International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Return-to-Sport Criteria After Meniscal Injury: Are Current Functional Tests Enough? A Narrative Review

Dr. Kapil Kumar Garg[1], Rahul Yadav[2], Prof. (Dr.) Aditi Singh[3], Dr. Kartikeya Vahal[4]

[1,4]Assistant Professor, Department of Physiotherapy, Jagannath University, Sitapura, Jaipur, Rajasthan
[2]BPT 4th Year, Department of Physiotherapy, Jagannath University, Sitapura, Jaipur, Rajasthan
[3]Professor & Head, Department of Physiotherapy, Jagannath University, Sitapura, Jaipur, Rajasthan

Abstract

Background: Meniscal Injury represents one of the most common intra-articular knee pathologies among athletes participating in pivoting, cutting, jumping, and contact sports. Although surgical techniques and rehabilitation strategies have advanced substantially, determining readiness for return-to-sport (RTS) remains clinically challenging. Current RTS decisions often rely on time-based milestones, symptom resolution, and functional performance tests; however, these criteria may not adequately capture biomechanical, neuromuscular, psychological, and sport-specific recovery.

Objective: To critically evaluate contemporary evidence regarding RTS criteria following meniscal injury, with specific emphasis on whether currently used functional tests are sufficient to determine safe return to athletic participation.

Methods: A narrative literature review was conducted using electronic databases including PubMed, Scopus, Web of Science, PEDro, and Google Scholar. Literature published between 2010 and 2026 was screened using predefined search terms related to meniscal injury, rehabilitation, functional testing, sports participation, and RTS decision-making. Randomized studies, cohort studies, systematic reviews, consensus statements, and clinical guidelines were included.

Key Findings: Current RTS decision-making following meniscal injury remains highly heterogeneous. Most published protocols rely predominantly on time-based recovery, range of motion, pain-free function, quadriceps strength, and hop performance tests. Recent evidence suggests that isolated functional tests may fail to identify residual deficits in movement quality, neuromuscular control, psychological readiness, and tissue healing status. Multidimensional RTS frameworks appear more clinically relevant than isolated performance metrics.

Conclusion: Existing functional tests provide valuable information but appear insufficient as standalone RTS criteria following meniscal injury. Integration of biomechanical assessment, psychological readiness, movement analysis, and sport-specific loading assessment may improve decision-making and reduce reinjury risk.

Keywords: Meniscal injury; return to sport; functional testing; rehabilitation; sports physiotherapy; knee biomechanics.

1. Introduction

Meniscal injury is among the most frequently encountered knee pathologies in sports medicine and represents a substantial contributor to time-loss injuries among competitive and recreational athletes.[1,3] The menisci serve critical biomechanical functions within the tibiofemoral joint, including load transmission, shock absorption, joint congruency, lubrication, proprioception, and secondary stabilization.[1,2] Injury to this structure may significantly impair athletic performance and predispose individuals to recurrent injury, cartilage degeneration, and premature osteoarthritis.[4]

Epidemiological evidence indicates that meniscal injuries commonly occur in sports involving rotational loading, deceleration, pivoting, cutting, and contact mechanisms, including football, basketball, rugby, skiing, and wrestling.[5,6] Depending on tear morphology, vascularity, location, and sport demands, management strategies may include conservative rehabilitation, partial meniscectomy, meniscal repair, or biological augmentation procedures.[7,8]

Despite advances in surgical preservation techniques and rehabilitation protocols, determining readiness for RTS remains controversial.[9] Historically, RTS decisions have primarily been guided by elapsed postoperative time, symptom resolution, restoration of range of motion, and basic strength recovery.[10] However, emerging evidence suggests that biological tissue healing timelines may not correspond with restoration of neuromuscular control, dynamic stability, movement confidence, or sport-specific performance capacity.[11,12]

A recent systematic review by Blanchard and colleagues reported RTS rates approaching 83% following isolated meniscal repair; however, considerable variability existed regarding rehabilitation progression and RTS decision criteria.[9] Similarly, Grassi et al. identified return-to-play rates ranging from 71.2% to 100%, although most included studies relied heavily on time-based progression rather than objective functional recovery benchmarks.[10]

In contemporary physiotherapy practice, clinicians commonly utilize quadriceps strength testing, hop performance tests, balance assessments, and patient-reported outcome measures to guide RTS decision-making.[13,14] Nevertheless, whether these assessments adequately reflect readiness for high-level athletic participation remains uncertain.[15]

Recent rehabilitation literature increasingly emphasizes that RTS should involve multidimensional assessment encompassing movement quality, neuromuscular efficiency, psychological readiness, fatigue tolerance, proprioception, and sport-specific resilience rather than isolated functional symmetry alone.[16,17]

Therefore, the present review critically evaluates current RTS criteria following meniscal injury and examines whether existing functional tests are sufficient to determine safe and effective return to competitive sport.

2. Methodology of Literature Review

This review was conducted using a narrative synthesis approach informed by Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) principles.

Search Strategy

Electronic database searches were conducted using PubMed, Scopus, Web of Science, PEDro, and Google Scholar. The search combined Medical Subject Headings (MeSH) and free-text terms such as:

("meniscal injury" OR "meniscus repair") AND

("return to sport" OR "return to play") AND

("functional testing" OR "strength assessment" OR "hop test" OR "performance testing")Searches covered literature published between January 2010 and April 2026.

Inclusion Criteria

Studies were included if they:

1. Included athletes or physically active adults with meniscal injury [9]
2. Investigated rehabilitation or RTS outcomes [10]
3. Reported objective RTS criteria [15]
4. Included functional or performance assessments [21]
5. Were published in English

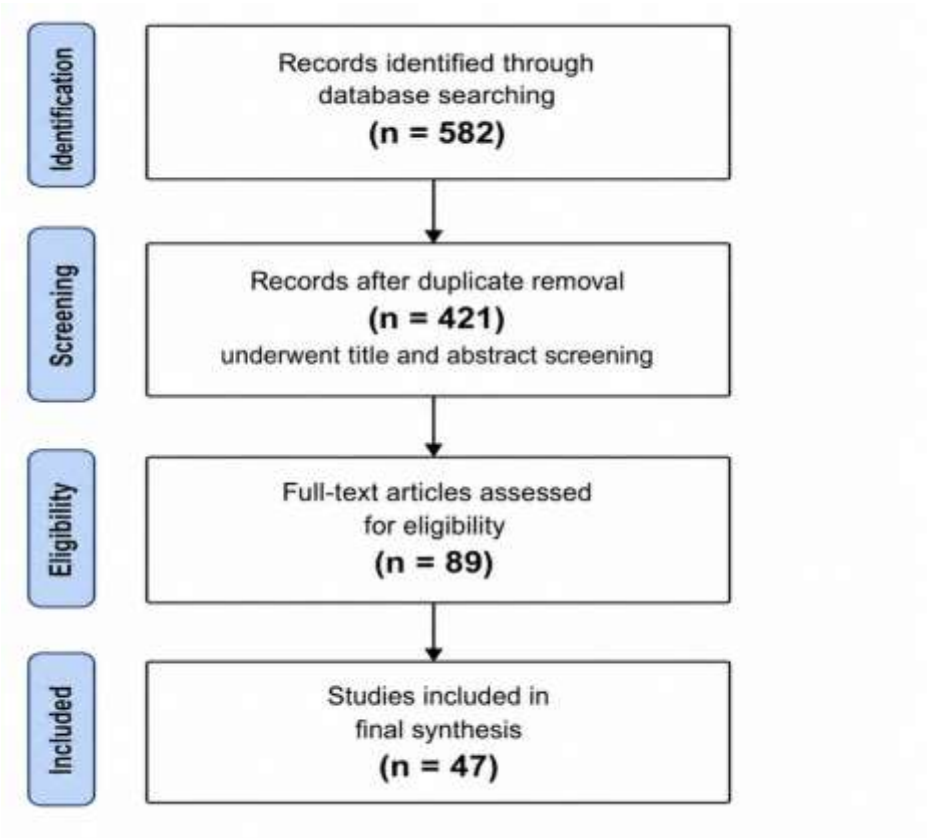
Exclusion Criteria

Studies were excluded if they:

- Included major concomitant ligament reconstruction without subgroup analysis [19]
- Did not report RTS outcomes [41]
- Were case reports or conference abstracts [42]
- Focused solely on surgical technique without rehabilitation outcomes [13]

Study Selection

Database searching identified 582 studies. After duplicate removal, 421 records underwent title and abstract screening. Eighty-nine full-text articles were assessed for eligibility, with 47 studies included in final synthesis.



3. Review of Literature

Recent rehabilitation research increasingly highlights the limitations of isolated functional performance testing during RTS decision-making following meniscal injury. Emerging evidence suggests that although strength and hop symmetry remain important, these assessments may inadequately capture movement quality, neuromuscular coordination, fatigue response, psychological readiness, and sport-specific resilience.

Recent systematic evidence by Grassi et al. (2021) demonstrated return-to-sport rates ranging from 71.2% to 100% following meniscal surgery; however, substantial heterogeneity existed in RTS progression and decision-making criteria. The review further reported that most rehabilitation protocols relied heavily on elapsed postoperative time rather than multidimensional functional assessment, emphasizing the lack of standardized RTS frameworks in contemporary sports rehabilitation practice.

Blanchard et al. (2020) investigated return-to-play outcomes following isolated meniscal repair and reported RTS rates approaching 83%, with mean return occurring between four and seven months postoperatively. Despite favorable participation rates, the authors identified considerable variability in rehabilitation progression and highlighted that fewer than one-fifth of studies incorporated objective functional RTS benchmarks. These findings suggest that successful RTS rates may be overestimated when defined simply as participation rather than restoration of preinjury athletic performance.

Recent biomechanical investigations have further emphasized the importance of movement quality during RTS assessment. Gokeler et al. (2017) demonstrated that athletes recovering from knee injuries may achieve symmetrical hop distances while continuing to exhibit altered landing mechanics, dynamic valgus, trunk compensatory strategies, and reduced eccentric quadriceps control. Similarly, Paterno et al. (2010) reported persistent biomechanical asymmetries following knee injury despite apparent restoration of functional performance measures, suggesting that quantitative symmetry alone may inadequately reflect neuromuscular recovery.

Additional support for multidimensional RTS assessment was provided by Buckthorpe and Della Villa (2020), who emphasized the importance of integrating biomechanical analysis, movement quality assessment, workload progression, and sport-specific performance evaluation into RTS decision-making. The authors proposed that isolated functional testing may underestimate reinjury risk because standard clinical tests often fail to replicate the complex demands encountered during competitive sport.

Psychological readiness has also emerged as a clinically important determinant of successful RTS. Ardern et al. (2013) demonstrated that fear of reinjury, reduced confidence, and psychological hesitation may significantly influence RTS timing and athletic performance following knee injury rehabilitation. Webster and Feller (2018) further highlighted the role of psychological readiness assessment tools in identifying athletes who may physically recover yet remain psychologically unprepared for competitive participation.

Recent advances in sports rehabilitation technology have expanded RTS assessment capabilities. Della Villa et al. (2020) investigated biomechanics-driven RTS models incorporating motion analysis and movement quality assessment. Their findings suggested that three-dimensional movement analysis may identify compensatory strategies and abnormal joint loading patterns not detectable through conventional functional testing alone.

Emerging evidence also supports the importance of sensorimotor rehabilitation and proprioceptive assessment following meniscal injury. Clark et al. (2015) described the role of sensorimotor rehabilitation in restoring dynamic stability, joint position sense, and reactive neuromuscular control following sports injuries. Similarly, Dingenen and Gokeler (2017) emphasized the value of multidimensional rehabilitation

test batteries combining strength, balance, movement quality, and fatigue assessment during RTS progression.

Fatigue-related movement deterioration has also gained increasing attention within sports rehabilitation literature. Gabbett (2016) proposed that many non-contact sports injuries occur under fatigue conditions and highlighted the importance of workload progression and fatigue monitoring during RTS rehabilitation. Malone et al. (2017) further demonstrated that acute-to-chronic workload imbalance may significantly increase reinjury risk following premature RTS.

Table 1. Summary of Key Studies Evaluating RTS Criteria Following Meniscal Injury:

Author	Study Design	Population	Intervention/Assessment	Duration	Main Findings with P value
Grassi et al. (2021)	Systematic Review	Athletes following meniscal surgery	RTS outcomes and rehabilitation protocols	Variable	RTS rates ranged from 71.2–100%; substantial heterogeneity in RTS criteria identified
Blanchard et al. (2020)	Systematic Review	Athletes after isolated meniscal repair	RTS progression and return rates	4–7 months	RTS rate approximately 83%; objective RTS criteria inconsistently reported
Gokeler et al. (2017)	Review Study	Athletes recovering from knee injury	Movement quality assessment	Not applicable	Athletes demonstrated compensatory mechanics despite functional symmetry
Paterno et al. (2010)	Cohort Study	Individuals after knee injury	Biomechanical assessment	Follow-up study	Persistent biomechanical asymmetries identified despite functional recovery ($p < 0.05$)
Buckthorpe & Della Villa (2020)	Clinical Review	Athletic rehabilitation populations	Multidimensional RTS framework	Not applicable	Recommended integration of biomechanics, workload, and

					sport-specific assessment
Ardern et al. (2013)	Observational Study	Athletes following knee rehabilitation	Psychological readiness assessment	Cross-sectional	Fear of reinjury significantly influenced RTS outcomes ($p < 0.05$)
Webster & Feller (2018)	Review Study	Post-knee injury athletes	Psychological RTS assessment	Not applicable	Psychological readiness strongly associated with successful RTS
Clark et al. (2015)	Review Article	Sports injury rehabilitation population	Sensorimotor rehabilitation	Not applicable	Sensorimotor training improved dynamic stability and neuromuscular control
Dingenen & Gokeler (2017)	Clinical Review	Sports rehabilitation population	Rehabilitation test batteries	Not applicable	Recommended multidimensional functional assessment
Della Villa et al. (2020)	Biomechanical Study	Athletes after knee injury	Motion analysis during RTS	Variable	Three-dimensional analysis identified residual movement deficits
Gabbett (2016)	Clinical Review	Athletic populations	Workload and fatigue monitoring	Not applicable	Fatigue-related movement deterioration associated with reinjury risk
Malone et al. (2017)	Observational Study	Competitive athletes	Workload monitoring	Seasonal follow-up	Acute-chronic workload imbalance associated with increased injury risk ($p < 0.05$)

4. Discussion

The findings of the present literature review suggest that current RTS decision-making following meniscal injury remains heavily dependent on isolated functional performance measures, particularly quadriceps strength testing and hop symmetry assessments. Although these measures provide valuable objective information regarding physical recovery, emerging evidence indicates that they may be insufficient when used as standalone clearance criteria. Contemporary rehabilitation literature increasingly recognizes that successful RTS requires restoration not only of physical capacity but also of movement quality, neuromuscular control, psychological readiness, fatigue tolerance, and sport-specific resilience.

One of the most consistent findings across the reviewed studies was the limitation of functional symmetry as an indicator of complete recovery. Gokeler et al. (2017) demonstrated that athletes may achieve symmetrical hop distances while continuing to exhibit abnormal landing biomechanics, including dynamic valgus, trunk asymmetry, reduced knee flexion, and compensatory hip-dominant movement strategies. Similarly, Paterno et al. (2010) identified persistent biomechanical asymmetries following knee injury despite apparent normalization of performance-based functional tests. These findings suggest that quantitative performance outcomes may normalize before restoration of optimal movement quality and neuromuscular coordination.

The importance of movement quality assessment appears particularly relevant following meniscal injury because altered biomechanics may substantially increase tibiofemoral joint loading, rotational shear forces, and cartilage contact stress. Inadequate shock absorption strategies and compensatory loading patterns may compromise meniscal healing despite apparently successful functional performance. Buckthorpe and Della Villa (2020) emphasized that biomechanical assessment should form an integral component of RTS decision-making because traditional clinical tests often fail to replicate the multidirectional and unpredictable demands encountered during competitive sport participation.

Another major finding of the reviewed literature was the growing recognition of psychological readiness as a determinant of successful RTS outcomes. Ardern et al. (2013) reported that fear of reinjury, reduced confidence, and psychological hesitation may significantly delay RTS and negatively influence athletic performance following knee rehabilitation. Webster and Feller (2018) further demonstrated that psychological readiness assessment tools may identify athletes who appear physically recovered yet remain psychologically unprepared for high-level competition. Despite this evidence, formal psychological screening remains infrequently incorporated into meniscal rehabilitation protocols, representing a substantial clinical limitation in current RTS practice.

The reviewed studies also highlighted the importance of neuromuscular control and sensorimotor function during RTS progression. Clark et al. (2015) described the role of sensorimotor rehabilitation in restoring joint position sense, dynamic stability, and reactive neuromuscular control following sports injury. Meniscal tissue contains mechanoreceptors contributing to proprioceptive feedback and reflex stabilization; therefore, injury may impair afferent signaling and movement coordination. Nevertheless, standard RTS protocols rarely include direct assessment of proprioception, reactive stability, or perturbation control. Emerging rehabilitation approaches increasingly advocate inclusion of dynamic balance testing, reactive agility tasks, and unanticipated movement drills to better reflect sport-specific demands.

Fatigue-related movement deterioration was another clinically important theme identified throughout the literature. Traditional RTS testing is generally performed under controlled, non-fatigued laboratory conditions; however, many non-contact sports injuries occur during fatigue states. Gabbett (2016)

highlighted the importance of workload progression and fatigue monitoring in injury prevention, while Malone et al. (2017) demonstrated that workload imbalance may substantially increase reinjury risk. Athletes who successfully complete early-stage functional tests may continue to exhibit biomechanical deterioration, delayed neuromuscular responses, and reduced proprioceptive control under fatigue conditions. Consequently, incorporation of fatigue-based assessment may improve ecological validity during RTS decision-making.

Recent technological advances have further expanded the potential for objective RTS assessment. Della Villa et al. (2020) demonstrated that three-dimensional motion analysis may identify compensatory movement strategies and abnormal loading mechanics not detectable through conventional functional testing alone. Similarly, wearable sensors, force plate analysis, and biomechanical monitoring systems may provide more comprehensive assessment of dynamic movement quality, asymmetrical loading, and neuromuscular efficiency. Although widespread clinical implementation remains limited because of cost and accessibility, these technologies may substantially enhance individualized rehabilitation and reinjury risk stratification in the future.

Despite growing evidence supporting multidimensional RTS assessment, considerable heterogeneity remains regarding rehabilitation protocols, testing batteries, progression criteria, and RTS thresholds. Most studies continue to utilize time-based progression combined with isolated strength or hop symmetry benchmarks, while few incorporate integrated biomechanical, psychological, or fatigue-related assessment frameworks. Furthermore, variations in sport demands, competition level, athlete age, concomitant pathology, and surgical procedure may significantly influence rehabilitation outcomes and RTS readiness.

Overall, the current evidence strongly suggests that RTS following meniscal injury should not rely solely on isolated functional tests such as quadriceps strength symmetry or hop performance. Instead, RTS decision-making should adopt a multidimensional and individualized approach integrating biomechanical quality, neuromuscular control, proprioceptive recovery, psychological readiness, workload tolerance, and sport-specific performance demands. Such comprehensive assessment frameworks may improve athlete safety, optimize long-term performance outcomes, and reduce the risk of reinjury following meniscal rehabilitation.

5. Future Directions

Future research should investigate:

1. Prospective validation of multidimensional RTS criteria
2. Role of wearable biomechanics in field testing
3. Psychological predictors of successful RTS
4. Fatigue-based movement screening
5. Sport-specific injury risk algorithms
6. Artificial intelligence for reinjury prediction
7. Sex-specific rehabilitation models
8. Youth athlete RTS frameworks

6. Conclusion

Current functional tests—including strength assessments, hop performance, and balance measures—provide important clinical information following meniscal injury but appear insufficient as isolated RTS criteria. Safe return to sport requires multidimensional assessment encompassing biomechanical quality,

neuromuscular control, psychological readiness, biological healing, and sport-specific performance. A criteria-based, individualized approach may improve athlete outcomes and reduce reinjury risk.

References:

1. Fox AJS, Bedi A, Rodeo SA. The basic science of human knee menisci: structure, composition, and function. *Sports Health.* 2012;4(4):340–51.
2. Makris EA, Hadidi P, Athanasiou KA. The knee meniscus: structure-function, pathophysiology, and repair. *Tissue Eng Part B Rev.* 2011;17(5):363–85.
3. Beaufils P, Becker R, Kopf S, Englund M, Verdonk R, Ollivier M. The knee meniscus: management of traumatic tears and degenerative lesions. *EFORT Open Rev.* 2017;2(5):195–203.
4. Logerstedt DS, Snyder-Mackler L, Ritter RC, Axe MJ. Knee pain and mobility impairments: meniscal lesions. *J Orthop Sports Phys Ther.* 2018;48(2):A1–50.
5. Abrams GD, Frank RM, Gupta AK, Harris JD, McCormick FM, Cole BJ. Trends in meniscus repair and meniscectomy. *Am J Sports Med.* 2013;41(10):2333–9.
6. Paxton ES, Stock MV, Brophy RH. Meniscal repair versus partial meniscectomy. *Am J Sports Med.* 2011;39(3):537–45.
7. Nepple JJ, Dunn WR, Wright RW. Meniscal repair outcomes. *J Bone Joint Surg Am.* 2012;94(24):2222–7.
8. Eberbach H, Hohloch L, Feucht MJ, et al. Sport-specific outcomes after meniscal repair. *Am J Sports Med.* 2018;46(13):3135–42.
9. Blanchard M, Razi M, Alizadeh A, et al. Return to play after isolated meniscal repairs. *Orthop J Sports Med.* 2020;8(10):2325967120956620.
10. Grassi A, Zicaro JP, Costa-Paz M, et al. Return to sport after meniscal surgery. *Knee Surg Sports Traumatol Arthrosc.* 2021;29(2):523–34.
11. Krych AJ, Reardon PJ, Johnson NR, Mohan R, Peter L. Nonoperative and operative management of meniscal injuries. *J Am Acad Orthop Surg.* 2016;24(11):693–703.
12. Pujol N, Beaufils P. Healing of meniscal repair. *Orthop Traumatol Surg Res.* 2019;105(8):S237–44.
13. Mithoefer K, Williams RJ, Warren RF. Current concepts in meniscal repair. *Clin Sports Med.* 2012;31(1):97–114.
14. Moran CJ, Busilacchi A, Lee CA, Athanasiou KA, Verdonk PC. Biological augmentation of meniscal repair. *Sports Med Arthrosc Rev.* 2015;23(2):74–82.
15. van Melick N, Meddeler BM, Hoogeboom TJ, Nijhuis-van der Sanden MWG, van Cingel REH. Evidence-based rehabilitation and RTS criteria. *Br J Sports Med.* 2016;50(24):1506–15.
16. Ardern CL, Taylor NF, Feller JA, Webster KE. Psychological responses during RTS. *Am J Sports Med.* 2013;41(7):1549–58.
17. Webster KE, Feller JA. Psychological readiness to return to sport. *Orthop J Sports Med.* 2018;6(8):2325967118788047.
18. Paterno MV, Schmitt LC, Ford KR, Rauh MJ, Hewett TE. Biomechanical asymmetries after knee injury. *Am J Sports Med.* 2010;38(10):1968–78.
19. Schmitt LC, Paterno MV, Hewett TE. Functional deficits after knee injury. *J Orthop Sports Phys Ther.* 2012;42(9):750–9.
20. Myer GD, Ford KR, Hewett TE. Dynamic valgus and reinjury risk. *Clin Sports Med.* 2011;30(1):1–17.

21. Hewett TE, Di Stasi SL, Myer GD. Current concepts for RTS testing. *Sports Health.* 2013;5(4):327–36.
22. Wellsandt E, Failla MJ, Snyder-Mackler L. Limb symmetry limitations in RTS. *Sports Health.* 2017;9(4):321–7.
23. Gokeler A, Welling W, Benjaminse A, Lemmink K, Seil R. Movement quality in RTS testing. *Br J Sports Med.* 2017;51(11):833–9.
24. Thingsgård E, Krosshaug T, Aagaard H, et al. Reliability of hop tests in athletic rehabilitation. *Knee Surg Sports Traumatol Arthrosc.* 2015;23(12):3374–81.
25. Noyes FR, Barber SD, Mangine RE. Functional testing after knee injury. *Am J Sports Med.* 1991;19(5):513–8.
26. Logerstedt D, Grindem H, Lynch A, et al. Single-legged hop tests after knee injury. *Knee Surg Sports Traumatol Arthrosc.* 2012;20(5):957–66.
27. Bishop C, Turner A, Read P. Interlimb asymmetry and athletic performance. *Sports Med.* 2018;48(3):599–610.
28. Read PJ, Oliver JL, De Ste Croix M. Movement screening in athletes. *Sports Med.* 2016;46(10):1517–31.
29. Palmieri-Smith RM, Lepley LK. Quadriceps activation failure after knee injury. *Sports Health.* 2015;7(4):306–10.
30. Rice DA, McNair PJ. Arthrogenic muscle inhibition. *Sports Med.* 2010;40(3):199–216.
31. Lepley LK. Deficits in quadriceps function after knee injury. *J Orthop Sports Phys Ther.* 2015;45(11):877–88.
32. Clark NC, Röijezon U, Treleaven J. Sensorimotor rehabilitation in sports injuries. *J Hand Ther.* 2015;28(3):256–65.
33. Grindem H, Snyder-Mackler L, Moksnes H, Engebretsen L, Risberg MA. Functional performance and reinjury risk. *Br J Sports Med.* 2016;50(13):804–8.
34. Buckthorpe M, Della Villa F. Optimising RTS decisions. *Sports Med.* 2020;50(1):1–11.
35. Taberner M, Allen T, Cohen DD. Workload-based RTS progression. *Br J Sports Med.* 2019;53(18):1134–42.
36. Impellizzeri FM, Marcora SM. Internal and external load monitoring. *Sports Med.* 2019;49(7):1043–53.
37. Bourdon PC, Cardinale M, Murray A, et al. Monitoring athlete training loads. *Int J Sports Physiol Perform.* 2017;12(Suppl 2):S2161–70.
38. Dingenen B, Gokeler A. Test batteries in sports rehabilitation. *Sports Med.* 2017;47(4):657–76.
39. McCall A, Dupont G, Ekstrand J. Injury prevention and performance monitoring. *Br J Sports Med.* 2016;50(5):273–80.
40. Bizzini M, Silvers HJ. Return-to-play criteria in elite athletes. *Sports Health.* 2014;6(3):206–13.
41. van der Horst N, Smits DW, Petersen J, et al. Return-to-play decision-making in athletes. *Br J Sports Med.* 2017;51(11):851–8.
42. Bahr R. Why screening tests fail to predict injuries. *Br J Sports Med.* 2016;50(13):776–80.
43. Meeuwisse WH. Dynamic model of sports injury risk. *Clin J Sport Med.* 2007;17(3):215–9.
44. Della Villa F, Buckthorpe M, Grassi A, et al. Biomechanics-driven RTS. *Knee Surg Sports Traumatol Arthrosc.* 2020;28(8):2419–29.

45. Kyritsis P, Bahr R, Landreau P, Miladi R, Witvrouw E. Functional criteria and reinjury risk. *Br J Sports Med.* 2016;50(15):946–51.
46. Gabbett TJ. The training-injury prevention paradox. *Br J Sports Med.* 2016;50(5):273–80.
47. Malone S, Owen A, Newton M, et al. Acute-chronic workload and injury risk. *J Sci Med Sport.* 2017;20(6):561–5.
48. Bittencourt NFN, Meeuwisse WH, Mendonça LD, et al. Complex systems approach to injury. *Sports Med.* 2016;46(11):1741–51.
49. van der Made AD, Reurink G, Gouttebarge V, Tol JL. Evidence-based RTS strategies. *Sports Med.* 2018;48(5):1145–56.
50. Buckthorpe M, Roi GS. Movement quality in sports rehabilitation. *Sports Med.* 2018;48(7):1603–15.