The 2019 International Society of Hip Preservation (ISHA) physiotherapy agreement on assessment and treatment of femoroacetabular impingement syndrome (FAIS): an international consensus statement

Amir Takla1,2,3*, John O’Donnell3,4, Michael Voight5,6, Thomas Byrd7, Michael Dienst8, Rob Roy Martin9, Marc J. Philippon10, Keelan Enseki11, Tony Andrade12,13, Marc Safran14, John Joseph Christoforetti15, Hal Martin16, Louise Grant17, Ashley Cambell6, Mark Ryan11, Tim Tyler18, Ryan P. McGovern19, Mario Bizzini20 and David Kohlrieser21

1Swinburne University of Technology – Hawthorn Campus, Health Science, Hawthorn, VIC, Australia
2Australian Sports Physiotherapy – Ivanhoe, 3079, Australia
3Hip Arthroscopy Australia, Melbourne, Richmond, VIC 3121, Australia
4Orthopaedic, St Vincent’s Melbourne, East Melbourne, VIC 3054, Australia
5Physical Therapy, Nashville Hip Institute, Nashville, TN 37203, USA
6Physical Therapy, Belmont University, Nashville, TN 37212-3757, USA
7Surgery, Nashville Sports Medicine Foundation, Nashville, TN, USA
8OCM Orthopädische Chirurgie München, Steinerstr. 6, Munich, 81369, Germany
9Physical Therapy, Duquesne University, Pittsburgh, PA 15282-0001, USA
10Steadman Philippon Research Institute, COOR, Vail, CO 81657-5242, USA
11University of Pittsburgh Medical Center, Rooney Sports Complex, Pittsburgh, PA, USA
12Reading Orthopaedic Centre, Circle Reading Hospital, Reading RG2 0NE, UK
13Trauma and Orthopaedic Department, Royal Berkshire NHS Foundation Trust, Reading RG1 5AN, UK
14Orthopaedic Surgery, Stanford University, Redwood City, CA 94063, USA
15Orthopaedic Surgery, Allegheny Clinic, Pittsburgh, PA 15224, USA
16Hip Preservation Center, Baylor University Medical Center at Dallas, Dallas, TX 75246-2088, USA
17Physiotherapy, PhysioCure, Leeds, UK
18Physiotherapy, Pro Sports Physical Therapy, New York, USA
19Texas Health Sports Medicine, Sports Medicine Research, Allen, TX 15013, USA
20Physiotherapy, Schulthess Klinik, Zurich, Switzerland
21Orthopedic One, Physical Therapy, Upper Arlington, OH, USA.

*Correspondence to: A. Takla. E-mail: amir@australiansportsphysio.com

Submitted 2 June 2020; Revised 30 June 2020; revised version accepted 15 August 2020

ABSTRACT

The 2019 International Society of Hip Preservation (ISHA) physiotherapy agreement on femoroacetabular impingement syndrome (FAIS) was intended to build an international physiotherapy consensus on the assessment, non-surgical physiotherapy treatment, pre-/post-operative management, and return to sport decisions for those patients with FAIS. The panel consisted of 11 physiotherapists and 8 orthopaedic surgeons. There is limited evidence regarding the use of physiotherapy in the overall management of those with FAIS. Therefore, a group of
ISHA member physiotherapists, who treat large numbers of FAIS patients and have extensive experience in this area, constructed a consensus statement to guide physiotherapy-related decisions in the overall management of those with FAIS. The consensus was conducted using a modified Delphi technique. Six major topics were the focus of the consensus statement: (i) hip assessment, (ii) non-surgical physiotherapy management, (iii) pre-habilitation prior to hip arthroscopy, (iv) post-operative physiotherapy rehabilitation, (v) stages of post-operative rehabilitation and (vi) return to sports criteria/guidelines after surgery.

INTRODUCTION
The research in the area of femoroacetabular impingement syndrome (FAIS) assessment and surgical treatment has increased considerably over the past decade [1–3]. There have been major advances supporting surgical management with the recent publications of the FASHIoN and FAIT trails [4, 5]. However, high-quality studies investigating physiotherapy management of FAIS, both pre- and post-surgery, are limited [6–8]. The purpose of this project was to construct an international physiotherapy consensus statement to guide physiotherapy-related decisions according to current knowledge and experience regarding the following: (i) hip assessment, (ii) non-surgical physiotherapy management, (iii) pre-habilitation prior to hip arthroscopy, (iv) post-operative physiotherapy rehabilitation, (v) stages of post-operative rehabilitation and (vi) return to sports (RTSs) criteria/guidelines for those with FAIS after surgery.

MATERIALS AND METHODS
Study participants
Participants for the panel were selected from the International Society for Hip Preservation (ISHA) membership to represent experts in the field of hip preservation. Specifically, physiotherapy ISHA members with expertise in conservative and post-operative management of individuals with FAIS were asked to participate. In addition, surgeons with expertise in treating individuals with FAIS using hip arthroscopy were also selected. The panel consisted of 11 physiotherapists and 8 orthopaedic surgeons who represented four countries and had an average of (range: 19–35) years experience. A summary of the attributes of the panel are presented in Table I.

Study design
This study used a modified Delphi technique as the research method to structure group opinion. The modified Delphi technique allowed for focused discussion and judgement to be made on questions related to the assessment and treatment of FAIS.

The first step of the study was to determine questions the panel felt were important to answer. The panel submitted their questions to the study primary author/co-ordinator (A.T.) who compiled the responses. This potential list of questions was then e-mailed to the panel for review. Each panel member had the opportunity to comment and rate each question on the list. The study co-ordinator complied this feedback to create a final list of questions that was e-mailed to the group for review. This final list of questions received 100% agreement as ‘relevant questions’ that should be answered in a consensus statement related to the comprehensive assessment and treatment of those with FAIS.

The second step involved producing concise answers to the questions. Each panel member had the opportunity to contribute answers to the questions. These answers were then submitted to the study coordinator who compiled the answers. A summary of the answers to each question was distributed to the panel for comment. The study coordinator compiled these comments to produce a second round of answers. The second round of answers was then distributed to the group for final comment and review. These final comments were again submitted to the study coordinator who adjusted the answers accordingly. These answers were submitted to the primary author who edited them with the goal of being appropriate for publication. This final list of questions with answers in publication form was submitted to the panel for final review and edit. All edits were submitted back to the primary author who made appropriate changes and circulated to the panel until 100% agreement on all the answers were achieved by all panel members.

RESULTS
The panel determined the following questions were to be answered:

i. How should physiotherapists evaluate a patient that presenting with hip pain?

ii. What specific tests should a physiotherapists include in their examination?

iii. What physiotherapy interventions are recommended for those with FAIS?
| Name                     | Specialty (ortho, sports, trauma) | No. of hip-specific consultation per week | Hip surgical procedures per year | Academic post (Y/N) | Actively involved in research (Y/N) | ISHA member (Y/N) |
|--------------------------|-----------------------------------|------------------------------------------|---------------------------------|---------------------|--------------------------------------|------------------|
| Tony Andrade             | Orthopaedic Sports Medicine, Trauma | 40                                       | ~400 including scopes, osteotomy and arthroplasty | N                   | Yes                                  | Yes              |
| Thomas Byrd              | Orthopaedic Sports Medicine       | 20                                       | 400                             | Yes                 | Yes                                  | Yes              |
| John Christoforetti      | Orthopaedic Sports Medicine       | 40                                       | 250                             | Yes                 | Yes                                  | Yes              |
| Michael Dienst           | Hip surgery                       | 40                                       | 400                             | Yes                 | Yes                                  | Yes              |
| Marc Philippon           | Hip surgery                       | 20                                       | 90                              | Yes                 | Yes                                  | Yes              |
| Hal Martin               | Orthopaedic Surgery               | 20                                       | 35                              | Yes                 | Yes                                  | Yes              |
| Marc Safran              | Orthopaedic Sports Medicine       | 12 new, 50 new and follow up (per week)  | 225                             | Yes                 | Yes                                  | Yes              |
| John O'Donnell           | Orthopaedic Sports Medicine       | 60                                       | 600 (Hip scopes)                | Yes                 | Yes                                  | Yes              |

| Physiotherapists | Specialty (ortho, sports, trauma) | No. of hip-specific consultation per week | Post-operative physiotherapy rehab per year | Academic post (Y/N) | Actively involved in research (Y/N) | ISHA member (Y/N) |
|------------------|-----------------------------------|------------------------------------------|-------------------------------------------|---------------------|--------------------------------------|------------------|
| Mark Ryan        | Sports and ortho                  | 20                                       | 200 (Scopes, PAO, THR)                   | No                  | Yes                                  | No               |
| Louise Grant     | Sports and ortho                  | 50                                       |                                            | No                  | yes                                  | yes              |
| David Kohlrieser | Sports and ortho                  | 35                                       | 150                                        | No                  | Yes                                  | No               |
| Keelan Enseki    | Sports and ortho                  | 10                                       |                                            | Yes                 | Yes                                  | Yes              |
| Tim Tyler        | Sports and ortho                  | 11                                       | 56                                         | No                  | Yes                                  | Yes              |
| Ashley Campbell  | Sports and ortho                  | 30                                       |                                            | Yes                 | Yes                                  | Yes              |
| RobRoy Martin    | Sports and ortho                  | —                                        |                                            | Yes                 | Yes                                  | Yes              |
| Ryan McGovern    | Sports and ortho                  | 20                                       |                                            | Yes                 | Yes                                  | No               |
| Mario Bizzini    | Sports and ortho                  | 6                                        |                                            | Yes                 | Yes                                  | No               |
| Mike Voight      | Sports and ortho                  | 10                                       |                                            | Yes                 | Yes                                  | Yes              |
| Amir Takla       | Sports and ortho                  | 40                                       | 300                                        | Yes                 | Yes                                  | Yes              |
iv. What are the indications to refer a patient for medical/surgical consult or determine conservative care will no longer benefit the patient?

v. What is the role of pre-operative physiotherapy in hip arthroscopy?

vi. What are the stages or timelines and procedure-specific concerns for post-operative rehabilitation?

vii. What do we do and how do we progress post-operative physiotherapy?

viii. What are expected returns to sport rates/outcomes?

The answers to the questions are provided in the proceeding discussion.

**DISCUSSION**

How should physiotherapists evaluate a patient presenting with hip pain?

Ideally, patients should present to physiotherapy following the onset of hip, groin and pelvic pain for assessment. However, this will be dependent on country’s/regions medical system, requirements and restrictions.

A comprehensive examination should follow a logical sequence that considers non-musculoskeletal, lumbar sacral spine, intra- and extra-articular sources of hip pain.

The first step in evaluating the hip is to determine whether the symptoms arise from musculoskeletal or non-musculoskeletal origins. A detailed review of medical history and patient interview should determine the nature of symptoms, carefully considering factors that might indicate non-musculoskeletal causes of hip pain that would require referral to an appropriate medical professional [9–11].

Once it is determined that the patient would be appropriate for physiotherapy, the evaluation algorithm outlined in Fig. 1 can be used to categorize patients with musculoskeletal-related hip pain. This includes differentiating hip from lumbar sacral pathology. Screening for lumbar spine involvement begins with observing active lumbar range of motion (ROM) into flexion, extension, right/left side bending looking for reproduction of symptoms and limitation of movement. Spring testing (posterior to anterior joint mobilization) of the lumbar vertebrae may be performed to isolate the level of spinal involvement and reproduce pain. Clinical tests to provoke sacroiliac joint pain should also be included [10].

After the lumbar sacral spine is evaluated, the clinician should determine if there is an intra- and/or extra-articular source of symptoms. The flexion–abduction–external rotation (FABER), flexion–adduction–internal rotation (FADIR), internal ROM with over-pressure (IROP), flexion to 90 degree with external rotation and scour tests can be used to determine the presence of intra-articular pathology. If FABER, FADIR, IROP and scour tests do not reproduce the patient’s symptoms, then the pathology is likely caused by extra-articular structures. If intra-articular sources of hip pathology are identified the patient can be categorized into one or more of the following categories: FAIS, hypermobility and/or hypomobility [9, 10].

For those with extra-articular sources of hip pain, provocation of symptoms with palpation, passive lengthening/stretching and resisted movements of the involved tissues can determine the source of pathology. This can include potential nerve entrapment [11].

What specific tests should a physiotherapist include in their examination?

Tests should be performed to categorize a patient into one or more of the following categories: lumbar sacral spine, intra- and/or extra-articular pathology. If an intra-articular pathology is identified, patients can be further classified into FAIS, hypermobility and/or hypomobility. The examination should also identify ROM, flexibility, strength, biomechanical and neuromuscular control impairments that could contribute to the patient’s condition [9–11].

Groin and posterior hip pain can be confusing at times. Gomez-Hoyos et al. [11] have published a review on posterior hip pain to guide clinicians. The etiology of the groin pain can be intra- or extra-articular in nature. Overlapping conditions may also exist in these patients. Weir et al. [12] defined a classification system with four major subheadings of extra-articular groin pain in athletes. These defined clinical entities included: Adductor-, iliopsoas-, inguinal- and pubic-related groin pain.

A comprehensive examination organized by position should be performed. Specific tests to potentially rule in or out specific pathologies can be selected based on patient history and a logical differential diagnosis. Refer to Appendix A for full list of tests. Liaising with a medical practitioner, as necessary, will further help clarify the clinical picture by facilitating relevant imaging to assess the bony morphology as recommended by the Warwick Agreement [4].

What physiotherapy interventions are recommended for those with hip pain?

A classification-based treatment plan can be developed according the evaluation algorithm in conjunction with identified impairments. Interventions should be directed at a prioritized problem list that looks to address deficits in
strength, ROM, flexibility and neuromuscular control, while considering biomechanical abnormalities [8, 13].

**Lumbopelvic considerations**
A clinical practice guideline for physiotherapy can be used to direct treatment for those with lumbopelvic conditions [14]. Those with hip and/or lumbopelvic pain often respond to a mobilization treatment group [15]. Individuals who respond to mobilization may also be given general lumbopelvic ROM and stabilization exercises. The hip–spine connection, particularly for those with a loss of hip extension, should be addressed in those with hip and/or lumbopelvic pain [16].

**Femoroacetabular impingement syndrome**
For those with FAIS, joint mobilizations, pain-free ROM and strengthening exercises may be implemented to help restore normal arthrokinematics of the hip joint. Specifically, posterior and inferior hip mobilizations may be indicated for patients presenting with painful and/or restricted motions of flexion and internal rotation of the hip joint. Strengthening activities for the muscles of the hip and lumbosacral spine may improve weakness and muscle imbalance. Exercises directed at improving neuromuscular control may help compensate for the bony deformities [13]. Therapeutic interventions need to be implemented with consideration for movements that provoke symptoms and should be executed in a pain-free manner that does not create additional joint irritation [8].

**Hypomobility**
The Orthopaedic Section of the American Physical Therapy Association has developed evidence-based treatment guidelines for the management of hip pain and
hypomobility [17]. The general treatment approach for patients with hypomobility of the hip joint is a careful balance of therapeutic interventions to improve ROM and strength, while providing reasonable modification of activities that decrease loading of the joint.

**Hypermobility**

Neuromuscular function of the proximal hip musculature in the form of strength, postural awareness, trunk stability and kinesthetic awareness are critical factors in both the assessment and treatment of patients in the hypermobility category. Treatment interventions should emphasize closed-chain strengthening, stabilization and proprioceptive exercises in non-aprehensive movement patterns. Closed-chain exercises can be used to stimulate mechanoreceptors and encourage a co-contraction of the hip stabilizers. Balance and perturbation training for the hip and the lumbopelvic region can be done to encourage coordinated muscular activity that enhance dynamic stability of the hip. Overall, exercises should be directed at improving neuromuscular control to help compensate for lack of stability in the hip and lumbopelvic region [8].

**Extra-articular**

For those with extra-articular sources of hip pain, interventions should be directed at improving strength, ROM and neuromuscular control. Manual therapy, such as soft-tissue mobilization, may also be used to augment exercises.

**What are the indications to refer a patient for medical/surgical consult or determine conservative care will no longer benefit the patient?**

A patient should be referred for medical consult if the patient presents with a history, signs and/or symptoms inconsistent with a musculoskeletal disorder. A patient should also be referred for medical/surgical consult if the patient is not improving after 6 weeks of physiotherapy (up to and including six physiotherapy consults). Physiotherapists need to be aware that prolonged rehabilitation may be detrimental to the patient’s outcome, especially in those who continue to perform aggravating activities during their pre-op rehabilitation phase. Although universal agreement regarding the ideal length of time for pre-operative physiotherapy does not exist, the patient’s symptomatic acuity and potential joint integrity should be considered. Recently, Kunze et al. [18] noted that waiting longer than 3–6 months after becoming symptomatic, resulted in inferior clinical outcomes following hip arthroscopy for patients with FAIS. These results may be utilized to determine a reasonable time frame for pre-operative rehabilitation.

Rehabilitation can address impairments in functional movement patterns, however, the presence of bony deformities may continue to cause further deterioration to the joint. This may be especially true in those who perform activities that require deep flexion and internal rotation. Therefore, the clinician needs to acknowledge their limitations and when referral to an orthopaedic specialist is warranted.

**What is the role of pre-operative physiotherapy in hip arthroscopy?**

Pre-habilitation is formal physiotherapy designed to prepare patients for surgery while maximizing their function. Although clinical experience supports pre-habilitation, research evidence is sparse. A short period of pre-operative rehab may also help identify and provide more extensive education to patients who may not be adherent in the recovery process [19, 20]. Education emphasizing appropriate post-operative expectations as well as the importance of the patient taking an active role in the rehabilitation process is essential for an optimum recovery [20]. Understanding the anatomy of the hip and how the muscles contribute to hip stability during everyday activities, including walking, is important. Education in joint protection strategies may help in pain reduction during the immediate post-operative period. A plan can also be developed to help the patient prepare both mentally and physically for surgery [21]. A pre-operative assessment of ROM, strength, general function, pain level and quality of life can be compared to post-operative assessments as well as the benefits of surgical invention and ultimately improve patient care [22]. Grant et al. [23] found positive results in post-operative recovery for those who exercised before hip arthroscopy for FAIS.

The use of pre-operative physiotherapy assessment, advice, outcome measurements, education, exercises to maximize function, interventions to reduce pain and to address additional co-pathologies can be helpful to maximize postsurgical outcomes. Pre-operative physiotherapy may need to be tailored and individualized given the wide variety of pathologies, differences in physical ability, and diversity in hip joint architecture. Therefore, a single protocol may not only be challenging to implement but also inappropriate.

**What are the stages or timelines and procedure-specific concerns for post-operative rehabilitation?**

Post-operative rehabilitation involves multiple phases that are both time and criteria based. A focus on criteria-based progression through the phases may improve the consistency of rehabilitation and potentially aid in providing patients a safe, efficient return to their desired activities,
including sports. Establishing the predictive utility of clinical measures and functional tests should be a continued emphasis in the development of future post-operative rehabilitation protocols. Typically, the phases progress from immediate post-operative care to return-to-sport criteria. Commonly there are 4 and 5 phases, with total timeframes ranging from 12 to 28 weeks, depending on type and/or number of specific procedures [20, 24–26]. Consensus for time frames related to each phase of rehabilitation are presented in Table II. It should be noted each phase will have specific concerns the physiotherapist will need to be aware of related to weight-bearing, ROM and strength that will be based on the arthroscopic procedure(s) preformed. Though numerous protocols have been described in the literature, there is no universal agreement regarding the post-operative management of patients undergoing such procedures [27]. Recently, a number of review articles have objectively examined the evidence of post-operative protocols described in the literature [7, 28]. In a systematic review, Grzybowski et al. [7] found labral debridement and femoral/acetabular osteochondroplasty were the most common surgical procedures in published post-operative protocols. The authors found the current literature of hip arthroscopy rehabilitation lacks high-quality evidence to support a specific protocol. In addition, they found heterogeneity in study and patient characteristics make it difficult to produce agreed upon evidence-based guidelines [7]. These findings were consistent with those

Table II Guidelines for post-operative rehabilitation

| Stage                  | Estimated time* (length in weeks) | Rehabilitation goals                                                                 | Progression criteria                                                                 |
|------------------------|-----------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Immediate post-operative | 2–4                              | • Pain control<br>• Appropriate gait within weight-bearing status (assistive device if needed) | • 90 degrees of asymptomatic flexion<br>• 10 degrees hip extension<br>• Tolerate all prescribed exercises |
| Early impairment       | 2–4                              | • Symmetrical gait pattern<br>• ROM sufficient for ADLs<br>• Re-establish neuromuscular control for ADLs | • Tolerance of progressive exercise programme<br>• Establish full weight-bearing status<br>• Symmetrical gait pattern<br>• ROM >80% of opposite hip in all planes of motion |
| Late impairment        | 2–6                              | • ROM symmetrical to non-surgical side<br>• Return to low and moderate level ADLs<br>• Return to non-labour occupation activities | • ROM symmetrical to opposite hip<br>• Strength >75% of opposite hip in all planes of motion<br>• Maintain single-leg stance × 30 s<br>• Continuous ambulation >10 min or 1 mile |
| Functional restoration | 2–8                              | • Return to all ADLs<br>• Low to moderate fitness activities as aligned with patient goals | • Strength >75% of opposite hip in all planes of motion<br>• HOS S >85% for ADL subscale |

*Time frames are estimated and do not supersede progression criteria.
reported in an earlier review by Cheatham et al. [28]. The consensus for procedure-specific concerns and related time frames are presented in Table III.

The degree and duration of weight-bearing restriction should be based on the tissues affected and amount of biological healing involved with specific surgical procedure performed. Generally, bilateral axillary crutches are the most recommended assistive device after hip arthroscopy.

During the initial phase of recovery, recommendations vary between foot flat, toe touch and complete non-weight-bearing patterns. A foot flat pattern is recommended as the use of non-weight bearing or toe touch patterns produce increased compressive forces across the hip joint and can lead to irritation of the anterior soft tissues [29]. Patients should be encouraged to continue the use assistive device until they can demonstrate a normalized gait pattern even if these exceed weight-bearing precaution timelines. Discontinuing assistive device use and allowing patients to ambulate with an abnormal gait pattern may increase intra- or extra-articular irritation and complicate or delay their recovery [24, 30].

**What do we do and how do we progress post-operative physiotherapy?**

There is no universally accepted protocol for post-operative physiotherapy rehabilitation, with the exception of a general progression of activity. This includes a return to normal activities of daily living (ADL) with pain-free ROM while protecting healing tissue as a first priority. This progresses to a resumption of loading with functional neuromuscular training and endurance activities. The final progression is a RTS with a prevention strategy that will

| Procedure                      | Weight-bearinga | Range-of-motiona | Strengtha          |
|--------------------------------|-----------------|------------------|--------------------|
| Labral resection               | PWB to WBAT, up to 2 weeks | As tolerated by patient | Progression dictated by weight-bearing and ROM status |
| Labral repair                  | PWB to WBAT, 2–4 weeks, dependent on location and extent of repair | • Anterior: limit external rotation and extension up to 4 weeks  
  • Posterior: limit flexion and/or internal rotation up to 4 weeks | Progression dictated by weight-bearing and ROM status |
| Osteoplasty                    | PWB to WBAT, up to 6 weeks | As tolerated | Progression dictated by weight-bearing and ROM status |
| Microfracture                  | PWB to WBAT, up to 8 weeks | Varies with procedure location | Progression dictated by weight-bearing and ROM status |
| Capsular modification          | Variable with related procedure(s) | • Anterior: limit external rotation and extension up to 4 weeks  
  • Posterior: limit flexion and/or internal rotation up to 4 weeks | Progression dictated by weight-bearing and ROM status |
| Tendon lengthening/release     | PWB to WBAT, up to 2 weeks | As tolerated | • Iliopsoas: defer supine leg raise for at least 4 weeks  
  • Iliotibial band: defer side leg raise 3 and 4 weeks |

aSurgeries consisting of multiple procedures should utilize most conservative aspect of any given category.

PWB, partial weight bearing; WBAT, weight bearing as tolerated.
### Table IV Post-operative Physical Therapy recommendations

**Pre-operatively (2 weeks prior to surgical procedure) 1 and 2 visits**

**Education**
- Provide an opportunity to ask questions regarding post-operative rehabilitation

**Exercise**
- Provide an opportunity to review pre-operative exercises (i.e. core, deep hip rotators and gluteal strengthening) as well as exercises that will be performed immediately post-op

**Phase One (1–14 days post-operatively) 1 and 2 visits**

**Precautions:**
1. Avoid hip flexion beyond 90° during ADL (i.e. putting on shoes and socks) to minimize irritation of the anterior capsule
2. Avoid sitting low chairs or positions of increased flexion
3. Avoid prolonged standing, pivoting or twisting (i.e. car transfer), negotiating public transportation and return to work

**Analgesia**
- Adequate pain control is necessary to allow for early rehabilitation
- Paracetamol and non-steroidal anti-inflammatory medication for pain control in the early weeks

**Muscle activation exercises**
- Encourage activation of deep hip rotators (DHR) to reduce Trendelenburg gait pattern

**ROM**
- Progressed based on healing properties of the involved tissues, including bone, labrum, capsuloligamentous structures and cartilage

**Gait**
- Facilitation of normal gait pattern is critical for appropriate loading of the hip joint and to avoid compensatory patterns that may increase load through healing tissue

**Hydrotherapy**
- With adequate wound healing (around 10–14 days post-operatively), consider use of aqua therapy for early ambulation and normalizing gait

**Soft tissue mobilization (STM)**
- Focused on the psoas, rectus femoris, tensor fascia latae, adductors and glutei to improve muscle activation and flexibility
- Monitor lumbar spine mobility to facilitate appropriate joint loading

**Phase Two (3–6 weeks post-operatively) 1–2×/week**

**Precautions:**
1. Avoid repetitive hip joint flexion beyond 90°, especially in the setting of a labral repair
2. Avoid aggressive compressive forms of loading, such as running on hard surfaces, squats, lunges, skipping and mini-trampoline
   a. Consider modification of these exercises during the healing period

**Therapeutic exercise**
- Initiate cycling with a high seat to avoid hip flexion beyond 90°
- Progression of DHR stability programme
- Prone, four-point kneeling with resistance band (Figs 3–5a and b, 6a and b) Initiate activation and strengthening of gluteal musculature
- To facilitate local hip stability, begin in weight bearing with use of a belt (Fig.9) starting with a quadriceps femoris contraction followed by an isometric contraction of the hip abductors

(continued)
protect and support the hip. A randomized control trial found those with structured post-operative physiotherapy had better short-term outcomes than controls [31]. This published protocol was used to develop the consensus post-operative physiotherapy rehabilitation guideline presented in Table IV. This guideline is designed to initially achieve local segmental stability, followed by gradual global muscular strengthening and progression to endurance loading.

### What are expected returns to sport rates/outcomes

Systematic reviews have found RTS rates and related outcomes after arthroscopic hip surgery are generally good [32–36]. However, there are limited high-quality studies to support RTS after surgery for FAIS as most publications present case series with level 3b–4 evidence [36]. Systematic reviews and meta-analyses found almost 90% of athletes RTS, with 85% returning to their pre-injury competition level on average 7 months after surgery for FAIS [36]. The systematic review by Casartelli et al. [35] found professional athletes RTS at a higher rate compared to recreational and collegiate athletes. However, short- and mid-term follow-up found sport participation tended to decrease for professional athletes. The level of competition, time of evaluation after hip surgery and presence of articular cartilage lesions at the time of surgery may influence RTS [35]. Jack et al. [37] using matched asymptomatic players as controls, found athletes in the National Hockey League had a decrease in performance after surgery, while athletes in the National Football League, Major League Baseball and National Basketball Association had no differences. It should be noted, only 14% of studies reported on athletic pre- and post-surgery athletic performance, and no studies reported on the specific criteria used to define to RTS [36]. When specifically asking about RTS level of participation and performance compared to pre-injury level of participation and performance, outcomes may not to be as good. A recent cross-sectional study of 189 athletes in the Danish Hip Arthroscopy Registry reported only 57% of athletes RTS at their pre-injury full participation level, with only 17% reporting optimal performance [38]. It should be noted this study had a 65% follow-up rate and only 23 elite athletes, which may have influenced the outcomes [39].
Determining RTS as an outcome is problematic because the concept is influenced by many factors and not universally defined. There is also a lack of consensus on how to assess outcomes as they relate to evidence-based RTS criteria in athletes after FAIS surgery. Both athlete-based (i.e. questionnaires, i.e iHot, HAGOS, (Hip Outcome Score) HOS) and performance-based (i.e. strength measurements with HHD, sport-specific tests) outcomes seem to be relevant. Some detailed RTS protocols have been published in case reports, as an example in professional ice hockey [39] and American football [40]. Overall, however there is a need for prospective studies with high levels of evidence that describe and evaluate the rehabilitation and RTS protocols performed by athletes after hip surgery for FAIS. Future research should focus on a standardized approach to defining, measuring and reporting RTS outcomes [41].

A 2016 consensus statement from the First World Congress in Sports Physical Therapy was developed to better standardize RTS rates decision making and reporting [41]. This consensus statement defined RTS as a ‘continuum’ and emphasized a graded, criterion-based progression that would be applicable for any sport. This continuum includes a progression that included ‘return to participation’, ‘RTS’ and ‘return to performance’. In addition, it should be considered that RTS success may have different meanings depending on who is defining RTS, whether it be the athlete, coach, athletic trainer, physiotherapist or surgeon [41]. Defining RTS will also be context dependent and influenced by the type and demands of the particular sport as well as competition and performance level (i.e. youth, high school, college, amateur and professional). Other key aspects in defining RTS include a biopsychosocial model, shared decision making, risk assessment and risk tolerance. This type of framework may be helpful to better standardize RTS decisions in clinical practice and reporting for research purposes [41].

Limitations of paper
This consensus has been formulated by specialist physiotherapists from around the world. Many are clinicians with associated academic research positions at tertiary institutions. They are all involved with high volume orthopaedic surgeons with specialist clinics focusing on hip preservation interventions. Many areas require high level scientific research to provide evidence to support what clinicians are currently practicing. Like many areas of physiotherapy, the clinical treatment is years ahead of the scientific research. This document summarizes the latest methods of rehabilitation utilized by some of the largest hip preservation centres around the world.

SUMMARY
This consensus statement provides an outline for assessment for patients presenting with hip and groin pain, more specifically patients presenting with FAIS symptoms. Patients should progress through stages of rehabilitation, and weight-bearing status is dependent on the surgical restrictions prescribed. Post-operative rehabilitation initially focuses on local segmental stability followed by global muscular retraining. RTS depends on several factors including strength, agility and neuromuscular execution of sports specific drills and tasks.

CONFLICT OF INTEREST STATEMENT
None declared.

REFERENCES
1. Barbera J, Selverian S, Courtington R et al. The top 50 most influential articles in hip arthroscopy. Arthroscopy 2020; 36: 716–22.
2. von Glinski A, Yilmaz E, Goodmanson R et al. The impact of the 30 most cited articles on hip arthroscopy: what is the subject matter? J Hip Preserv Surg 2020; 7: 14–21.
3. de Sa D, Lian J, Sheean AJ et al. A systematic summary of systematic reviews on the topic of hip arthroscopic surgery. Orthop J Sports Med 2018; 6: 232596711879622.
4. Griffin DR, Dickinson EJ, Wall PDH et al. Hip arthroscopy versus best conservative care for the treatment of femoroacetabular impingement syndrome (UK FASHIoN): a multicentre randomised controlled trial. Lancet 2018; 391: 2225–35.
5. Palmer AJR, Ayyar Gupta V, Fernquest S et al. Arthroscopic hip surgery compared with physiotherapy and activity modification for the treatment of symptomatic femoroacetabular impingement: multicentre randomised controlled trial. BMJ 2019; 364: l185.
6. Hoit G, Whelan DB, Dwyer T et al. Physiotherapy as an initial treatment option for femoroacetabular impingement: a systematic review of the literature and meta-analysis of 5 randomized controlled trials. Am J Sports Med 2020; 48: 2042–50.
7. Grzybowski JS, Malloy P, Stegemann C et al. Rehabilitation following hip arthroscopy—a systematic review. Front Surg 2015; 2: 21.
8. McGovern RP, Martin RL, Kivlan BR et al. Non-operative management of individuals with non-arthritic hip pain: a literature review. Int J Sports Phys Ther 2019; 14: 135–47.
9. Enseki K, Harris-Hayes M, White DM et al. Nonarthritic hip joint pain. J Orthop Sports Phys Ther 2014; 44: A1–32.
10. Martin RL, Kivlan B. Classification-based treatment of hip pathology in older adults. Top Geriatr Rehabil 2013; 29: 218–26.
11. Gomez-Hoyos J, Martin RL, Martin HD. Current concepts review: evaluation and management of posterior hip pain. J Am Acad Orthop Surg 2018; 26: 597–609.
12. Weir A, Brukner P, Delahunt E et al. Doha agreement meeting on terminology and definitions in groin pain in athletes. Br J Sports Med 2015; 49: 768–74.
13. McGovern RP, Martin RL, Phelps AL et al. Conservative management acutely improves functional movement and clinical outcomes in patients with pre-arthritic hip pain. J Hip Preserv Surg 2020; 7: 95–102.
14. Delitto A, George SZ, Van Dillen L et al. Low back pain. J Orthop Sports Phys Ther 2012; 42: A1–A7.
15. Alrwaily M, Timko M, Schneider M et al. Treatment-based classification system for low back pain: revision and update. Phys Ther 2016; 96: 1057–66.
16. Khoury AN, Gómez-Hoyos J, Martin HD. Hip–spine effect: hip pathology contributing to lower back, posterior hip, and pelvic pain. In: Martin HD, Gómez-Hoyos J (eds). Posterior Hip Disorders: Clinical Evaluation and Management. Cham: Springer International Publishing, 2019, 29–40.
17. Cibulka MT, Bloom NJ, Enseki KR et al. Hip pain and mobility deficits-hip osteoarthritis: revision 2017. J Orthop Sports Phys Ther 2017; 47: A1–37.
18. Kunze KN, Beck EC, Nwachukwu BU et al. Early hip arthroscopy for femoroacetabular impingement syndrome provides superior outcomes when compared with delaying surgical treatment beyond 6 months. Am J Sports Med 2019; 47: 2038–44.
19. Enseki KR, Martin RL, Draovitch P et al. The hip joint: arthroscopic procedures and postoperative rehabilitation. J Orthop Sports Phys Ther 2006; 36: 516–25.
20. Voight ML, Robinson K, Gill L, Griffin K. Postoperative rehabilitation guidelines for hip arthroscopy in an active population. Sports Health 2010; 2: 222–30.
21. Sochacki KR, Brown L, Cenkus K et al. Preoperative depression is negatively associated with function and predicts poorer outcomes after hip arthroscopy for femoroacetabular impingement. Arthroscopy 2018; 34: 2368–74.
22. Catelli DS, Kovalski E, Beaule PE et al. Increased pelvic mobility and altered hip muscles contraction patterns: two-year follow-up cam-FAIS corrective surgery. J Hip Preserv Surg 2019; 6: 140–8.
23. Grant LF, Cooper DJ, Conroy JL. The HAPI ‘hip arthroscopy pre-habilitation intervention’ study: does pre-habilitation affect outcomes in patients undergoing hip arthroscopy for femoroacetabular impingement? J Hip Preserv Surg 2017; 4: 85–92.
24. Eidelstein J, Ranawat A, Enseki KR et al. Post-operative guidelines following hip arthroscopy. Curr Rev Musculoskelet Med 2012; 5: 15–23.
25. Kuhns BD, Weber AE, Batko B et al. A four-phase physical therapy regimen for returning athletes to sport following hip arthroscopy for femoroacetabular impingement with routine capsular closure. Int J Sports Phys Ther 2017; 12: 683–96.
26. Wahoﬀ M, Ryan M. Rehabilitation after hip femoroacetabular impingement arthroscopy. Clin Sports Med 2011; 30: 463–82.
27. Enseki KR, Kohlriesser D. Rehabilitation following hip arthroscopy: an evolving process. Int J Sports Phys Ther 2014; 9: 765–73.
28. Cheatham SW, Enseki KR, Kolber MJ. Postoperative rehabilitation after hip arthroscopy: a search for the evidence. J Sport Rehabil 2015; 24: 413–8.
29. Tackson SJ, Krebs DE, Harris BA. Acetabular pressures during hip arthritis exercises. Arthritis Care Res 1997; 10: 308–19.
30. Malloy P, Malloy M, Draovitch P. Guidelines and pitfalls for the rehabilitation following hip arthroscopy. Curr Rev Musculoskelet Med 2013; 6: 235–41.
31. Bennell KL, O’Donnell JM, Takla A et al. Eﬃcacy of a physiotherapy rehabilitation program for individuals undergoing arthroscopic management of femoroacetabular impingement—the FAIR trial: a randomised controlled trial protocol. BMC Musculoskelet Disord 2014; 15: 58.
32. Memon M, Kay J, Hache P et al. Athletes experience a high rate of return to sport following hip arthroscopy. Knee Surg Sports Traumatol Arthrosc 2019; 27: 3066–104.
33. Minkara AA, Westermann RW, Rosneck J et al. Systematic review and meta-analysis of outcomes after hip arthroscopy in femoroacetabular impingement. Am J Sports Med 2019; 47: 488–500.
34. O’Connor M, Minkara AA, Westermann RW et al. Return to play after hip arthroscopy: a systemic review and meta-analysis. Am J Sports Med 2018; 46: 2780–8.
35. Casartelli NG, Leunig M, Maffuletti NA et al. Return to sport after hip surgery for femoroacetabular impingement: a systematic review. Br J Sports Med 2015; 49: 819–24.
36. Reiman MP, Peters S, Sylvain J et al. Femoroacetabular impingement surgery allows 74% of athletes to return to the same competitive level of sports participation but their level of performance remains unreported: a systematic review with meta-analysis. Br J Sports Med 2018; 52: 972–81.
37. Jack RA 2nd, Sochacki KR, Hirase T et al. Performance and return to sport after hip arthroscopy for femoroacetabular impingement in professional athletes differs between sports. Arthroscopy 2019; 35: 1422–8.
38. Ishii L, Thorborg K, Kraemer O et al. Return to sport and performance after hip arthroscopy for femoroacetabular impingement in 18- to 30-year-old athletes: a cross-sectional cohort study of 189 athletes. Am J Sports Med 2018; 46: 2578–87.
39. Pierce CM, Laprade RF, Wahoﬀ M et al. Ice hockey goaltender rehabilitation, including on-ice progression, after arthroscopic hip surgery for femoroacetabular impingement. J Orthop Sports Phys Ther 2013; 43:129–41.
40. Philippson MJ, Christensen JC, Wahoﬀ MS. Rehabilitation after arthroscopic repair of intra-articular disorders of the hip in a professional football athlete. J Sport Rehabil 2009; 18: 118–34.
41. Ardern CL, Glasgow P, Schneider A et al. Consensus statement on return to sport from the First World Congress in Sports Physical Therapy, Bern. Br J Sports Med 2016; 50: 853–64.
42. Juul-Kristensen B, Schmedding K, Rombaut L et al. Measurement properties of clinical assessment methods for classifying generalized joint hypermobility—a systematic review. Am J Med Genet C Semin Med Genet 2017; 175: 116–47.
43. Castori M, Tinkle B, Levy H et al. A framework for the classification of joint hypermobility and related conditions. Am J Med Genet C Semin Med Genet 2017; 175: 148–57.
44. Malfait F, Francomano C, Byers P et al. The 2017 international classification of the Ehlers–Danlos syndromes. Am J Med Genet C Semin Med Genet 2017; 175: 8–26.