

Systematic Review/Meta-Analysis

Are Exercise Therapy Protocols For The Treatment of Hip-Related Pain Adequately Described? A Systematic Review of Intervention Descriptions

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Background

Hip-related pain is an umbrella term encompassing pain from non-arthritis hip joint pathologies, such as femoroacetabular impingement syndrome, hip dysplasia, and labral tears. Exercise therapy is commonly recommended for these conditions, but the reporting completeness of these interventions is currently unclear.

Purpose

The aim of this systematic review was to assess the reporting completeness of exercise therapy protocols for people with hip-related pain.

Study design

Systematic review according to PRISMA guidelines.

Materials and Methods

A systematic search was conducted, searching the MEDLINE, CINAHL, and Cochrane databases. The search results were independently screened by two researchers. Inclusion criteria were studies using exercise therapy in people with non-arthritis hip-related pain. Two independent researchers used the Cochrane risk of bias tool version 2 to analyze risk of bias, and the Consensus on Exercise Reporting Template (CERT) checklist and score (1-19) to synthesize reporting completeness.

Results

Fifty-two studies used exercise therapy for hip-related pain, but only 23 were included in the synthesis as 29 studies had no description of the intervention. CERT scores ranged from 1 to 17 (median 12, IQR 5-15). The most well-described items were tailoring (87%), and the least well-described items were motivation strategies (9%) and starting level (13%). Studies used exercise therapy alone (n=13), or in combination with hip arthroscopy (n=10).

Conclusion

Only 23 of 52 eligible studies reported sufficient details to be included in the CERT synthesis. The median CERT score was 12 (IQR 5-15), with no study reaching the maximum score of 19. Lack of reporting makes it difficult to replicate interventions in

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future research, and to draw conclusions on efficacy and dose-response to exercise therapy for hip-related pain.

Level of evidence

Level 1, systematic review

INTRODUCTION

Hip-related pain is an umbrella term encompassing pain arising from non-arthritic hip joint pathologies in three categories: 1) femoroacetabular impingement syndrome (FAIS), 2) acetabular dysplasia and/or instability, and 3) hip joint problems without distinct morphology (such as labral and chondral lesions).¹ Hip-related pain is associated with significant burden in young and middle-aged adults, leading to poor function and low quality of life.²

Exercise therapy for musculoskeletal pain is an effective, low-cost intervention with few adverse events,^{3,4} and is recommended in high quality clinical practice guidelines for diagnoses such as osteoarthritis, low back pain, neck pain and rotator cuff disorders.⁵ Exercise therapy is also suggested as a key component of treatment for hip-related pain, whether or not surgical intervention is undertaken.^{6,7} Physical therapist-led interventions that mainly include exercise therapy, have moderate positive effects compared to sham/control interventions.⁸ However, the optimal content and delivery of exercise therapy is unclear.⁹

To establish best practice, the details of exercise therapy interventions must be described. Complete reporting of the details of an intervention is an important aspect of study quality. Incomplete reporting of the intervention details within a study limits the ability to inform future research,¹⁰ and lowers the clinical applicability of the research findings.¹¹ With the aim to increase the reporting completeness of complex interventions, the CONSORT statement extension for non-pharmacological trials,¹⁰ and the Template for intervention description and replication (TIDieR) guidelines,¹² were developed. The Consensus for Exercise Reporting Template (CERT) was developed to guide and facilitate reporting completeness of exercise therapy interventions.¹³ The CERT checklist can also be used to evaluate completeness of reporting of exercise therapy protocols. It is unknown whether reporting completeness of exercise therapy interventions for hip-related pain has improved since the publication of the CERT guidelines (i.e., 2016). It is also unclear whether any relationship exists between reporting completeness of exercise therapy interventions and other factors related to study quality, such as risk of bias.

Some studies have examined the reporting completeness of exercise therapy interventions for pain around the hip and groin.¹⁴⁻¹⁶ Systematic reviews have described incomplete reporting in studies using exercise therapy as treatment for extra-articular groin pain (i.e. adductor-related, inguinal-related or pubic-related groin pain)¹⁵ and hip OA.¹⁴ A recent scoping review examined specific exercises for FAIS, and how these relate to proposed pathomechanics, in people treated with a non-operative approach.¹⁶ The authors used CERT as a secondary measure and a proxy for

study quality, but did not report any detailed CERT synthesis or description of the intervention content.¹⁶

To the authors knowledge, there are no systematic reviews examining the completeness of the reporting of exercise therapy interventions with/without concurrent surgical intervention for people with hip-related pain. Such knowledge can inform understanding of efficacy of exercise therapy for this patient population, as well as improve future research. Therefore, the main aim of this study was to assess the reporting completeness of exercise therapy protocols for people with hip-related pain. In addition, the aim was also to provide a summary of the content of the exercise therapy protocols included in the study, as well as compare CERT scores between i) studies published before and after publication of CERT, and ii) studies with different levels of risk of bias.

MATERIALS AND METHODS

This systematic review, adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement, was preregistered in the PROSPERO database (CRD42020154139).

LITERATURE SEARCH AND STUDY SELECTION

LITERATURE SEARCH

A systematic search in the MEDLINE, CINAHL, and Cochrane databases was conducted by a research librarian for research studies from earliest available to 31 October 2019 and updated February 19, 2021. The following key words were used:

Population-based terms: ‘hip’, ‘hip pain’, ‘femoroacetabular impingement’, ‘non arthritic hip pain’, ‘acetabular labrum’, ‘dysplas*’, ‘hip chondral’, ‘hip instability’

Intervention-based terms: ‘exercis*’, ‘training’, ‘physiotherap*’, ‘therap*’, ‘physical therap*’, ‘rehabilitat*’, ‘manual therap*’, ‘mobilization’, ‘patient education’, ‘conservative’, ‘non operative’

The search strategy was adapted to the different databases (Appendix A). Reference lists of included studies were screened for further relevant studies.

STUDY SELECTION

Studies were eligible for inclusion if they were randomized controlled trials, cohort studies, case control studies, or published study protocols that included:

- People with non-arthritic hip-related pain, as defined by the International Hip-related Pain Research Network, Zurich 2018¹
- People with persistent pain (>3 months duration)

- Aged 18 to 50 years
- A description of exercise therapy, including details such as treatment modality, prescription, type and/or duration.

Review studies and clinical commentaries were not eligible for inclusion. Studies were also excluded if they included:

- People with verified osteoarthritis (Tönnis grade >1)
- People with total hip replacement
- People with acute hip injury, such as a fracture of the neck of the femur
- People with extra-articular pain, such as adductor-related groin pain
- Interventions including treatment (e.g., therapeutic injection therapy or manual therapy) without exercise therapy

After the initial search performed by a research librarian, all records were imported into the Covidence software, and duplicates were removed. Two researchers (AE, AP) conducted independent screening of titles and abstracts and eligible studies were read in full text (Figure 1). Any disagreements on inclusion were resolved in a consensus meeting, with a third researcher (EA) acting as deciding vote if necessary.

DATA EXTRACTION AND ASSESSMENT

Descriptive details of included studies were extracted by a single researcher and included author, publication year, patient population, sample size, participant age, intervention type (exercise therapy alone or in combination with surgery), outcome measures and results.

The CERT checklist¹⁷ was used to extract and assess the reporting completeness of the included studies. The CERT consists of 16 items over seven domains; what (materials); who (provider); how (delivery); where (location); when, how much (dosage); tailoring (what, how); and how well (compliance/planned and actual). Each item was scored as a 0 (not described), 1 (described) or NA (not applicable). The score ranges from 0 to 19 with higher numbers indicating better description. If any studies compared exercise therapy to surgery and exercise therapy, the treatment protocol for the group receiving exercise therapy only was examined. If a study had multiple exercise therapy treatment groups, the treatment protocol hypothesized to be superior was selected for analysis. Data from each study and any related sources (i.e., appendices, supplemental material, published study protocols, development descriptions and feasibility studies) was independently extracted and assessed by two researchers with experience treating hip-related pain with exercise therapy. The Explanation and Elaboration statement to the CERT was used to guide scoring.¹⁷ The reason for any items being considered 'not described', were recorded. The details and location of each item response was recorded for each study (Appendix B). To evaluate if completeness of reporting has improved since the publication of CERT (December 2016), studies published 2019 or later were considered likely to have had access to

the tool during planning and conducting of their study. Data related to risk of bias was also independently extracted and assessed by two researchers (AE, AP) using the Cochrane risk of bias tool version 2 (RoB 2).¹⁸ Any disagreements on CERT or RoB 2 scores were resolved in a consensus meeting, with a third researcher (EA) acting as deciding vote if necessary.

DATA ANALYSIS

Cohen's kappa was used to measure agreement between raters on the CERT score and RoB 2 tool, and median and inter-quartile ranges (IQR) were used to describe the data. The item responses from the included studies were synthesized by a single researcher, to provide an overview of the contents of the interventions. Mann-Whitney U test was used to compare the CERT scores of studies published before and after the publication of the CERT checklist, and studies with different levels of bias.

RESULTS

STUDY SELECTION

In total, 5444 records were identified, and 234 studies were screened in full text. While 52 studies used exercise therapy as part of their intervention, only 23 studies¹⁹⁻⁴¹ (44%) reported any details. The remaining 29 studies were not included in the CERT synthesis (Figure 1). Twenty-five of these 29 studies were surgical trials, using exercise therapy as part of post-operative rehabilitation (Appendix C).

Study characteristics and CERT scores are described for the 23 studies that could be included in the synthesis.

STUDY CHARACTERISTICS

STUDY DESIGN

Of the 23 studies, three were randomized controlled trials (RCTs),^{23,27,30} four pilot RCTs,^{19,25,29,34} four RCT study protocols,^{21,36,37,41} five prospective case series,^{20,22,24,26,32} one feasibility study,²⁸ and six retrospective case series.^{31,33,35,38-40} Sample size ranged from 15 to 348. The studies used exercise therapy alone,^{19-29,40,41} or in combination with hip surgery.³⁰⁻³⁹

PARTICIPANTS

The studies reported mean ages ranging from 23-43 years and included participants with a diagnosis of FAIS,^{19-25,27,29,30,34-38} dysplasia,^{26,28,41} FAIS and borderline dysplasia,^{33,39} hip-related pain,^{31,40} and chondrolabral pathology.³²

OUTCOME MEASURES AND RESULTS

The studies included in the synthesis reported effects of interventions on hip-specific and/or generic patient-reported outcome measures, as well as tests of physical function (Table 1).

Table 1. Study characteristics of studies included in the CERT synthesis

Included studies	Study type	Risk of bias	Patient population	Participants at baseline, PT/control (%male)	Age, PT/control (SD)	Intervention	Outcomes	Results	Conclusions
Adib et al 2018	Retrospective case series	High	Hip-related pain	60 (28) / NA	23 (range 14-42) / NA	Hip arthroscopy and rehabilitation (ROM ex., stretching, isolated hip muscle ex., functional ex., running progressions, sport specific drills)	Incidence of post-operative iliopsoas tendinopathy	60 (24%) of patients developed post-op iliopsoas tendinopathy. 47% resolved symptoms with physical therapy, 53% required an injection.	Iliopsoas tendinopathy is an under-reported complication after hip arthroscopy.
Amar et al 2021	Retrospective cohort study	High	FAIS	125 (60) / NA	36.7 (14.4) / NA	Hip arthroscopy and rehabilitation consisting of ROM ex., soft tissue therapy, isometric ex., gradual progression to proprioceptive, functional ex., and running.	Primary: Not described Secondary: HOS-ADL, satisfaction, frequency and duration of physical therapy sessions, perceived importance of home program	HOS-ADL and satisfaction level was correlated with frequency and duration of physical therapy visits as well as perceived importance of home exercise program.	Patient perception and the length and frequency of individual physical therapy sessions are important factors in self-reported outcomes after hip arthroscopy for FAIS.
Aoyama et al 2019	Pilot RCT	High	FAIS	12 (0) / 12 (0)	43.3 (range 31-54) / 45.8 (range 29-54)	Hip abductor exercises and core exercises compared to hip abductor exercises alone.	Primary: Not described Secondary: Hip ROM, hip strength, trunk endurance, iHOT-12, mHHS, Vail hip score	No between group differences in hip ROM or strength at 8 weeks, Vail and iHOT-12 significant improvement in trunk training group, mHHS no difference	The addition of trunk stabilisation exercises improves short-term outcomes
Beck et al 2020	Retrospective cohort study	High	FAIS with borderline dysplasia	64 (27) / 112 (37)	33.2 (11.9) / 33.1 (12.0)	Hip arthroscopy and rehabilitation consisting of joint mobilisations, core ex., gait training, functional exercises	Primary: Not described Secondary: HOS-ADL, HOS-SS, mHHS, VAS.	Improvement in all PROMs 5 years after arthroscopy, borderline dysplasia patients did not have worse outcomes compared to isolated FAIS patients.	Success rates 5 years after arthroscopy for FAIS were not significantly different between patients with borderline dysplasia and normal acetabular coverage.
Bennell et al 2017	RCT	High	FAIS	14 (86) / 16 (75)	31.0 (7.0) / 28.6 (8.1)	Hip arthroscopy and rehabilitation consisting of motor control ex. of hip rotators, aquatic ex., ROM ex., functional ex., jogging and sport specific drills	Primary: iHOT-33, HOS-Sport Secondary: HAGOS, Tegner activity scale, GRC	Post-operative physical therapy performed better in primary outcome in the short term, compared to controls.	Individual physical therapy may augment improvements in PROMs following arthroscopy for FAIS.
Casartelli et al 2018	Prospective case series	High	FAIS	34 (35) / NA	25 (5) / NA	Isolated hip muscle ex., isometric trunk training, balance ex., stretching & functional ex.	Primary: Not described Secondary: Global treatment outcome questionnaire (GTO), HOS-ADL, HOS-Sport, EQ-5D, VAS, hip strength, dynamic pelvic control	52% responders to therapy (GTO). PROMs, abduction strength, pelvic control higher in responders, non-responders had more severe cam	Half of patients with FAIS respond to exercise treatment, improvement in PROMs, hip abductor strength and pelvic control is associated with good outcomes
Coppack et al 2016	RCT study protocol	Some concerns	FAIS	50 / 50 (planned)	18-50 (inclusion)	Motor control ex. of hip rotators and trunk/pelvis, isolated hip muscle ex., functional ex., stretching	Primary: HAGOS-ADL, VAS Secondary: NAHS-physical function, EQ5D,	NA	NA

Included studies	Study type	Risk of bias	Patient population	Participants at baseline, PT/control (%male)	Age, PT/control (SD)	Intervention	Outcomes	Results	Conclusions
							HADS, 6-minute walk test, Y-balance test, Hip ROM, hip strength, SIRBS, adherence		
Emara et al 2011	Prospective case series	High	FAIS	37 (73) / NA	33 (5) / NA	Stretching, activity modification	Primary: not described Secondary: HHS, NAHS, Hip ROM	Significant improvements in HHS and NAHS, no change in hip ROM	Conservative treatment of FAIS achieved good early results.
Freke et al 2019	Prospective case series	High	Chondrolabral pathology	67 (70) / 67 (70)	31 (8) / 31 (8)	Hip arthroscopy and rehabilitation (ROM ex., isometric ex., isolated hip muscle ex., functional ex., plyometrics, running, sports specific training)	Primary: Not described Secondary: Hip ROM and isometric hip strength	ROM and strength improved after arthroscopy and rehabilitation, but some strength and ROM variables remained lesser than matched controls	By 6 months after arthroscopy, strength in all directions and flexion and rotation ROM are significantly improved in both limbs.
Fukui et al 2015	Retrospective case series	High	FAIS with borderline dysplasia	100 (50) / NA	35 (range 18-69) / NA	Hip arthroscopy and rehabilitation (ROM ex., isometric contractions, aquatic therapy, stretching, isolated hip muscle ex., functional ex., trunk ex., running, power and plyometrics)	Primary: not described Secondary: mHHS, SF-12, HOS	Patients with FAIS and borderline dysplasia reported improvements in all PROMs after arthroscopy and rehabilitation.	FAI and labral pathology can be successfully managed using hip arthroscopy, with capsular management, in patients with borderline dysplasia.
Grant et al 2017	Pilot RCT	Some concerns	FAIS	9 (50) / 9 (14)	37.5 (6) / 41.7 (12)	Hip arthroscopy and pre- and rehabilitation (circulation, muscle activation, ROM ex., motor control ex. for trunk/pelvis, hydrotherapy, balance, isolated hip muscle ex., functional ex., running drills)	Primary: not described Secondary: NAHS, EQ5D-5L, hip muscle strength	Pre-operative exercise therapy and post-arthroscopy rehabilitation compared to just arthroscopy and rehabilitation resulted in better outcomes in muscle strength and EQ5D.	Patients undergoing hip arthroscopy for FAI, may improve their pain, function and muscle power pre- and post-operatively using specific exercises
Griffin et al 2018	RCT	Some concerns	FAIS	177 (64) / 171 (58)	35.2 (9.4) / 35.4 (9.7)	Motor control ex. for the trunk and pelvis, isolated hip muscle ex., functional ex.	Primary: iHOT-33 Secondary: EQ5D-5L, SF12, adverse events, health care cost	Significant improvement in primary outcome in both arthroscopy and physical therapy groups, with more improvement in arthroscopy.	Offering hip arthroscopy to patients with FAIS led to better patient-assessed function 12 months compared with best conservative care.
Guenther et al 2017	Prospective case series	High	FAIS	20 (90) / NA	29.8 (6.8) / NA	Isolated hip muscle ex., isometric trunk training, balance, functional ex.	Primary: not described Secondary: Isometric hip muscle strength, HOOS, GRC	Significant improvement in HOOS, and isometric strength in abduction, internal rotation and adduction.	An exercise programme could be safely completed and statistically significant changes in strength, function, and self-reported clinical outcomes were achieved.

Included studies	Study type	Risk of bias	Patient population	Participants at baseline, PT/control (%male)	Age, PT/control (SD)	Intervention	Outcomes	Results	Conclusions
Kemp et al 2018	Pilot RCT	Some concerns	FAIS	17 (29) / 7 (29)	37 (8) / 38 (10)	Isolated hip muscle ex., isometric trunk training, functional ex., plyometrics, cardiovascular training	Primary: Feasibility Secondary: iHOT-33, HOOS, isometric hip muscle strength, hip ROM, functional task performance	A full scale study is feasible. FAIS-specific physical therapist intervention performed better than standard physical therapy.	A FAIS specific physical therapy intervention may have a positive effect on improving hip adductor strength, reducing pain, and improving function.
Kuroda et al 2013	Prospective case series	High	Hip dysplasia	25 (0) / NA	37 (range 19-55) / NA	Isometric abduction	Primary: not described Secondary: Hip instability, isometric hip abduction strength, VAS	Improvement in hip instability and VAS after abductor training, no significant increase in abductor strength.	Abductor muscle strengthening exercises can significantly improve patient pain levels and muscle strength
Mansell et al 2018	RCT	High	FAIS, military population	40 (65) / 40 (52)	30.6 (7.4) / 29.7 (7.4)	Mobility ex., isolated hip muscle ex., isometric trunk training, functional ex.	Primary: HOS Secondary: iHOT-33, GRC	Significant improvement in primary outcome in both groups, no significant differences between groups.	Most patients perceived little to no change in status at 2 years, and one-third of military patients were not medically fit for duty at 2 years.
McGovern et al 2021	Retrospective cohort study	High	Pre-arthritis hip pain	46 (33) / NA	30 (12) / NA	Individualized supervised and home-based exercise therapy mainly using functional ex.	VAS, HOS-ADL, HOS-SS	30 out of 46 improved their functional performance tests and these patients also reported better improvements in PROMs.	Patients that improved their functional movement control following rehabilitation are likely to report less pain and greater functional ability in their daily and sports-related activities.
Mortensen et al 2018	Feasibility study	High	Hip dysplasia	16 (25) / NA	28 (range 22-40) / NA	Isolated hip muscle machine-based training, functional ex.	Primary: Feasibility (VAS, adherence, drop-out) Secondary: HAGOS, hop tests, isokinetic hip strength	The treatment had good adherence and few adverse events, and showed improvement in HAGOS, hop tests and strength.	Supervised progressive resistance training is feasible and may improve pain, PROMs, functional performance and hip flexion muscle strength.
Reimer et al 2021	RCT study protocol	Some concerns	Hip dysplasia	48 / 48 (planned)	18-40 (inclusion)	Progressive resistance training using cable machines and dumbbells/barbells, with gradual increase in intensity	Primary: HAGOS Secondary: HAGOS sub scales, single leg hop for distance, adverse events and medications	NA	NA
Riff et al 2018	Retrospective case series	High	FAIS	32 (41) / NA	34.7 (6.7) / NA	Hip arthroscopy and rehabilitation consisting of isometric ex., functional ex., plyometrics, running, trunk isometric training	Primary: Not described Secondary: Return-to-HIIT questionnaire, mHHS, HOS	A high rate of patients returned to high-intensity training at the same level after arthroscopy and rehabilitation	Patients participating in HIIT returned to sport 88% of the time at a mean 9.8 6 5.7 months after hip arthroscopic surgery for FAIS.
Risberg et al 2018	RCT study protocol	Low	FAIS	70 / 70 (planned)	18-50 (inclusion)	Hip arthroscopy and rehabilitation consisting of isolated hip muscle ex., functional ex. plyometric ex.,	Primary: iHOT-33 Secondary: HOOS, Arthritis Self-Efficacy Scale, Tampa Scale of	NA	NA

Included studies	Study type	Risk of bias	Patient population	Participants at baseline, PT/control (%male)	Age, PT/control (SD)	Intervention	Outcomes	Results	Conclusions
						trunk isometric training, aerobic training	Kinesiophobia, HSAS, PSFS, GRC, hip ROM, isometric hip strength, functional task performance		
Tijssen et al 2016	RCT study protocol	Some concerns	FAIS	15 / 15 (planned)	18-50 (inclusion)	Hip arthroscopy and rehabilitation consisting of ROM ex., stretching, aerobic training, isolated hip muscle ex., functional ex., sport specific ex.	Primary: Feasibility Secondary: iHOT-33, functional task performance, hip ROM, isometric hip strength, HSAS, GRC	NA	NA
Wright et al 2016	Pilot RCT	Some concerns	FAIS	7 (43) / 8 (12)	31.0 (4.9) / 36.1 (11.8)	Supervised training (stretching, isolated hip muscle ex., functional ex., trunk muscle training) and manual therapy.	Primary: HOS, VAS Secondary: Lower extremity functional scale (LEFS), GRC, functional task performance	Improvement in pain and PROM in both groups, no significant difference between groups	Physical therapy interventions provide significant, clinically important improvements in pain for patients with FAI.

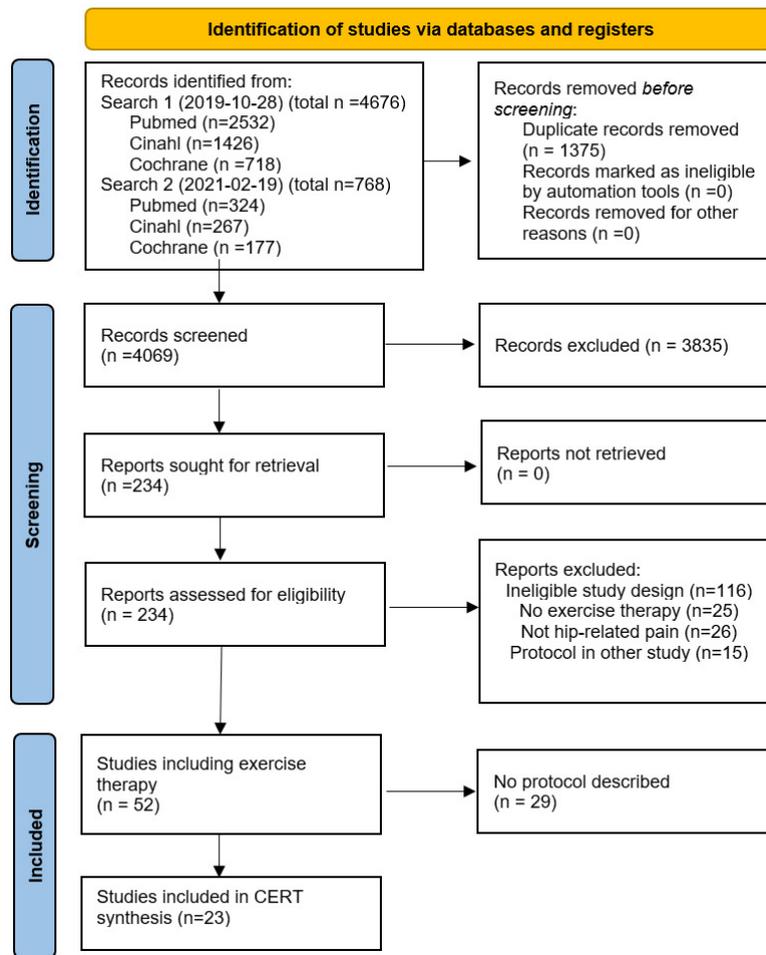


Figure 1. Flowchart of study selection

CERT SCORE SYNTHESIS

None of the studies referred to CERT in their methods section. CERT scores ranged between 1 and 17, with a median of 12 (IQR 5-14). Five^{21,25,28,30,36} studies reported on 15 or more CERT items (75%), 14^{20,21,23-30,34,36,37,41} reported on 10 (50%) or more and 18 studies^{19-21,23-30,32-34,36,37,40,41} reported on five (25%) or more items. No study had the maximum score of 19. The most reported items were tailoring (14a and 14b), which was reported in 20^{19-34,36,37,40,41} of 23 studies. The lowest score was observed for motivation strategies (item 6) and starting level (item 15), which was reported in two^{23,37} and three^{21,28,41} studies, respectively. Details regarding scores are provided in [Table 2](#), and protocol content in Appendix B. The agreement for CERT scores between the two raters was K=0.72, representing a substantial agreement.

CERT ITEMS SYNTHESIS

WHAT (ITEM 1)

Eighteen (78%) studies^{19,21-30,32-34,36-39} described equipment used. Commonly used materials were resistance bands, weight cuffs, stationary bicycles, and unstable surfaces. While most studies described the equipment used

(e.g., leg press), the specific type of equipment (e.g. model of machine) or resistance level was rarely described.

WHO (ITEM 2)

Six (26%) studies^{21,25,29,30,34,36} sufficiently described the title and qualifications of the prescriber. Of the studies that did not report this item, eleven studies^{20,23,24,26-28,32,37,38,40,41} described the professional title (primarily physical therapists) but not qualifications or experience, while six studies^{19,22,31,33,35,39} provided no details about the prescribers.

HOW (ITEM 3-11)

INDIVIDUAL/GROUP (ITEM 3)

Eleven (48%) studies^{20,21,23-27,29,30,34,37} provided detail whether exercise therapy was conducted in individual or group settings, with all 11 studies using individual training sessions.

SUPERVISED/UNSUPERVISED (ITEM 4)

Sixteen (70%) studies^{20,21,23-30,34,36-38,40,41} reported on supervision. Fourteen of these^{20,21,23-25,27,29,30,34,36-38,40,41} used a combination of supervised (ranging from 5-24 sessions) and non-supervised

Table 2. CERT scores

Author and year	1. Equipment	2. Qualifications	3. Individual/group	4. Supervision	5. Adherence	6. Motivation	7a. Progression criteria	7b. Program progression	8. Exercises	9. Home component	10. Non-exercise	11. Adverse events	12. Setting	13. Intervention	14a. Generic or tailored	14b. How was it tailored	15. Starting level	16a. Fidelity	16b. Delivery as planned	Sum
Bennell et al 2017	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	17
Coppack et al 2016	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	NA	16
Kemp et al 2018	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	1	1	16
Risberg et al 2018	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	NA	15
Mortensen et al 2018	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	15
Tijssen et al 2016	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	1	NA	14
Guenther et al 2017	1	0	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	14
Grant et al 2017	1	1	1	1	1	0	1	0	1	1	1	0	1	1	1	1	0	1	0	14
Griffin et al 2018	1	0	1	1	1	1	0	0	1	1	1	1	1	0	1	1	0	1	1	14
Wright et al 2016	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	0	1	0	14
Reimer et al 2021	1	0	0	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	NA	13
Kuroda et al 2013	1	0	1	1	1	0	0	1	1	1	0	1	1	1	1	1	0	0	0	12
Casartelli et al 2018	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1	1	0	0	1	11
Mansell et al 2018	1	0	1	1	0	0	0	1	1	0	1	0	1	1	1	1	0	0	1	11
McGovern et al 2020	1	0	0	1	0	0	0	0	1	1	0	0	1	0	1	1	0	0	0	7
Aoyama et al 2019	1	0	0	0	0	0	0	0	1	0	1	0	0	1	1	1	0	0	0	6
Fukui et al 2015	1	0	0	0	0	0	1	0	1	0	1	0	0	0	1	1	0	0	0	6
Freke et al 2019	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	1	0	0	0	5
Emara et al 2011	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	4
Amar et al 2021	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	3
Adib et al 2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2
Beck et al 2021	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2
Riff et al 2018	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Sum	18	6	11	16	12	2	8	10	17	14	17	12	17	14	20	20	3	8	7	

NA= non-applicable (due to study being a study protocol)

vised exercise. One study²⁸ had supervision on every training session (20 sessions), and one study²⁶ had no supervision.

ADHERENCE (ITEM 5)

Twelve (52%) studies^{20,21,23-26,28,30,34,36,37,41} reported adherence tracking. Eight studies^{20,21,23-25,34,36,37} used a training diary or app, two studies^{21,30} a Likert scale, two studies^{19,26} used verbal confirmation of adherence, and three studies^{28,30,41} recorded the number of attended sessions.

MOTIVATION (ITEM 6)

Two (9%) studies^{23,37} reported any motivation strategies used. This consisted mainly of education on the importance of adherence to the exercise therapy.

PROGRESSION (ITEMS 7A&B)

Eight (35%) studies^{24,28,30,32-34,36,41} reported criteria for progression of exercise. The criteria varied, with studies reporting the use of time frames,⁴¹ pain free range of motion and ambulation,³²⁻³⁴ pain free exercise execution,^{30,32-34} a rate of perceived exertion^{24,36} and/or VAS pain cut-off,³⁶ being able to complete >2 repetitions above prescribed on last set,^{28,41} and/or force production limb symmetry index³²⁻³⁴ as markers for progression.

Ten (43%) studies^{21,24-26,28-30,36,41} described how the program was progressed. Most studies used concurrent means of progression, including: i) increased exercise volume (repetitions and/or sets performed),^{21,25,26,41} ii) increased intensity, targeting heavier loads,^{25,28,29,36,41} iii) progression from isolated muscle exercises to more complex motions, such as compound functional movements, single leg work or unstable surfaces,^{21,24,25,29,30,36} iv) addition of more exercises over time,²⁷ v) faster loading rates, such as plyometric training.^{25,36}

EXERCISES (ITEM 8)

Seventeen (74%) studies^{19,21,23-30,32-34,36,37,40,41} reported the exercises used. These included isolated non-weight-bearing exercises (such as side lying hip abduction),^{19,21,23-30,32-34,36,37,41} isometric trunk training (such as planks),^{19,24,25,27,29,33,36} compound lower extremity exercises (such as squats and lunges),^{21,23-25,27-30,32-34,36,37,40,41} cardiovascular training (with exercise bikes, elliptical machines or running),^{25,30,32-34,36} stretching/mobility,^{21,27,29,30,32-34,37} and/or plyometrics (jumping and landing drills, running progressions).^{25,32-34,36}

HOME COMPONENT (ITEM 9)

Fourteen (61%) studies^{20,21,23-26,28-30,34,36,37,40,41} reported on any home component to their exercise program. Twelve studies^{20,21,23-25,29,30,34,36,37,40,41} primarily provided participants with a home-based program, with supervised sessions to check exercise technique and progression. One study²⁶ used a home program only as the intervention, and one study²⁸ used no home component.

NON-EXERCISE COMPONENT (ITEM 10)

Seventeen (74%) studies^{19-23,25,27-30,33-39} described any non-exercise component. Manual therapy (such as soft-tissue treatment and/or mobilizations) was performed in 13 studies^{21,23,25,27,29,30,33-39} and 8 studies^{19-23,25,30,34} used patient education, commonly concerning hip anatomy and activity modification.

ADVERSE EVENTS (ITEM 11)

Twelve (52%) studies^{20,21,23-26,28-30,36,37,41} described adverse events related to their exercise intervention. No serious adverse events related to exercises were reported, though 4 studies^{23,24,28,30} reported participants experiencing muscle soreness and a transient increase in pain after exercise therapy. One study reported approximately 25% of patients dropping out of the intervention due to increases in pain or fatigue related to the exercises.²⁶

WHERE (ITEM 12)

Seventeen (74%) studies^{20,21,23-30,34,36-41} included descriptions of the study setting, with exercise therapy interventions mostly being performed at outpatient physical therapy clinics.

WHEN/HOW MUCH (ITEM 13)

Fourteen (61%) studies^{19-21,24-30,34,36,37,41} reported on intervention dosage. The duration ranged from three weeks to six months, and frequency ranged between daily training to three sessions weekly. Six studies^{21,24,28,30,36,41} provided dosage anchored against a measure of intensity, such as rate of perceived exertion or a percentage of repetition maximum (RM).^{28,36,41}

TAILORING (ITEMS 14-15)

Twenty (87%) studies^{19-34,36,37,40,41} reported whether the program was tailored to the individual, of which 15 used an individualized approach^{20,21,23-25,27,29-34,36,37,40} and five a generic program.^{19,22,26,28,41} The treating physical therapist tailored the program based on the patient impairment, pain-free range of motion surgical procedure, and desired activity levels and sport-specific demands. Three studies (13%)^{21,28,41} reported the patients' starting level, two of which RM-based starting levels,^{28,41} and one where the treating physical therapist adapted the starting dose based on patient presentation.²¹

HOW WELL (ITEM 16 A & B)

Eight (35%) studies^{21,23,25,29,30,34,36,37,41} reported on intervention fidelity. To increase fidelity, physical therapists delivering the intervention were given written instruction^{21,23,30,34,36} and physical training^{21,23,25,29,30,36} in application of the protocol. Two studies used follow up sessions with the researchers.^{23,36} The authors of two studies were also treating clinicians.^{25,37} Seven studies (54%)^{20,23-25,27,28,30} reported whether the interventions

were delivered according to plan, primarily using reports of adherence and attended sessions to describe the applied intervention. The included RCT study protocols^{21,36,37,41} were not applicable for this item as the intervention had not been completed.

STUDIES PUBLISHED BEFORE AND AFTER CERT

Studies published before 2019^{21-31,33-37} had higher (better) CERT scores (n=16, median 14, IQR 7.25-15) compared to those published 2019 or later^{19,20,32,38-41} (n=7, median 6, IQR 3-11) (p=0.034).

RISK OF BIAS

Risk of bias was high in 14 studies,^{19,20,22,24,26-28,31-33,35,38-40} some concerns in 8 studies^{21,23,25,29,30,34,37,41} and low in one study³⁶ (Table 1, Appendix D). Studies with some concerns or low risk of bias were analyzed together (n=9), and had higher CERT scores (median 14, IQR 14-16) compared to those with high risk of bias (n=14) (median 6, IQR 3-11) (p<0.001). Agreement for risk of bias was substantial (K=0.69).

DISCUSSION

Fifty-two studies used exercise therapy as part of their intervention to treat hip-related pain, but 29 studies provided no details beyond mentioning the use of exercise therapy and could not be included in the CERT synthesis. Of the 23 studies included in the synthesis, the median CERT score was 12 (IQR 5-14) and none reached the maximum score of 19. The results suggest that studies using exercise therapy to treat hip-related pain did not report protocols in sufficient detail to allow replication in future studies or clinical practice.

In line with the results of the present study, previous systematic reviews have reported median CERT scores ranging from 5-15 in exercise therapy studies for diagnoses such as rotator cuff disorders,⁴² achilles rupture,⁴³ low back pain,⁴⁴ and hip OA.¹⁴ In the present study, the most described item was tailoring (item 14a and 14b, described by 87%), while the least reported items were motivation strategies (item 6, 9%) and starting level (item 15, 13%). Motivation is a key factor in adherence to rehabilitation,⁴⁵ and behavior change related to physical activity.⁴⁶ A lack of describing motivational strategies could imply this aspect has not been considered, which could in turn limit the effectiveness of otherwise well designed and described protocols. People with hip-related pain is a heterogeneous group with varying levels of functional impairments.^{2,47} Therefore, the appropriate starting level may be unique to the individual, and a lack of criteria description may lead to a starting level that is too challenging for some, and not sufficiently demanding for others. Also, less than half of the studies described progression criteria (item 7a, 35%), or how progression was performed (item 7b, 43%), and 14 of 23 (61%) studies had descriptions of dosage, such as repetitions, sets and frequency (item 13). This is in ac-

cordance with previous systematic reviews where the commonly unreported items were motivation strategies, starting levels, progression criteria and fidelity.^{14,42-44} Based on our results and similar reviews, important aspects of exercise therapy protocols are consistently unreported in the literature. Improvement of reporting completeness may better our understanding of exercise therapy for this patient population, as well as allow for replication in further studies and implementation into clinical practice.

As the optimal exercise therapy for people with hip-related pain is currently unknown, a clinical focus on impairments related to the disorder, such as reduced hip muscle strength, has been suggested.⁷ Without complete reporting in research trials, the strategies to best address these impairments are unclear. Also, results from trials comparing exercise therapy to other interventions, such as hip arthroscopy, need to be analyzed with completeness of reporting in mind, as exercise therapy may encompass a wide range of treatment strategies.

In the present study, CERT scores were significantly lower (worse) in studies published 2019 or later compared to those published earlier. One reason for this result could be that only six studies were published in the later time frame, whereof three were retrospective. Complete reporting requires thorough planning which is less likely achieved in a retrospective compared to a prospective design. Although the goal of reporting guidelines, such as CERT, is to improve reporting completeness, a recent systematic review using TIDieR found that reporting on physical therapy interventions had not meaningfully improved in a sample of trials from 2000 and 2018.⁴⁸ This, and the fact that no studies in our review referred to CERT in their methods section, indicate of a lack of implementation of guidelines by the research community. In our review, studies with lower risk of bias had significantly higher CERT scores than those with higher risk of bias. While the RoB 2 tool was designed to assess risk of bias in RCTs, the authors used it as a secondary measure for all included studies to provide a broad picture of the risk of bias, although this tool may not be the most appropriate for all study designs. While CERT and the RoB 2 measure different constructs, their association may reflect that a more thoroughly designed and planned study address factors related to risk of bias as well as intervention transparency. Increasing the overall scientific rigor of the published literature by raising awareness and implementation of relevant guidelines, and addressing important aspects of risk of bias, may also affect reporting completeness.

CERT has been suggested to be used as a checklist when planning an exercise therapy protocol, and as a measure of reporting completeness in systematic reviews on exercise therapy.¹⁷ There are some challenges in using CERT in systematic reviews. First, there is no consensus on what is to be considered a good or sufficient score. Charlton et al used a classification of CERT scores based on percentage of items described; high (>75% of items reported), moderate (60-74%) and poor (<60%) levels of reporting standard.¹⁵ However, these values were chosen based on cut-offs from the Downs and Black scale, and not on recommendations

or evaluation of data specific to CERT. Second, the maximum score of 19 was not met by any studies included in the current study or in any of the other reviews using CERT,^{15,16,42-44} apart from one study in the systematic review on hip osteoarthritis.¹⁴ Further research into what constitutes a realistic and relevant score might be needed. Third, the use of a composite overall score may not be appropriate, as some items may be of greater importance to allow replication. For example, the type and goal of exercises performed (for example: isolated hip muscle strength, functional performance), the dosage prescribed (volume, intensity), progression and adherence might be considered the basis of an exercise therapy protocol, with other items providing additional details. Further research on the relative importance of items or domains in the CERT may enhance its interpretability, and potentially lead to weighting of different items.

Strengths of this study include adherence to established guidelines and good agreement between raters. Both raters were experienced in using exercise therapy for hip-related pain, which may be valuable for understanding the nuance of the protocols. Also, the inclusion of a comprehensive description of the exercise therapy protocol content may serve as a summary to researchers and clinicians. There are limitations to the current study. To be included in the CERT synthesis, the inclusion criteria required some form of exercise therapy description. For this reason, most studies (29 of 52) that had used exercise therapy could not be included in the CERT synthesis, due to no description of their intervention. As such, these results may paint an overly positive picture of the state of reporting completeness for this patient population and should be viewed in combination

with the other 29 studies. It should be noted that 25 of the 29 studies not included in the CERT synthesis were surgical studies using exercise therapy as part of post-operative care, highlighting a lack of reporting in these trials.

CONCLUSIONS

Less than half of the studies (23 out of 52) using exercise therapy to treat hip-related pain reported sufficient details to be included in the CERT synthesis. Of the 23 studies included in the synthesis, the median CERT score was 12 (IQR 5-15), with no study reaching the maximum CERT score of 19. Interestingly, studies with less risk of bias had better CERT scores. Furthermore, the publication of CERT did not yield better scores. Taken together this seems to suggest that study rigor may drive better overall exercise intervention reporting. The lack of reporting completeness of exercise therapy protocols makes it difficult to replicate interventions in future research as well as in clinical practice, and to draw conclusions on efficacy and dose-response to such interventions.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

1. Reiman MP, Agricola R, Kemp JL, et al. 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. *Br J Sports Med.* 2020;54(11):631-641. doi:[10.1136/bjsports-2019-101453](https://doi.org/10.1136/bjsports-2019-101453)
2. Kierkegaard S, Langeskov-Christensen M, Lund B, et al. Pain, activities of daily living and sport function at different time points after hip arthroscopy in patients with femoroacetabular impingement: a systematic review with meta-analysis. *Br J Sports Med.* 2017;51(7):572-579. doi:[10.1136/bjsports-2016-096618](https://doi.org/10.1136/bjsports-2016-096618)
3. Babatunde OO, Jordan JL, Van der Windt DA, Hill JC, Foster NE, Protheroe J. Effective treatment options for musculoskeletal pain in primary care: A systematic overview of current evidence. *PLoS One.* 2017;12(6):e0178621. doi:[10.1371/journal.pone.0178621](https://doi.org/10.1371/journal.pone.0178621)
4. Geneen LJ, Moore RA, Clarke C, Martin D, Colvin LA, Smith BH. Physical activity and exercise for chronic pain in adults: an overview of Cochrane Reviews. *Cochrane Database of Systematic Reviews.* 2017;2020(2). doi:[10.1002/14651858.cd011279.pub3](https://doi.org/10.1002/14651858.cd011279.pub3)
5. Lin I, Wiles L, Waller R, et al. What does best practice care for musculoskeletal pain look like? Eleven consistent recommendations from high-quality clinical practice guidelines: systematic review. *Br J Sports Med.* 2020;54(2):79-86. doi:[10.1136/bjsports-2018-099878](https://doi.org/10.1136/bjsports-2018-099878)
6. Griffin DR, Dickenson EJ, O'Donnell J, et al. The Warwick Agreement on femoroacetabular impingement syndrome (FAI syndrome): an international consensus statement. *Br J Sports Med.* 2016;50(19):1169-1176. doi:[10.1136/bjsports-2016-096743](https://doi.org/10.1136/bjsports-2016-096743)
7. Kemp JL, Risberg MA, Mosler A, et al. 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. *Br J Sports Med.* 2020;54(9):504-511. doi:[10.1136/bjsports-2019-101458](https://doi.org/10.1136/bjsports-2019-101458)
8. Kemp JL, Mosler AB, Hart H, et al. Improving function in people with hip-related pain: a systematic review and meta-analysis of physiotherapist-led interventions for hip-related pain. *Br J Sports Med.* 2020;54(23):1382-1394. doi:[10.1136/bjsports-2019-101690](https://doi.org/10.1136/bjsports-2019-101690)
9. Kemp JL, King MG, Barton C, et al. 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. *Br J Sports Med.* 2019;53(19):1204-1205. doi:[10.1136/bjsports-2018-100173](https://doi.org/10.1136/bjsports-2018-100173)
10. Boutron I, Altman DG, Moher D, Schulz KF, Ravaut P, CONSORT NPT Group. CONSORT Statement for Randomized Trials of Nonpharmacologic Treatments: A 2017 Update and a CONSORT Extension for Nonpharmacologic Trial Abstracts. *Ann Intern Med.* 2017;167(1):40-47. doi:[10.7326/m17-0046](https://doi.org/10.7326/m17-0046)
11. Glasziou P, Chalmers I, Altman DG, et al. Taking healthcare interventions from trial to practice. *BMJ.* 2010;341:c3852. doi:[10.1136/bmj.c3852](https://doi.org/10.1136/bmj.c3852)
12. Hoffmann TC, Glasziou PP, Boutron I, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ.* 2014;348:g1687. doi:[10.1136/bmj.g1687](https://doi.org/10.1136/bmj.g1687)
13. Slade SC, Dionne CE, Underwood M, et al. Consensus on Exercise Reporting Template (CERT): Modified Delphi Study. *Phys Ther.* 2016;96(10):1514-1524. doi:[10.2522/ptj.20150668](https://doi.org/10.2522/ptj.20150668)
14. Burgess LC, Wainwright TW, James KA, von Heideken J, Iversen MD. The quality of intervention reporting in trials of therapeutic exercise for hip osteoarthritis: a secondary analysis of a systematic review. *Trials.* 2021;22(1):388. doi:[10.1186/s13063-021-05342-1](https://doi.org/10.1186/s13063-021-05342-1)
15. Charlton PC, Drew MK, Mentiplay BF, Grimaldi A, Clark RA. Exercise Interventions for the Prevention and Treatment of Groin Pain and Injury in Athletes: A Critical and Systematic Review. *Sports Med.* 2017;47(10):2011-2026. doi:[10.1007/s40279-017-0742-y](https://doi.org/10.1007/s40279-017-0742-y)
16. Wright AA, Tarara DT, Gisselman AS, Dischiavi SL. Do currently prescribed exercises reflect contributing pathomechanics associated with femoroacetabular impingement syndrome? A scoping review. *Phys Ther Sport.* 2021;47:127-133. doi:[10.1016/j.ptsp.2020.11.034](https://doi.org/10.1016/j.ptsp.2020.11.034)
17. Slade SC, Dionne CE, Underwood M, Buchbinder R. Consensus on Exercise Reporting Template (CERT): Explanation and Elaboration Statement. *Br J Sports Med.* 2016;50(23):1428-1437. doi:[10.1136/bjsports-2016-096651](https://doi.org/10.1136/bjsports-2016-096651)

18. Higgins JPT, Altman DG, Gøtzsche PC, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ*. 2011;343:d5928. doi:10.1136/bmj.d5928
19. Aoyama M, Ohnishi Y, Utsunomiya H, et al. A Prospective, Randomized, Controlled Trial Comparing Conservative Treatment With Trunk Stabilization Exercise to Standard Hip Muscle Exercise for Treating Femoroacetabular Impingement: A Pilot Study. *Clin J Sport Med*. 2019;29(4):267-275. doi:10.1097/jsm.0000000000000516
20. Casartelli NC, Bizzini M, Maffiuletti NA, et al. Exercise therapy for the management of femoroacetabular impingement syndrome: preliminary results of clinical responsiveness. *Arthritis Care Res (Hoboken)*. 2019;71(8):1074-1083. doi:10.1002/acr.23728
21. Coppack RJ, Bilzon JL, Wills AK, et al. A comparison of multidisciplinary team residential rehabilitation with conventional outpatient care for the treatment of non-arthritic intra-articular hip pain in UK Military personnel – a protocol for a randomised controlled trial. *BMC Musculoskeletal Disord*. 2016;17(1):459. doi:10.1186/s12891-016-1309-z
22. Emara K, Samir W, Motasem EH, Ghafar KAE. Conservative treatment for mild femoroacetabular impingement. *J Orthop Surg (Hong Kong)*. 2011;19(1):41-45. doi:10.1177/230949901101900109
23. Griffin DR, Dickenson 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(10136):2225-2235. doi:10.1016/s0140-6736(18)31202-9
24. Guenther JR, Cochrane CK, Crossley KM, Gilbert MK, Hunt MA. A Pre-Operative Exercise Intervention Can Be Safely Delivered to People with Femoroacetabular Impingement and Improve Clinical and Biomechanical Outcomes. *Physiotherapy Canada*. 2017;69(3):204-211. doi:10.3138/ptc.2016-34
25. Kemp JL, Coburn SL, Jones DM, Crossley KM. The Physiotherapy for Femoroacetabular Impingement Rehabilitation Study (physioFIRST): A Pilot Randomized Controlled Trial. *J Orthop Sports Phys Ther*. 2018;48(4):307-315. doi:10.2519/jospt.2018.7941
26. Kuroda D, Maeyama A, Naito M, et al. Dynamic hip stability, strength and pain before and after hip abductor strengthening exercises for patients with dysplastic hips. *IES*. 2013;21(2):95-100. doi:10.3233/ies-130480
27. Mansell NS, Rhon DI, Meyer J, Slevin JM, Marchant BG. Arthroscopic Surgery or Physical Therapy for Patients With Femoroacetabular Impingement Syndrome: A Randomized Controlled Trial With 2-Year Follow-up. *Am J Sports Med*. 2018;46(6):1306-1314. doi:10.1177/0363546517751912
28. Mortensen L, Schultz J, Elsner A, et al. Progressive resistance training in patients with hip dysplasia: A feasibility study. *J Rehabil Med*. 2018;50(8):751-758. doi:10.2340/16501977-2371
29. Wright AA, Hegedus EJ, Taylor JB, Dischiavi SL, Stubbs AJ. Non-operative management of femoroacetabular impingement: A prospective, randomized controlled clinical trial pilot study. *J Sci Med Sport*. 2016;19(9):716-721. doi:10.1016/j.jsams.2015.11.008
30. Bennell KL, Spiers L, Takla A, et al. Efficacy of adding a physiotherapy rehabilitation programme to arthroscopic management of femoroacetabular impingement syndrome: a randomised controlled trial (FAIR). *BMJ Open*. 2017;7(6):e014658. doi:10.1136/bmjopen-2016-014658
31. Adib F, Johnson AJ, Hennrikus WL, Nasreddine A, Kocher M, Yen YM. Iliopsoas tendonitis after hip arthroscopy: prevalence, risk factors and treatment algorithm. *J Hip Preserv Surg*. 2018;5(4):362-369. doi:10.1093/jhps/hny049
32. Freke MD, Crossley K, Sims K, et al. Acute and Subacute Changes in Hip Strength and Range of Movement After Arthroscopy to Address Chondrolabral Pathology. *Am J Sports Med*. 2019;47(8):1939-1948. doi:10.1177/0363546519850816
33. Fukui K, Briggs KK, Trindade CAC, Philippon MJ. Outcomes After Labral Repair in Patients With Femoroacetabular Impingement and Borderline Dysplasia. *Arthroscopy*. 2015;31(12):2371-2379. doi:10.1016/j.arthro.2015.06.028
34. 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 femoro-acetabular impingement? *J Hip Preserv Surg*. 2017;4(1):85-92. doi:10.1093/jhps/hnw046
35. Riff AJ, Ukwuani G, Clapp I, Movassaghi K, Kelly DM, Nho SJ. High Rate of Return to High-Intensity Interval Training After Arthroscopic Management of Femoroacetabular Impingement Syndrome. *Am J Sports Med*. 2018;46(11):2594-2600. doi:10.1177/0363546518776638

36. Risberg MA, Ageberg E, Nilstad A, et al. Arthroscopic Surgical Procedures Versus Sham Surgery for Patients With Femoroacetabular Impingement and/or Labral Tears: Study Protocol for a Randomized Controlled Trial (HIPARTI) and a Prospective Cohort Study (HARP). *J Orthop Sports Phys Ther.* 2018;48(4):325-335. doi:10.2519/jospt.2018.7931
37. Tijssen M, van Cingel REH, Staal JB, Teerenstra S, de Visser E, Nijhuis-van der Sanden MWG. Physical therapy aimed at self-management versus usual care physical therapy after hip arthroscopy for femoroacetabular impingement: study protocol for a randomized controlled trial. *Trials.* 2016;17(1):91. doi:10.1186/s13063-016-1222-7
38. Amar E, Martin RL, Tudor A, Factor S, Atzmon R, Rath E. Midterm Outcomes and Satisfaction After Hip Arthroscopy Are Associated With Postoperative Rehabilitation Factors. *Orthop J Sports Med.* 2021;9(1):2325967120981888. doi:10.1177/2325967120981888
39. Beck EC, Drager J, Nwachukwu BU, et al. Patients With Borderline Hip Dysplasia Achieve Clinically Significant Improvement After Arthroscopic Femoroacetabular Impingement Surgery: A Case-Control Study With a Minimum 5-Year Follow-up. *Am J Sports Med.* 2020;48(7):1616-1624. doi:10.1177/0363546520916473
40. McGovern RP, Martin RL, Phelps AL, Kivlan BR, Nickel B, Christoforetti JJ. Conservative management acutely improves functional movement and clinical outcomes in patients with pre-arthritis hip pain. *J Hip Preserv Surg.* 2020;7(1):95-102. doi:10.1093/jhps/hnz075
41. Reimer LCU, Jakobsen SS, Mortensen L, et al. Efficacy of periacetabular osteotomy followed by progressive resistance training compared to progressive resistance training as non-surgical treatment in patients with hip dysplasia (PreserveHip) – a protocol for a randomised controlled trial. *BMJ Open.* 2019;9(12):e032782. doi:10.1136/bmjopen-2019-032782
42. Major DH, Røe Y, Grotle M, et al. Content reporting of exercise interventions in rotator cuff disease trials: results from application of the Consensus on Exercise Reporting Template (CERT). *BMJ Open Sport Exerc Med.* 2019;5(1):e000656. doi:10.1136/bmjsem-2019-000656
43. Christensen M, Zellers JA, Kjær IL, Silbernagel KG, Rathleff MS. Resistance Exercises in Early Functional Rehabilitation for Achilles Tendon Ruptures Are Poorly Described: A Scoping Review. *J Orthop Sports Phys Ther.* 2020;50(12):681-690. doi:10.2519/jospt.2020.9463
44. Davidson SRE, Kamper SJ, Haskins R, et al. Exercise interventions for low back pain are poorly reported: a systematic review. *J Clin Epidemiol.* 2021;139:279-286. doi:10.1016/j.jclinepi.2021.05.020
45. Chan DK, Lonsdale C, Ho PY, Yung PS, Chan KM. Patient Motivation and Adherence to Postsurgery Rehabilitation Exercise Recommendations: The Influence of Physiotherapists' Autonomy-Supportive Behaviors. *Arch Phys Med Rehabil.* 2009;90(12):1977-1982. doi:10.1016/j.apmr.2009.05.024
46. Teixeira PJ, Carraça EV, Markland D, Silva MN, Ryan RM. Exercise, physical activity, and self-determination theory: a systematic review. *Int J Behav Nutr Phys Act.* 2012;9(1):78. doi:10.1186/1479-5868-9-78
47. Pålsson A, Kostogiannis I, Ageberg E. Physical impairments in longstanding hip and groin pain: Cross-sectional comparison of patients with hip-related pain or non-hip-related groin pain and healthy controls. *Phys Ther Sport.* 2021;52:224-233. doi:10.1016/j.ptsp.2021.09.011
48. McCambridge AB, Nasser AM, Mehta P, Stubbs PW, Verhagen AP. Has Reporting on Physical Therapy Interventions Improved in 2 Decades? An Analysis of 140 Trials Reporting on 225 Interventions. *J Orthop Sports Phys Ther.* 2021;51(10):503-509. doi:10.2519/jospt.2021.10642

SUPPLEMENTARY MATERIALS

Appendix A

Download: <https://ijspt.scholasticahq.com/article/68069-are-exercise-therapy-protocols-for-the-treatment-of-hip-related-pain-adequately-described-a-systematic-review-of-intervention-descriptions/attachment/135442.docx>

Appendix B

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Appendix C

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