

ANKLE & FOOT: RETURN TO SPORT

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OBJECTIVES

- Understand the prevalence of ankle injuries in sport
- Recognize lack of consensus on established RTS criteria and testing for foot and ankle
- Understand the current ankle RTS evidence in literature, agreed upon vs. not
- Understand future research needed with research proposal

FOOT/ANKLE INJURIES

- Sprain
- Syndesmosis injury
- Stress fracture
- Fracture
- Achilles
- Plantar fasciitis

PREVALENCE¹⁻⁴

- Sprains are most common injury in sport¹
- Account for about 10% of emergency room visits²
- Lateral ankle sprains account for excess of \$1.1 billion in charges from ED in the US⁴
- Steadily increasing over the past 30 years³

PREVALENCE⁵⁻⁸

- Lateral ankle sprain highest reoccurrence of MSK injuries⁵
- Between 19% and 72% of patient with previous sprain suffer another⁶
- At least 40% of injured individuals develop Chronic Ankle Instability (CAI)⁷
 - CAI causes residual symptoms including⁸
 - Feelings of giving way/instability
 - Repeated ankle sprains
 - Persistent weakness
 - Pain with activity
 - Self reported disability

BACKGROUND

- Current lack of consensus on RTS criteria with ankle injuries in the literature and in practice

CURRENT LITERATURE

1. Ritchie & Izadi⁹
2. Clanton et al¹⁰
3. Wikstrom et al¹¹
4. Tassignon et al¹²

RITCHIE & IZADI⁹

- Outcome measure
 - Sports Ankle Rating System
 - Functional Ankle Disability Index
 - Foot and Ankle Ability Measure
 - Lower Extremity Function Score
- Manual Tests for stability
 - Anterior Drawer
 - Talar tilt

RITCHIE & IZADI⁹

- Functional testing (80% of contralateral)
 - Single leg hop for distance
 - Shuttle run
 - Side hop
 - Up and down hop
 - Modified Romberg
 - Start Excursion Balance Test
 - Heel Rocker Test

RITCHIE & IZADI⁹

- Orthoses
 - Revealed positive effects for treatment of ankle sprains
 - Custom and prefabricated equal
- Bracing
 - “Mandatory” in treatment of ankle sprains for return to play
 - Support prophylactic ankle bracing in athletes returning to sport after sprain

CLANTON ET AL¹⁰

- ROM
 - Dorsiflexion Lunge Test
- Balance and Proprioception
 - Star Excursion Balance Test
- Agility
 - Agility T-Test
- Strength
 - Vertical Jump Test

CLANTON ET AL¹⁰

- Psychological Factors
 - Up to 19% athletes experience physiological stress following injury
 - Increases risk of athletic injury
 - Loss of confidence, fear and anxiety
 - Trait Sport Confidence Inventory

WIKSTROM ET AL¹¹

- Hop test
 - Partial agreement
 - Little consistency for which test
- Static Balance
 - Partial agreement
 - Single leg balance more recommended
- Dynamic
 - Minority of papers
 - Star Excursion Balance Test
- 80% to contralateral limb
 - Only 2 papers provided this as threshold

WIKSTROM ET AL¹¹

- Pain and swelling should be tested
 - Partial agreement
 - No specifics or consistency
- Subjective assessments
 - Partial agreement
- Range of motion
 - No consistency
- Strength
 - No consistency

Table 2 Return-to-Sport Criteria From the 11 Published Expert Opinion Papers Included in This Investigation

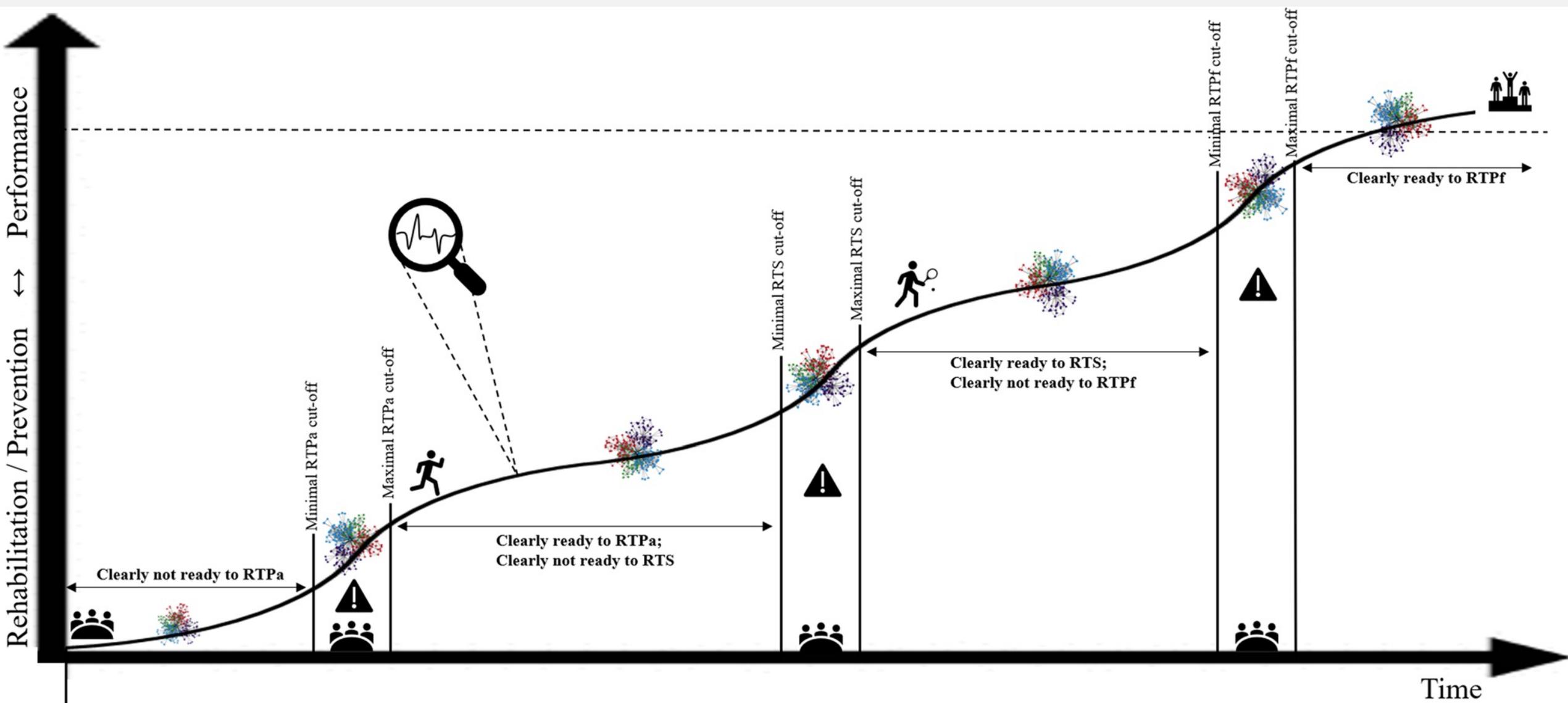
Domain (percent agreement)	Assessment techniques	Criterion thresholds
Pain/swelling ^{27-29,31,34,37} (54.5%)	Pain Ability to bear weight ²⁸ Visual analog scale ³¹ Foot and ankle ability index ³⁷ Numeric pain scale ³⁷ Swelling Limb girth ³¹	Free of pain and swelling ³⁴ Pain and swelling reductions from time of injury ²⁷ No more than minimal levels of pain and swelling present ²⁹
ROM ^{29-31,33,35,37} (54.5%)	Dorsiflexion Heel Rocker Test ³⁵ Goniometric ^{31,37} Weight-bearing lunge test ^{30,31,37}	10 successive heel rockers ³⁵ Full range of motion ^{29,33}
Strength ^{27,29-31,33,37} (54.5%)	Manual muscle testing ²⁹ Handheld dynamometry ³⁷ Sargent/vertical jump testing ³⁰ Standing jump ³¹ Calf raises until fatigue ³¹	A return to normal strength ²⁷ 90% of uninjured limb strength ^{29,33}
Static balance ^{27,29,31,34-37} (63.6%)	Single-leg balance test ^{29,34,36,37} Modified Romberg test with eyes closed ³⁵ On a force platform ³¹ Balance error scoring system ³⁷	Ability to balance without pain ²⁹ Maintain single-limb stance for 10 s ³⁶ Sway amount equal to the uninjured ²⁷
Dynamic balance ^{29,30,32,35,37} (45.5%)	Star Excursion Balance Test ^{29,30,32,35,37} Y-Balance Test ³⁰	Compare with the uninjured limb ³⁵ 80% of uninjured limb reach ³² Ability to complete Star Excursion Balance Test with little to no pain ²⁹
Running ^{27,28,33,37} (36.4%)	Complete a return to run program ²⁷ Running technique ³⁷	Little to no pain while running ²⁷ Run at max speed without pain ³³
Sport-specific movement ^{27-33,35-37} (90.9%)	Lateral hopping ^{29,35} Vertical hopping ^{29,35} Shuttle run ^{29,35} Sport-specific test ^{27,31} Jumping and cutting ²⁸ Agility T test ^{29,30} Single-leg hop ^{29,36} Walk and tiptoe ³⁶	80% of the uninjured leg amount ^{32,35} Little to no pain while completing the test ^{27,29,33} Consistent T-test times between 8.9 and 13.5 s ³⁰ Speed and quality movement during sport-specific test ³¹ Ability to take 3 steps and return ³⁶ Ability to complete 6 hops ³⁶
Patient reported outcomes ^{29-32,35,37} (54.5%)	Foot and ankle ability measure ^{27,37} Lower-extremity function scale ²⁷ Lower limb task questionnaire ³⁰ Trait sport confidence inventory Injury-psychological readiness to return sport scale ^{33,37}	Athlete feels confident ³² The athlete is ready to return ³⁴

TASSIGNON ET AL¹²

- Clinical Assessment
 - Swelling
 - Ligamentous laxity
 - ROM
- Performance Testing
 - Proprioception
 - Hopping and jumping
 - ROM
 - Balance
 - Agility/speed
 - Strength

TASSIGNON ET AL¹²

- Time based protocols vs. testing
 - Argue against time based
- Varying Levels
 - RTPa: Return to Participation
 - RTS: Return to Sport
 - RTPf: Return to Performance



-  = Injury: start of the road to recovery: rehabilitation + clinical assessment (gathering information on the initial state of the system)
-  = Patient's progress: no constant increase. Some day-to-day variability in the patient's RTS process exists
-  = Shared decision-making: athlete, medical staff, coaching staff

-  = Dynamic RTS profile
-  = Phase-transition zone; considerable uncertainty arises when the team needs to decide on allowing the athlete to the next phase
- = Performance level prior to injury

TASSIGNON ET AL¹²

- Future areas needed
 - Sport Specific movements
 - Sensorimotor deficits with appropriate testing
 - Static
 - Dynamic
 - Reactive
 - Endurance testing
 - Psychological
 - Fear avoidance



STUDY PROPOSAL

RESEARCH QUESTION

- In the literature, is there a cluster of return to sport functional tests and criteria to minimize the chance of repeat foot and ankle injury?

HYPOTHESIS

- There is not current agreement upon testing procedures, appropriate set of criteria and areas in which to access, in conjunction with clinical reasoning to safely integrate individuals back to sport.

HYPOTHESIS EXPLANATION

- Currently fair agreement on domains
- Lack of agreement on individual testing
- Multiple different protocols currently proposed
- Similar concepts to ACLR RTS
 - LE kinematics involve ankle as well
 - Different domains to look at

SUBJECTS

- Inclusion Criteria

- Ankle sprain in previous 3 month
- High school age athletes
- Returning to sport/activity
- Receiving physical therapy for injury

- Exclusion Criteria

- Previous ankle surgery on involved side
- Concurrent foot/ankle pathologies

STUDY DESIGN

- Randomized control trial
- 50 subjects
 - 25 control
 - 25 experimental
- Experimental:
 - Combined cluster criteria
 - Clinical judgement
 - Subjective outcome
- Control:
 - Current literature criteria
 - Clinical judgement
 - Subjective outcome

EXPERIMENTAL PROTOCOL⁹⁻¹²

- Ligamentous laxity
 - Anterior drawer
- Static balance
 - Modified Romberg with EC
- Dynamic Balance
 - Star balance excursion test
- ROM
 - Dorsiflexion lunge
- Strength
 - Calf raises to fatigue
- Sport Specific
 - Single leg hop test
 - Forward
 - Lateral
- Agility
 - Shuttle run

EXPERIMENTAL PROTOCOL⁹⁻¹²

- Psychological
 - Fear Avoidance Belief Questionnaire
- Bracing in Return to Sport and Performance
 - Anticipation of working out of brace once well into RTPf

PROTOCOL

- Following bout of PT when returning to activity, functional testing administered
 - How many meet criteria of within 80% or more of uninjured
 - If met, cleared for return to sport
- What percent in 2 year follow up have recurrent ankle sprain?
 - Is it less than 20%?
 - Improvement than current literature

STATS

- Two-way ANOVA
- P values < 0.05
- 95% confidence interval

ANTICIPATED RESULTS

- The new proposed experimental criterion, addressing all areas in which the individual should be tested before returning to play, along with clinical experience and subjective information will cause lower reinjury rates than criterion in the current literature.

LIMITATIONS

- Varying levels of contact, cutting and intensity of sports
- Unblinded researchers due to running testing
- Some overlap between current literature and new testing
- Potential lack of patient follow up
- Patient motivation and participation in PT
- Inability to access and quantify muscular fatigue levels that may be contributing to re-injury
 - Area needed in further research
- More literature on ankle vs. foot injuries with RTS

REFERENCES

1. Ferran NA, Maffulli N. Ferran NA, Maffulli N. Epidemiology of sprains of the lateral ankle ligament complex. *Foot Ankle Clin* 2006;11(3):659–62. *Foot Ankle Clin*. 2006;11(3):659-662.
2. Kannus P, Renstrom P. Current concepts review: treatment for acute tears of the lateral ligaments of the ankle. *J Bone Joint Surg Am*. 1991;73:305-312.
3. Birrer RB, Fani-Salek MH, Totten VY. Managing ankle injuries in the emergency department. *Emerg Med J*. 1999;17:651-660.
4. Shah S, Thomas AC, Noone JM, Blanchette CM, Wickstrom EA. Incidence and cost of ankle sprains in the United States emergency departments. *Sports Health*. 2016;8(6):547-552.
5. Gribble PA, Bleakley CM, Caulfield BM. Evidence review for the 2016 international ankle consortium consensus statement on the prevalence, impact, and long-term consequences of lateral ankle sprains. *Br J Sport Med*. 2016;50(24):1496–1505. *Br J Sports Med*. 2016;50(24):1496-1505.
6. Yeung MS, Chan KM, So CH. An epidemiological survey on ankle sprain. *Br J Sports Med*. 1994;28:112-116.
7. Doherty C, Bleakley C, Hertel J, Caulfield B, Ryan L, Delahunt E. Recovery from a first-time lateral ankle sprain and the predictors of chronic ankle instability: a prospective cohort analysis. *Am J Sports Med*. 2016;44(4):995-1003.
8. Delahunt E, Coughlan GF, Caulfield B. Inclusion criteria when investigating insufficiencies in chronic ankle instability. *Med Sci Sports Exerc* 2010;42(11):2106–21. *Med Sci Sports Exerc*. 2010;42(11):2106-2121.
9. Richie DH, Izadi FE. Return to play after an ankle sprain: guidelines for the podiatric physician. *Clin Podiatr Med Surg*. 2015;32(2):195-215. doi:10.1016/j.cpm.2014.11.003
10. Clanton TO, Matheny LM, Jarvis HC, Jeronimus AB. Return to play in athletes following ankle injuries. *Sports Health*. 2012;4(6):471-474. doi:10.1177/1941738112463347
11. Wikstrom EA, Mueller C, Cain MS. Lack of Consensus on Return-to-Sport Criteria Following Lateral Ankle Sprain: A Systematic Review of Expert Opinions. *J Sport Rehabil*. 2020;29(2):231-237. doi:10.1123/jsr.2019-0038
12. Tassignon B, Verschueren J, Delahunt E, et al. Criteria-Based Return to Sport Decision-Making Following Lateral Ankle Sprain Injury: a Systematic Review and Narrative Synthesis. *Sports Med*. 2019;49(4):601-619. doi:10.1007/s40279-019-01071-3

QUESTIONS?