Introduction

Lateral ankle sprains are the most prevalent musculoskeletal injury sustained by individuals who participate in sports; they also account for the highest proportion of all musculoskeletal injuries presenting to US emergency departments. Furthermore, lateral ankle sprains have the highest recurrence rate of all musculoskeletal injuries. It is estimated that up to 74% of individuals who sprain their ankle will experience recurrent sprains and/or ongoing symptoms of pain, swelling, instability and “giving way”. Return to sport (RTS) times vary for individuals who have sustained an acute lateral ankle sprain injury. At the moment, there are no clear criteria to guide RTS decisions after lateral ankle sprain injury.

The aim of this study is to use a Delphi approach to develop consensus for RTS criteria for individuals who have sustained an acute lateral ankle sprain injury.

You have been identified as having expertise in RTS decision making for athletes that commonly sustain acute lateral ankle sprain injuries. Your participation in this Delphi study will involve completing surveys about RTS criteria after acute lateral ankle sprain injury. Your anonymous responses will be used to develop expert consensus.

Your participation in this study is voluntary and you are able to withdraw at any time by contacting a member of the research team (details below). If you withdraw, you will not be asked to contribute any further data to the study, but data you have already anonymously contributed will be retained. This is due to the anonymity of responses, which means that we are unable to identify your responses among others in the data already collected. Your privacy will be maintained at all times. Survey data will be stored securely on password-protected hard drives/servers. You may not receive direct benefit from participating in this study, but we anticipate the study findings will inform RTS practices and decision-making processes. We will send you a summary of the study findings on completion of the project.

If you have any questions about this research, please contact Dr Michelle Smith at m.smith5@uq.edu.au or +617 3365 4660. If you would like to speak to an ethics research officer not involved in the study you may contact The University of Queensland Ethics Coordinator on humanethics@research.uq.edu.au or +617 3443 2102.

* 1. Please select one of the options below to confirm your consent to participate in this research project. If you choose to participate in this study and select “yes” then you will automatically be directed to the survey. If you choose not to participate and select “no”, you will be unable to continue.

- Yes, I agree/consent to participate in this study
- No, I do not agree/consent to participate in this study
Demographics

For the purpose of this survey, return to sport (RTS) is defined as “sanctioned for unrestricted training and cleared/available for match play/competition selection”. (This is based on definitions of time loss injury from Fuller et al 2006 and RTS from Arden et al 2016).

* 2. What is your sex?
   - Male
   - Female

* 3. What is your age?

* 4. In which country do you currently work?

* 5. What is your current profession?
   - Physiotherapist
   - Athletic trainer
   - Athletic therapist
   - Sports scientist
   - Other (please specify)

* 6. What is the highest qualification that you have undertaken?
   - Certificate
   - Diploma
   - Bachelor
   - Masters (Clinical)
   - Masters (Research)
   - Doctorate (Clinical)
   - Masters of Philosophy (MPhil)
   - Doctor of Philosophy (PhD)
   - Other (please specify)
* 7. How many years of clinical experience do you have in your field?

* 8. Which elite sport that you are mainly working with, in which athletes experience acute ankle sprains, will serve as the basis for answering the following questions about RTS criteria after an acute lateral ankle sprain?

- Soccer
- Basketball
- Rugby league
- Rugby union
- Rugby 7s
- Touch rugby
- Team handball
- Volleyball
- Netball
- Australian rules football
- Other (please specify)

- American/Canadian football
- Gaelic football
- Field hockey
- Tennis
- Lacrosse
- Badminton
- Squash
- Korfball
- Hurling
- Camogie

* 9. How long (in years) have you been working in this sport?

* 10. Please state the level of competition you are working with in this sport (e.g. National Representative Team; National Institute of Sport; English Premier League; NCAA Division 1).

* 11. What sex of athlete are you working with in this sport?

- Males
- Females
- Males & females

* 12. What is the age group of the athletes you are working with in this sport (tick all that apply)?

- Children (12 years and under)
- Adolescents (13-17 years)
- Adults (18 years and older)
- Masters

If you have selected “Masters”, please indicate the age athletes become “Masters” in your sport.
Lateral ankle sprain and RTS experience

To remind you, for the purpose of this survey, return to sport (RTS) is defined as “sanctioned for unrestricted training and cleared/available for match play/competition selection”. (This is based on definitions of time loss injury from Fuller et al 2006 and RTS from Arderon et al 2016).

* 13. On average, how many athletes do you manage (assess, treat, rehabilitate, screen, oversee care) with an acute lateral ankle sprain injury each year?

* 14. On average, how many athletes with an acute lateral ankle sprain injury do you manage until they RTS each year?

* 15. What is your involvement in the RTS decision for individuals with an acute lateral ankle sprain injury?
  - Fully autonomous in making the final RTS decision (without advice or consultation with other health professional team members)
  - Make the final RTS decision with advice or consultation with other health professional team members
  - Provide advice to (consult with) the health professional who is making the final RTS decision
  - Collaboratively (share responsibility in) making the RTS decision with other health professional team members
  - Other (please explain)

* 16. On average, in your experience how long (in days) does it take an athlete to RTS after an acute lateral ankle sprain injury?

* 17. Have you been involved in the development or implementation of RTS criteria for athletes with acute lateral ankle sprains?
  - Yes
  - No

If yes, please explain.
* 18. Have you been involved in the development or implementation of screening programs to identify athletes at risk of sustaining a lateral ankle sprain injury?
   - Yes
   - No
   
   If yes, please explain.

* 19. Have you been involved in the development or implementation of an injury prevention program to prevent lateral ankle sprains?
   - Yes
   - No
   
   If yes, please explain.

* 20. On the below numerical rating scale (where 0=no expertise and 10=highest level of expertise), please rate your expertise in the RTS management of athletes with acute lateral ankle sprains?

   

* 21. On the below numerical rating scale (where 0=not a problem and 10=worst injury problem), please indicate how much of a problem you think acute lateral ankle sprains are in your sport?
To remind you, for the purpose of this survey return to sport (RTS) is defined as “sanctioned for unrestricted training and cleared/available for match play/competition selection”. (This is based on definitions of time loss injury from Fuller et al 2006 and RTS from Arden et al 2016).

* 22. Do you feel the assessment of **swelling** should be a criterion to support the RTS decision after an acute lateral ankle sprain?
   - Yes
   - No
   - Unsure/I don't know

Please indicate the reason(s) for your response.

* 23. Do you feel the assessment of **pain severity over the last 24 hours** should be a criterion to support the RTS decision after an acute lateral ankle sprain?
   - Yes
   - No
   - Unsure/I don't know

Please indicate the reason(s) for your response.

* 24. Do you feel the assessment of **pain severity over the last week** should be a criterion to support the RTS decision after an acute lateral ankle sprain?
   - Yes
   - No
   - Unsure/I don't know

Please indicate the reason(s) for your response.
<table>
<thead>
<tr>
<th>Q 25. Do you feel the assessment of <strong>pain severity on palpation</strong> should be a criterion to support the RTS decision after an acute lateral ankle sprain?</th>
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<tbody>
<tr>
<td><strong>Yes</strong></td>
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<tr>
<td><strong>No</strong></td>
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<td>Please indicate the reason(s) for your response.</td>
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<tr>
<th>Q 26. Do you feel the assessment of <strong>pain severity during sport specific physical activity</strong> should be a criterion to support the RTS decision after an acute lateral ankle sprain?</th>
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<tbody>
<tr>
<td><strong>Yes</strong></td>
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<tr>
<td><strong>No</strong></td>
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<td>Please indicate the reason(s) for your response.</td>
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<tr>
<th>Q 27. Do you feel the assessment of <strong>ankle range of motion</strong> should be a criterion to support the RTS decision after an acute lateral ankle sprain?</th>
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<tr>
<td><strong>Yes</strong></td>
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<tr>
<td><strong>No</strong></td>
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<tr>
<th>Q 28. Do you feel the assessment of <strong>ankle muscle length</strong> should be a criterion to support the RTS decision after an acute lateral ankle sprain?</th>
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<tr>
<td><strong>Yes</strong></td>
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<td><strong>No</strong></td>
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<th>Q 29. Do you feel the assessment of <strong>ankle muscle strength</strong> should be a criterion to support the RTS decision after an acute lateral ankle sprain?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td><strong>No</strong></td>
</tr>
<tr>
<td>Please indicate the reason(s) for your response.</td>
</tr>
</tbody>
</table>
* 30. Do you feel the assessment of hip/knee muscle strength should be a criterion to support the RTS decision after an acute lateral ankle sprain?
   - Yes
   - No
   - Unsure/I don't know
   Please indicate the reason(s) for your response.

* 31. Do you feel the assessment of ankle muscle endurance should be a criterion to support the RTS decision after an acute lateral ankle sprain?
   - Yes
   - No
   - Unsure/I don't know
   Please indicate the reason(s) for your response.

* 32. Do you feel the assessment of hip/knee muscle endurance should be a criterion to support the RTS decision after an acute lateral ankle sprain?
   - Yes
   - No
   - Unsure/I don't know
   Please indicate the reason(s) for your response.

* 33. Do you feel the assessment of ankle muscle power should be a criterion to support the RTS decision after an acute lateral ankle sprain?
   - Yes
   - No
   - Unsure/I don't know
   Please indicate the reason(s) for your response.
* 34. Do you feel the assessment of lower limb muscle power should be a criterion to support the RTS decision after an acute lateral ankle sprain?
- Yes
- No

Please indicate the reason(s) for your response.

* 35. Do you feel the assessment of ankle muscle reaction time should be a criterion to support the RTS decision after an acute lateral ankle sprain?
- Yes
- No

Please indicate the reason(s) for your response.

* 36. Do you feel the assessment of ligamentous laxity should be a criterion to support the RTS decision after an acute lateral ankle sprain?
- Yes
- No

Please indicate the reason(s) for your response.

* 37. Do you feel the assessment of structural integrity of the ligament(s) on imaging should be a criterion to support the RTS decision after an acute lateral ankle sprain?
- Yes
- No

Please indicate the reason(s) for your response.
* 38. Do you feel the assessment of ankle joint arthrokinematics should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No

Please indicate the reason(s) for your response.

* 39. Do you feel the assessment of proprioception (joint position sense, the threshold for the detection of movement and force sense) should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No

Please indicate the reason(s) for your response.

* 40. Do you feel the assessment of static postural control/balance (defined as the coordination of muscles to keep the body's centre of mass within its base of support) should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No

Please indicate the reason(s) for your response.

* 41. Do you feel the assessment of dynamic postural control/balance (defined as the ability to tolerate separation of the centre of mass and centre of pressure while transitioning from one posture to the next or between a static to a dynamic state) should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No

Please indicate the reason(s) for your response.
42. Do you feel the assessment of foot biomechanics should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No
- Unsure/I don't know

Please indicate the reason(s) for your response.

43. Do you feel the assessment of lower limb and/or trunk kinematics should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No
- Unsure/I don't know

Please indicate the reason(s) for your response.

44. Do you feel an individual's performance on The Functional Movement Screen™ should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No
- Unsure/I don't know

Please indicate the reason(s) for your response.

45. Do you feel the assessment of anaerobic fitness should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No
- Unsure/I don't know

Please indicate the reason(s) for your response.
* 46. Do you feel the assessment of aerobic fitness should be a criterion to support the RTS decision after an acute lateral ankle sprain?
   - Yes
   - No
   - Unsure/don't know

Please indicate the reason(s) for your response.

* 47. Do you feel the assessment of straight-line running speed should be a criterion to support the RTS decision after an acute lateral ankle sprain?
   - Yes
   - No
   - Unsure/don't know

Please indicate the reason(s) for your response.

* 48. Do you feel the assessment of hopping should be a criterion to support the RTS decision after an acute lateral ankle sprain?
   - Yes
   - No
   - Unsure/don't know

Please indicate the reason(s) for your response.

* 49. Do you feel the assessment of jumping should be a criterion to support the RTS decision after an acute lateral ankle sprain?
   - Yes
   - No
   - Unsure/don't know

Please indicate the reason(s) for your response.
* 50. Do you feel the assessment of agility should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No
- Unsure/I don't know

Please indicate the reason(s) for your response.

* 51. Do you feel the assessment of sport specific tasks should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No
- Unsure/I don't know

Please indicate the reason(s) for your response.

* 52. Do you feel the assessment of patient-reported foot and ankle outcome measures (e.g. Foot and Ankle Ability Measure or Foot and Ankle Outcome Score) should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No
- Unsure/I don't know

Please indicate the reason(s) for your response.

* 53. Do you feel the assessment of perceived ankle stability (i.e. how steady and controlled the ankle feels when performing sporting tasks) should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No
- Unsure/I don't know

Please indicate the reason(s) for your response.
* 54. Do you feel the assessment of perceived ankle reassurance/confidence (i.e. how confident the athlete is that he/she will not sprain their ankle when performing sporting tasks) should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No
- Unsure/I don't know

Please indicate the reason(s) for your response.

* 55. Do you feel the assessment of psychological readiness should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No
- Unsure/I don't know

Please indicate the reason(s) for your response.

* 56. Do you feel the assessment of acute:chronic workload ratio should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No
- Unsure/I don't know

Please indicate the reason(s) for your response.

* 57. Do you feel the assessment of health-related quality of life should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No
- Unsure/I don't know

Please indicate the reason(s) for your response.
| RTS criteria |

To remind you, for the purpose of this survey return to sport (RTS) is defined as “sanctioned for unrestricted training and cleared/available for match play/competition selection”. (This is based on definitions of time loss injury from Fuller et al 2006 and RTS from Ardern et al 2016).
So far in this survey you have been asked whether the following should be criteria to support the RTS decision after an acute lateral ankle sprain.

- Swelling
- Pain severity over the last 24 hours
- Pain severity over the last week
- Pain severity on palpation
- Pain severity during sport-specific physical activity
- Ankle range of motion
- Ankle muscle length
- Ankle muscle strength
- Hip/knee muscle strength
- Ankle muscle endurance
- Hip/knee muscle endurance
- Ankle muscle power
- Lower limb muscle power
- Ankle muscle reaction time
- Ligamentous laxity
- Structural integrity of the ligament(s) on imaging
- Proprioception (joint position sense, threshold for the detection of movement and force sense)
- Static postural control/balance
- Dynamic postural control/balance
- Foot biomechanics
- Lower limb and/or trunk kinematics
- The Functional Movement Screen™
- Anaerobic fitness
- Aerobic fitness
- Straight-line running speed
- Hopping
- Jumping
- Agility
- Sport specific tasks
- Patient-reported foot and ankle outcome measures
- Perceived ankle stability
- Perceived ankle reassurance/confidence
- Psychological readiness
- Acute:chronic workload ratio
- Health-related quality of life
58. Is there anything else you feel should be a criterion to support the RTS decision after an acute lateral ankle sprain?

- Yes
- No

If yes, please list them here.

59. Do you feel the criteria to support the RTS decision should differ for individuals with an acute first-time lateral ankle sprain compared to individuals with CAI who are returning to sport following a new acute lateral ankle sprain?

- Yes
- No

If yes, please explain how you feel the criteria to support the RTS decision of these populations should differ (i.e. what criteria you would use with one group that you would not use with the other).

60. Do you think successful RTS after an acute lateral ankle sprain can be defined?

- Yes
- No
- Please explain your answer.
Thank you

61. If there is anything else you would like to add regarding RTS criteria after an acute lateral ankle sprain, please add it here.

Thank you for taking the time to complete this survey. Your participation is much appreciated.