

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The **main purpose** of the discussion today is to explore areas of tension and dissent.

We will not pursue further 'consensus' or vote on the 'no consensus' statements following the 2 Delphi Rounds.

Today's rich, organic, and variable - depending on the individual group - discussions will inform the Delphi Study 'story' (mainly the discussion section of the paper) and highlight areas for further deliberation/research.

Primary Cam Morphology Delphi Study
Young Athlete's Hip Research (YAHiR) Collaboration
Improving research quality on primary cam morphology

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Research Priorities

Conditions affecting the young person's hip (focusing on primary cam morphology (PCM) in athletes)

We already prioritised prospective cohort studies on **PCM aetiology and prognosis**.
How can we facilitate authentic **collaboration** on large multi-centre studies using similar methods to allow data-sharing? What are the challenges?

What are the risks/benefits of **screening**?
Should we only screen for PCM as part of prospective research?

What will facilitate athlete/participant **compliance** in long-term follow up studies?

How can we ensure **load management studies** (cohort studies/RCTs) during growth are feasible?
What resources are required to make load management studies during growth feasible? Who should be involved in the conduct of such studies? How early should recruitment begin? When should the study end?
What other aspects must researchers consider?

Primary Cam Morphology Delphi Study
Young Athlete's Hip Research (YAHiR) Collaboration
Improving research quality on primary cam morphology

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Research Priorities

Conditions affecting the young person's hip (focusing on primary cam morphology (PCM) in athletes)

What are the critical elements of effective physiotherapy/rehab for patients with **FAI syndrome**?
What information/data does one need to be sure of the elements of best practice physiotherapy?
What information is lacking and what needs to happen to obtain that information/those data?

"As an elite athlete, worries about **Return to Sport (RTS)** (which was my living) caused major anxiety for me so this is important".
What are the challenges with studying RTS? (elite & recreational athletes)

Qualitative research: What **types of questions** should we prioritise? What are the barriers to doing high quality qualitative research?
What do we want to know from patients/athletes/parents/coaches?
*"Research on how diagnosis; rehab; return to sport impacted the **mental health** of young athletes (and others)"*

Primary Cam Morphology Delphi Study
Young Athlete's Hip Research (YAHiR) Collaboration
Improving research quality on primary cam morphology

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Stakeholder Group discussion facilitators

Group 1: Dr Andrea Mosler & Dr Amy Price

How can we ensure **load management studies** (cohort studies/RCTs) during growth are feasible?
What resources are required to make load management studies during growth feasible? Who should be involved in the conduct of such studies? How early should recruitment begin? When should the study end?
What other aspects must researchers consider?

Qualitative research: What **types of questions** should we prioritise? What are the barriers to doing high quality qualitative research?
What do we want to know from patients/athletes/parents/coaches?
*"Research on how diagnosis; rehab; return to sport impacted the **mental health** of young athletes (and others)"*

Primary Cam Morphology Delphi Study
Young Athlete's Hip Research (YAHiR) Collaboration
Improving research quality on primary cam morphology

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Stakeholder Group discussion facilitators

Group 2: Ass Prof Joanne Kemp & Prof Sion Glyn-Jones

We already prioritised prospective cohort studies on **PCM aetiology and prognosis**. How can we facilitate authentic **collaboration** on large multi-centre studies using similar methods to allow data-sharing? What are the challenges?

What are the critical elements of effective physiotherapy/rehab for patients with **FAI syndrome**?
What information/data does one need to be sure of the elements of best practice physiotherapy?
What information is lacking and what needs to happen to obtain that information/those data?

Primary Cam Morphology Delphi Study
Young Athlete's Hip Research (YAHiR) Collaboration
Improving research quality on primary cam morphology

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Stakeholder Group discussion facilitators

Group 3: Prof Karim Khan & Dr Dawn Richards

Qualitative research: What **types of questions** should we prioritise? What are the barriers to doing high quality qualitative research?
What do we want to know from patients/athletes/parents/coaches?
*"Research on how diagnosis; rehab; return to sport impacted the **mental health** of young athletes (and others)"*

We already prioritised prospective cohort studies on **PCM aetiology and prognosis**. How can we facilitate authentic **collaboration** on large multi-centre studies using similar methods to allow data-sharing? What are the challenges?

Primary Cam Morphology Delphi Study
Young Athlete's Hip Research (YAHiR) Collaboration
Improving research quality on primary cam morphology

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Stakeholder Group discussion facilitators

Group 4: Dr Sean McAuliffe & Dr Eugene McNally

"As an elite athlete, worries about **Return to Sport (RTS)** (which was my living) caused major anxiety for me so this is important".
What are the challenges with studying RTS? (elite & recreational athletes)

What are the risks/benefits of **screening**?
Should we only screen for PCM as part of prospective research?

What will facilitate athlete/participant **compliance** in long-term follow up studies?

Primary Cam Morphology Delphi Study
Young Athlete's Hip Research (YAHiR) Collaboration
Improving research quality on primary cam morphology

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Stakeholder Group discussion facilitators

Group 5: Mr Paul Blazey & Ass Prof Rich Willy

What are the risks/benefits of **screening**?
Should we only screen for PCM as part of prospective research?

What will facilitate athlete/participant **compliance** in long-term follow up studies?

What are the critical elements of effective physiotherapy/rehab for patients with **FAI syndrome**?
What information/data does one need to be sure of the elements of best practice physiotherapy?
What information is lacking and what needs to happen to obtain that information/those data?

Primary Cam Morphology Delphi Study
Young Athlete's Hip Research (YAHiR) Collaboration
Improving research quality on primary cam morphology

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Stakeholder Group discussion facilitators

Group 6: Dr Andreas Serner & Prof Mike Clarke

We already prioritised prospective cohort studies on **PCM aetiology and prognosis**. How can we facilitate authentic **collaboration** on large multi-centre studies using similar methods to allow data-sharing? What are the challenges?

How can we ensure **load management studies** (cohort studies/RCTs) during growth are feasible?
What resources are required to make load management studies during growth feasible? Who should be involved in the conduct of such studies? How early should recruitment begin? When should the study end?
What other aspects must researchers consider?

Results

Research priorities – Delphi domain 5

Box 1 Interacting Group Process : mixed stakeholder group research priority discussion topics and results

Topic 1 – authentic collaboration: We already prioritised prospective cohort studies on primary cam morphology aetiology and prognosis. How can we facilitate authentic collaboration on large multi-centre studies using similar methods to allow data-sharing? What are the challenges?

While prospective cohort studies on primary cam morphology aetiology and prognosis are already prioritised, authentic collaboration on large multi-centre studies using similar methods to allow data-sharing should '*involve patient and the public in everything'*, focus on '*agreeing a standard set of variables'* (outcomes, interventions, assessments), and '*ask very specific questions'* using '*clear methods*'. Discussion groups raised 6 challenges to authentic collaboration (with possible solutions for some). First, authorship position, when publishing results, is often contested. Second, it is difficult to getting started with data sharing—larger/established research groups should lead. Third, early career researchers, especially from low and middle-income countries or resource poor settings, are sometimes not taken seriously enough. Fourth, equitable approach to funding division, although important, is difficult, especially dividing financial support across countries. Fifth, standardising of processes can be difficult for lower income countries or institutions. Last, funders should target grants to collaborative projects.

Topic 2 – screening and compliance: What are the risks/ benefits of screening? Should we only screen for primary cam morphology as part of prospective research? What will facilitate athlete/ participant compliance in long-term follow up studies?

The panel agreed that primary cam morphology screening as part of research to inform our knowledge '*is fine, but screening as part of routine clinical practice is likely not fine, and may lead to over-medicalisation'*. Risks of screening for primary cam morphology include '*overtreatment in a condition that we know is often asymptomatic'*—'*Why should we screen for a condition that we've already agreed is a "normal physiological response"?*' A biostatistician panel member commented on the importance of the World Health Organisation's Wilson-Junger criteria to inform whether screening is appropriate or not. The panel recommended that screening in younger cohorts (8 to 18y) should '*be carefully managed from an ethical perspective and it would need to be informed by qualitative studies of the potential nocebo impact of any diagnostic labelling. Further, advising younger individuals that they should limit participation in certain sports based on screening results lacks support'*. Screening *'does offer the potential to offer preventative support at an earlier stage to a small percentage of those with CAM who go on to develop significant hip problems later in life'.* Stakeholder groups discussed factors that will facilitate athlete/ participant compliance in long-term follow up studies: (1) involve stakeholders in study designs; (2) focus on language – *'let's figure out how to keep your hip healthy'*; (3) address a large qualitative research void with respect to compliance in prevention/cohort studies; (4) recruit full teams not individuals; (5) demonstrate [to athletes, coaches and managers] that performance improves—focus on performance development over hip health to get better buy-in from athletes, coaches, and parents; (6) foster wider organisational buy-in and involve policy-makers in priority setting; (7) consider how much is asked from participants—balance how much we measure to reduce the burden; (8) create a core outcome set for these areas to support streamlined research studies and participant burden.

Topic 3 – load management studies: How can we ensure load management studies (cohort studies/RCTs) during growth are feasible? What resources are required to make load management studies during growth feasible? Who should be involved in the conduct of such studies? How early should recruitment begin? When should the study end? What other aspects must researchers consider?

While it is important to involve 'methodology experts' (e.g., study design and training-load monitoring) and the target group in the development of any research, load management studies on primary cam morphology development during growth may not be the right priority for new research. Patient buy-in is likely to be low—'*elite sports children may be unwilling to reduce participation in their preferred sport'* and more attention needs to be given to context: '*optimal study designs may not be generalisable to suboptimal context'*.

Topic 4 – Critical elements of physiotherapy/ rehabilitation: What are the critical elements of effective physiotherapy/ rehab for patients with FAI syndrome? What information/ data does one need to be sure of the elements of best practice physiotherapy? What information is lacking and what needs to happen to obtain that information/ those data?

Discussing critical elements of effective physiotherapy/ rehabilitation ('best practice physiotherapy') for patients with FAI syndrome, stakeholder groups emphasised a '*holistic approach to rehabilitation'* that uses the '*same language'*; '*deals with patient expectations, especially time: life-long'*; '*addresses fear of movement'*; '*modifies what the patient do'*, and '*considers who the advocate for the athlete/patient should be'*. While warning '*not to focus on cam morphology as a problem'*, stakeholder groups recommended '*treatment programs need to be at least 6 months in duration*', '*exercise interventions should be the foundation, with potential room for manual therapy'*, and the field '*needs individual participant data (IPD) studies with subgroup analysis to inform this [best practice physiotherapy], as much of the therapy approaches that 'work' has been mixed methods so likely needs to be teased out as to which factors offer the greatest benefit'*.

Topic 5 – Return to sport (RTS):

'As an elite athlete, worries about Return to Sport (RTS) (which was my living) caused major anxiety for me so this is important'.

What are the challenges with studying RTS? (elite & recreational athletes) Based on an elite athlete panellist's earlier comment that 'worries about return to sport (RTS) caused major anxiety' as 'it was their living', stakeholder groups discussed challenges associated with studying RTS.

A patient-clinician panel member commented on their *'lived experience as a patient with FAI/ labral tear'*, emphasising that '*all healthcare providers have to be on the same page when it comes to expectations and treatments'*. This is key as patients *'struggle with learning how to ultimately "keep their hip happy"'*. This panel member emphasised three RTS aspects: (1) the importance of '*working with a strength and conditioning coach who helped me really get over the fear that loading my hip would make it worse'*; (2) working '*with a sports psychologist to work* *through catastrophizing thoughts I had about my hip imaging results*', and (3) '*identifying all lifestyle factors and training factors that will impact the hip: frequency of sport/ running, duration, intensity, sleeping, nutrition, strength training. This is hard for patients to work through'*. Stakeholder groups commented on 6 additional '*factors that may influence RTS: (1) Athlete expectations: what has the athlete been told about their condition and their potential prognosis by a health care practitioner. Does the athlete expect or feel that X intervention is the "only way" to allow them to return to sport? Are we honest with athletes about the potential that they may not return to their previous playing levels due to the current status of their injury/pain/hip? (2) Quality of intervention: we still don't have a "best practice" method/guide for hip interventions in CAM and FAI. The treatment that an athlete receives, surgical or non-surgical, may have a large influence on them returning to sport; (3) Stage of career: as indicated in an earlier comment – considering the stage of the athlete's career may influence RTS. Older athlete towards the end of their career may not "want to return to sport" to preserve long term health and QOL; (4) Sport type: individual vs team. Knowledge of an individual's sport may have a large influence on their RTS. Often team sport athletes may be able to gradually RTS or have their load managed. In individual sports this may not be possible and there may be more pressure to RTS when they are not necessarily ready; (5) Contract status: in professional athletes an athlete's contract status or endorsements may influence their RTS timeframe; (6) Support structures: the support structures and expertise available may influence an athlete's RTS.'*

While there's a '*need for clarity around the definition of "return to sport" – as return to sport is often very different than return to performance'*, stakeholder groups warned that '*the current binary ("yes or no") method of outlining RTS may not be fit for purpose'*. They suggested the possibility of *'a sliding scale or some type of Likert Scale that assesses athletes confidence/ happiness with playing status pre/ post intervention.'*

Finally, stakeholder groups emphasised *'the need for qualitative research in the area to ascertain players perspectives about RTS'*.

Topic 6 – qualitative research: Qualitative research: What types of questions should we prioritise? What are the barriers to doing high quality qualitative research? What do we want to know from patients/ athletes/ parents/ coaches?

Research statement proposed by PPI group member: *'Research on how diagnosis; rehab; return to sport impacted the mental health of young athletes (and others)'*

The importance of qualitative research was spotlighted by a patient-panellist's Delphi round 1 recommendation to add a research priority statement '*on how diagnosis, rehab, return to sport impacted the mental health of young athletes (and others)*'. Stakeholder groups emphasised '*considering all the aspects in anything that is labelled and how the label may impact growth and bias later'*. Differentiating between primary and secondary cam morphology is therefore important '*as an aid for better definition and intervention as the science evolves'*. It is '*super important in this population to understand a patient's journey from diagnosis through treatment'*. Athlete-patients are interested in what primary cam morphology and/ or FAI syndrome means for their hip '*long term'* – '*can we rehab or is surgery required?'*; '*How it will impact my career, life, both and do I need it fixed or not?*'. Stakeholder groups suggested researchers should '*embed what is important to patients or those with the morphology*', '*work in co-production'* on '*experience videos'*, and *'frameworks, maybe starting with safeguarding or prevention'*. In addition, stakeholder groups recommended '*peer focus groups with young people, explaining the science and giving them the problems to "solve for science" along with scenarios, risk communication, discuss pre-emptive or interventional screening and explain differences noting prostate-, breast-, lung screenings and costs'*. The groups highlighted involving parents and coaches as '*it's difficult*

for athlete-patients to rest/commit to physiotherapy especially when being pushed by parents/coaches'. It is also difficult to motivate patient-athletes to continue with exercise-based rehabilitation after 3-4 months especially with '*regional differences between effective physio/rehab/surgery'* and systems, for example '*pay for service and how that affects treatment decisions'*.

The Young Athlete's Hip Symposium

A Young Athlete's Hip Research (YAHiR) Collaborative initiative

#AthletesHip

Partnering to promote and protect athletes' hip health

Organising partner

Date	**Symposium:** 22nd September 2022 – 8:30 to 17.40 (BST)
Venue	**Worcester College, University of Oxford** Sultan Nazrin Shah Centre Auditorium and online (live streamed)
Cost	£150 (in-person) / £50 (online) This fee includes free access to recordings of the *Oxford-Aspetar-La Trobe Young Athlete's Hip Webinar Series* (11 webinars)
CPD Accreditation	**The Royal College of Surgeons of England has awarded up to 6 CPD points** Accredited Continuing Professional Development (rcseng.ac.uk)
Scientific Planning Committee	Paul Dijkstra (Chair), Siôn Glyn-Jones (Co-Chair), Joanne Kemp (Co-Chair), Karim Khan (Co-Chair), Clare Ardern (Co-Chair), Mike Clarke, Trisha Greenhalgh, Inger Mechlenburg, Andrea Mosler, Jason Oke, Amy Price, Dawn Richards
Scientific Faculty (including presenters, chairpersons and panellists)	Rintje Agricola, Thor Einar Andersen, Clare Ardern, Sheree Bekker, Paul Dijkstra, Jon Drezner, Kirsty Elliott-Sale, Siôn Glyn-Jones, Trish Greenhalgh, David Hanff, Josh Heerey, Per Hölmich, Lasse Ishøi, Christa Janse van Rensburg, Ara Kassarjian, Joanne Kemp, Vikas Khanduja, Karim Khan, Signe Kierkegaard, Stephanie Kliethermes, Cara Lewis, Sean McAuliffe, Inger Mechlenburg, Nonhlanhla Mkumbuzi, Andrea Mosler, Simon Newman, Jason Oke, Antony Palmer, Dora Papadopoulou, Lindsey Plass, Amy Price, Tanvi Rai, Dawn Richards, Andreas Serner, Pim van Klij, Fiona Wilson, Mara Yamauchi

Version 10: Sept22

Overall Objectives

Following this symposium you will be able to:

1. Discuss the natural history of primary cam morphology
2. Recommend a strategy to protect the young athlete's hip while promoting physical activity and sport
3. Develop an evidence-based diagnostic approach to femoroacetabular impingement (FAI) syndrome and primary cam morphology in the young athlete
4. Construct a best-practice treatment plan for the young athlete with FAI syndrome and primary cam morphology
5. Appreciate the causal association between primary cam morphology and hip osteoarthritis
6. Discuss surgical management for athletes with femoroacetabular impingement syndrome and primary cam morphology
7. Develop a return-to-sport strategy for athletes with femoroacetabular impingement syndrome (for those managed non-surgically and surgically)
8. Incorporate the lived experiences of athletes with femoroacetabular impingement syndrome into your clinical and research practice
9. Construct a research plan to answer some of the pertinent questions on primary cam morphology and its consequences
10. Appreciate the key components of authentic research collaboration
11. Apply the principles of inclusivity to your clinical and research practice

7.30 BST	Registration	
8.30 – 9.00	Welcome and introduction	
Session 1: 9.00 to 10.30		
Primary cam morphology in the young athlete – development, diagnosis, prevention		
Chair: Joanne Kemp and Inger Mechlenburg Objectives Following this session participants will be able to: 1. Discuss primary cam morphology as an important femoral morphology in the athlete 2. Consider stakeholder's perspectives (patients, parents and sports coaches) on primary cam morphology development and FAI syndrome 3. Describe the current evidence for surgery in young athletes with FAI syndrome and primary cam morphology		
10 min	Introduction and clinical cases	Joanne Kemp
5 min 1 slide	Should we bother with a benign bony bump? Three reasons why primary cam morphology matters	Andrea Mosler
5 min	Panel & audience	
5 min 1 slide	Unravelling the causal link between primary cam morphology and sport—three key areas to focus on	Vikas Khanduja
5 min	Panel & audience	
5 min 1 slide	Three key elements of an 'ideal' training load for 10 to 14-year old athletes to prevent bone & joint injuries/primary cam morphology	Lasse Ishøi
5 min	Panel & audience	
5 min 1 slide	Three key methodological considerations for studies in sport and exercise science with women as participants	Kirsty Elliott-Sale
5 min	Panel & audience	
5 min 1 slide	When to knock on the surgeon's door: three key surgical considerations for helping the young athlete with FAI syndrome and primary cam morphology	Siôn Glyn-Jones
5 min	Panel & audience	
30 min	Clinical cases and discussion	All
10.30 – 11.00 Tea		

Session 2: 11.00 to 12.30		
Femoroacetabular Impingement Syndrome in the athlete – treatment, thriving, winning		
Chairs: Andrea Mosler and Sean McAuliffe Objectives Following this session participants will be able to: 1. Construct a best-practice physiotherapy programme for the young athlete with FAI syndrome and primary cam morphology 2. Describe the appropriate imaging for studies on how primary cam morphology develops and for FAI syndrome in clinical practice 3. Describe realistic return to sport expectations after arthroscopic hip surgery for FAI syndrome		
10 min	Introduction and clinical cases	Andrea Mosler
5 min 1 slide	Three clinical pearls to diagnose FAI syndrome and primary cam morphology in the clinic	Antony Palmer
5 min	Panel and audience	
5 min 1 slide	Three key imaging considerations in the athlete with primary cam morphology and FAI syndrome	David Hanff
5 min	Panel and audience	
5 min 1 slide	Three priorities that will help young athlete-patients to thrive with FAI syndrome	Lindsey Plass
5 min	Panel and audience	
5 min 1 slide	Three key elements of best-practice physiotherapy treatment for the young athlete with FAI syndrome and primary cam morphology	Joanne Kemp
5 min	Panel and audience	
5 min 1 slide	Three key lessons from the 'Five-Year Follow-up After Hip Arthroscopic Surgery in the Horsens-Aarhus Femoroacetabular Impingement (HAFAI) Cohort'	Signe Kierkegaard
5 min	Panel and audience	
30 min	Clinical cases and discussion	All
12:30 – 13:30 Lunch		

Session 3: 13.30 to 15.00		
Hip Osteoarthritis in the athlete – can we predict and prevent it?		
Chair: Christa van Rensburg and Sion Glyn-Jones Objectives Following this session participants will be able to: 1. Construct a management plan for the athlete with hip osteoarthritis 2. Summarise the current evidence on the risk of developing future osteoarthritis in the young athlete with FAI syndrome and primary cam morphology 3. Describe the relationships between cam morphology, hip symptoms, and hip osteoarthritis 4. Appreciate the importance of physical activity/ sport following total hip replacement surgery		
10 min	Introduction and clinical case	Christa van Rensburg
5 min 1 slide	Three reasons why long-term joint health matters to athletes and coaches	Mara Yamauchi
5 min	Panel & audience	
5 min 1 slide	Can we predict and prevent future osteoarthritis in the young athlete with FAI syndrome and primary cam morphology? Three key points	Rintje Agricola
5 min	Panel & audience	
5 min 1 slide	My three top tips for managing the athlete with hip osteoarthritis	Dora Papadopoulou
5 min	Panel & audience	
5 min 1 slide	"But doc – I want to run more marathons!" My three top tips for athlete-patients and their clinicians when hip surgery is the only option.	Per Hölmich
5 min	Panel & audience	
5 min 1 slide	Unravelling the development of early hip OA in football players: three key findings from the Femoroacetabular and Hip Osteoarthritis Cohort (FORCe) study	Josh Heerey
5 min	Panel & audience	
5 min 1 slide	"I want what Andy Murray has". Three surgical considerations in hip arthroplasty for the athlete.	Simon Newman
5 min	Panel & audience	
20 min	Clinical case and discussion	All
15:00 – 15:30 Tea		

Session 4: 15.30 to 17:30		
Research: doing open, rigorous, inclusive and evidence-based research, disseminate and implement it!		
Chair: Clare Ardern and Amy Price Objectives: Following this session participants will be able to: 1. Construct an authentic collaboration plan to implement a prioritised research agenda 2. Describe the principles of inclusive research 3. Appreciate the characteristics of an authentic research leader		
5 min	Introduction	
5 min 1 slide	Three lessons from the Oxford Delphi consensus to **prioritise a research agenda** on conditions affecting the young person's hip (focussing on primary cam morphology and its natural history in athletes)	Paul Dijkstra
7 min	Panel & audience	
5 min 1 slide	Three top tips for planning and conducting high-quality **cohort studies**	Stephanie Kliethermes
9 min	Panel & audience	
5 min 1 slide	Three key factors contributing to **high quality research** on primary cam morphology and its natural history	Sean McAuliffe
9 min	Panel & audience	
5 min 1 slide	Three top tips for **authentic research collaboration** from interdisciplinary health research	Trisha Greenhalgh
9 min	Panel & audience	
5 min 1 slide	Inclusive research: three top tips to authentically involve **patient partners in research** and avoid tokenism	Amy Price
9 min	Panel & audience	
5 min break		
5 min 1 slide	Three top tips for prioritising **minoritised and marginalised** populations in research	Nonhlanhla Mkumbuzi
9 min	Panel & audience	
5 min 1 slide	Three lessons on: 'What would it take to meaningfully attend to **ethnicity and race** in health research? Learning from a trial intervention development study'	Tanvi Rai
9 min	Panel & audience	
5 min 1 slide	Conducting the research orchestra: three top tips for authentic **research leadership**	Clare Ardern
9 min	Panel & audience	
17:30 – 17:40 Symposium close – Karim Khan and Paul Dijkstra		

Young Athlete's Hip Research Meeting

Young Athlete's Hip Research (YAHiR) Collaborative initiative

ASPETAR
سبيتار

Organising partner

Date: 23 September 2022

Venue: Linbury Room, Worcester College, University of Oxford

Key strategic objective

To continue co-developing the YAHiR Collaborative – an international multi-professional community aiming to:

(1) improve outcomes for young athletes and patients with hip conditions
(2) add research value and reduce research waste on conditions affecting the young person's hip (currently focussing on primary cam morphology and its natural history)

VERSION: Sept22 V4

Strategic objectives

The purpose of the YAHiR Collaborative's Research meeting in Oxford is to:

1. Work towards implementing the Oxford Delphi Consensus on primary cam morphology and its consequences to increase research value and reduce research waste
2. Create supergroups based on the YAHiR Collaborative's prioritised research domains
3. Identify key studies based on the YAHiR Collaborative's prioritised research agenda
4. Agree on the key elements, working group and timelines for a paper: *Methodological considerations for studies in sport and exercise medicine, musculoskeletal rehabilitation and sports science fields on primary cam morphology and its natural history*
5. Agree on the key elements of a research support plan for the YAHiR Collaborative's prioritised research agenda
6. Develop the YAHiR Collaborative's Patient and Public Involvement framework

Deliverables (Operational objectives) to: – scope and timeline tbc

1. List of supergroups based on the YAHiR Collaborative's prioritised research domains
2. One prioritised research study per supergroup (or maximum two if appropriate)
3. Refined proposed subheading structure/sections** for the proposed paper: *Methodological considerations for studies in sport and exercise medicine, musculoskeletal rehabilitation and sports science fields on primary cam morphology and its natural history*
4. Co-developed list of key elements of research support (including resources, grants, personnel, website etc)
5. Refined draft PPI framework**

**Proposed drafts will be shared with the group in advance

Steering Committee	Paul Dijkstra, Siôn Glyn-Jones, Mike Clarke, Karim Khan, Jason Oke, Trish Greenhalgh, Clare Ardern, Amy Price, Andrea Mosler, Joanne Kemp, Sean McAuliffe
YAHiR Faculty	Rintje Agricola, Thor Einar Andersen, Clare Ardern, Sheree Bekker, Mike Clarke (online), Paul Dijkstra, Jon Drezner, Kirsty Elliott-Sale, Scott Fernquest, Siôn Glyn-Jones, Trish Greenhalgh, David Hanff, Josh Heerey, Per Hölmich, Lasse Ishøi, Christa Janse van Rensburg, Ara Kassarjian, Joanne Kemp, Karim Khan, Vikas Khanduja, Signe Kierkegaard, Stephanie Kliethermes, Cara Lewis, Sean McAuliffe, Inger Mechlenburg, Nonhlanhla Mkumbuzi, Andrea Mosler, Simon Newman, Jason Oke, Antony Palmer, Dora Papadopoulou, Marc Philippon, Lindsey Plass, Amy Price, Tanvi Rai, Dawn Richards (online), Andreas Serner, Pim van Klij, Fiona Wilson, Mara Yamauchi

NDORMS NUFFIELD DEPARTMENT OF ORTHOPAEDICS, RHEUMATOLOGY AND MUSCULOSKELETAL SCIENCES Medical Sciences Division | DEPARTMENT FOR CONTINUING EDUCATION UNIVERSITY OF OXFORD | CEBM UNIVERSITY OF OXFORD | NUFFIELD DEPARTMENT OF PRIMARY CARE HEALTH SCIENCES Medical Sciences Division

Young Athlete's Hip Research (YAHiR) Collaborative Research Meeting

Towards a more rigorous, inclusive, and evidence-based approach to research on primary cam morphology and its consequences to increase research value and reduce research waste

YAHiR Faculty Dinner:
Informal garden barbeque

22 September 2022, 7pm

Worcester College gardens, University of Oxford

YAHiR Research Meeting

23 September 2022

Linbury Building, Worcester College

7.30	Registration	
8.30 – 10.00 SESSION 1: The YAHiR Collaborative - Looking back and defining the future Session chairpersons: Sion Glyn-Jones and Andrea Mosler Objectives 1. Review the hip-and-groin research timeline 2. Summarise the YAHiR Collaborative's outputs/achievements to date 3. Confirm 'supergroups' (goals & membership) to implement the YAHiR Collaborative's research priorities		
8.30	Welcome and Introduction	
8.40	The 'athlete hip-and-groin' research/ consensus timeline (Doha, Warwick, Zurich, Oxford…)	Jo Kemp
9.00	Oxford Delphi consensus study: research priorities on conditions affecting the young person's hip and other YAHiR outputs to date	Paul Dijkstra
9.20	Outline today's goal for the supergroups to action the prioritised research agenda	Clare Ardern
9.30	Discussion	
10.00 – 10.30 Tea		

10:30 – 12:30 SESSION 2: Prioritising rigorous, inclusive and evidence-based research on conditions affecting the young athlete's hip Session chairpersons: Clare Ardern and Paul Dijkstra Objectives 1. Introduce 3 important research elements that could enhance YAHiR's aim to add research value and reduce research waste on conditions affecting the young person's hip 2. Discuss the 7 domains of a prioritised research agenda for primary cam morphology and its natural history		
10.30	Revisit & expand YAHiR Symposium Session 4: Consider co-production, mixed methods & pragmatism	Trish Greenhalgh and Amy Price
11.00	**Supergroups meet** (90 minutes: 2 x 40min sessions and 10min break)	OBJECTIVES – to:
	1. Aetiology and prognosis of primary cam morphology and FAI syndrome **Rintje Agricola, Fiona Wilson,** Pim van Klij, Josh Heerey, Antony Palmer, David Hanff, Stephanie Kliethermes, Kirsty Elliot-Sale, Scott Fernquest (9)	1. Agree on the most important future study/studies relevant to your supergroup 2. Consider and list what it would take to ultimately DO the best study for your supergroup (in the perfect/ your environment) 3. List/ consider what the rest of the YAHiR community (not just your supergroup) could do to potentially help your supergroup
	2. Diagnosis and screening for primary cam morphology (and FAI syndrome) **Andrea Mosler, Sean Mc Auliffe,** Jason Oke, Christa Janse van Rensburg, Andreas Serner, Lasse Ishøi (online), Ara Kassarjian (7)	
	3. Interventions/ Treatment (including best practice physiotherapy) – primary cam morphology & its hip disease consequences **Joanne Kemp, Per Holmich,** Inger Mechlenburg, Simon Newman, Thor-Einar Andersen, Signe Kierkegaard, Cara Lewis, Dora Papadopoulou (8)	
	4. Patient and Public Involvement: *inclusive research* **Amy Price, Nonhlanhla Mkumbuzi,** Dawn Richards (online), Lindsey Plass, Sheree Bekker, Tanvi Rai, Mara Yamauchi (6)	1. Refine a YAHiR Collaborative patient and public involvement framework focussing on co-production 2. Discuss, refine and prioritise the most important future studies relevant to the supergroup 3. Consider and list what it would take to ultimately DO the best study for your supergroup (in the perfect/ your environment)
38	**5. Leadership & Governance** **Clare Ardern, Paul Dijkstra,** Sion Glyn-Jones, Mike Clarke (online), Trish Greenhalgh, Jon Drezner, Karim Khan, Marc Philippon (online) (8) (Vikas Khanduja)	1. Discuss key lessons on leadership & governance of research collaboratives (based on faculty's experience) 2. Work towards a YAHiR leadership and governance framework
12:30 – 14:00 Lunch		

14.00 – 15.30 Session 3 Implementing the YAHiR Collaborative's research priorities

Session chairpersons: Jo Kemp and Karim Khan

Objective

1. Discuss supergroups' prioritised studies (including resources and support)
2. Refine the subheading structure for a paper: *Methodological considerations for studies in sport and exercise medicine, musculoskeletal rehabilitation and sports science fields on primary cam morphology and its natural history*
3. Discuss a YAHiR Collaborative 'roadmap' towards improving outcomes for young athletes and patients with hip conditions and better quality research (add research value and reduce research waste by focussing in the prioritised research agenda for conditions affecting the young person's hip)

Next steps: Implementing the prioritised research agenda		
14.00	Supergroups' report back (1 slide, 5 minutes each) and discussion to inform the proposed "Methodological Considerations" paper	Karim Khan & Clare Ardern (I-pad)
15.00	ROADMAP for YAHiR – JOURNEY(S) from here Towards effective and efficient implementation Research collaboration, co-developing shared resources: steering committee, administrative support, management, website, education material (patients & public, clinicians and researchers), research funding…	YAHiR Steering Group Hook back to KEY OBJECTIVE
15.20	Closing remarks	Karim Khan, Paul Dijkstra