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Section: Original Investigation

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Title: Monitoring rugby players for fitness and fatigue: what do coaches want?

Original Investigation

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ABSTRACT

Purpose: The advantages of monitoring players in a team are well documented. However, barriers associated with lack of resources and time prevents teams from implementing systematic monitoring programs. This study aims to identify 1) the methods rugby teams use to monitor the training load and associated response to the training load, and 2) prerequisites of a monitoring protocol that are scientifically suitable and practically applicable for monitoring fitness and fatigue of rugby players. **Methods**: Coaches and support staff working with varying levels of rugby union were invited to complete an online questionnaire. **Results**: Of the 55 respondents, 96% indicated that although they regarded monitoring the training load and training load response as important, there is no monitoring protocol which is cost-effective, time-efficient and non-aversive to the players. Respondents measured several variables when monitoring and incorporated more subjective than objective measures. Respondents (41%) indicated they would like a protocol that is time-efficient (5-10 min) and provides immediate feedback on players who identify as fatigued (50%). For coaches to have confidence in the information provided by the protocol, it needs to meet basic clinimetric principles of reliability and validity. The technical and biological error in the measurement needs to be known so that meaningful changes in fatigue and fitness can be distinguished from natural variations in the measurements. **Conclusions**: Prerequisites of an ideal monitoring protocol for rugby players were identified. It follows that a monitoring protocol that fulfills these prerequisites should satisfy both scientific principles and the coach's demands.

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INTRODUCTION

Enhancing athletic performance, while reducing the risk of injury, requires a systematic approach of progressively overloading the athlete while providing sufficient recovery to allow positive adaptations to occur.[1] The optimal training/recovery balance, in theory, facilitates improvements in performance and fitness, while reducing the risk of injury and unexpected fatigue.[2] Achieving a favourable balance between training, recovery and external stressors is difficult and becomes a challenge in the team sports setting, where individuals adapt at different rates.[3] Players in a team are generally prescribed a single training programme, yet the variations in player age, genetic characteristics and training status make it common for a wide range of responses to be observed.[3,4] Furthermore, each team member faces unique biopsychosocial stressors external to training, which affect their ability to recover and adapt.[3] This necessitates the need for individualized adjustments of the training programme based on how the athlete has adapted.[5] Evidence suggests that mismanaged training load is a major risk factor for injury, and coaches and support staff have been encouraged to adopt regular monitoring practices.[4–6]

A number of methods and tools to monitor the athlete's response to the training load exist. Monitoring has progressed beyond the use of performance tests, as it is well-accepted that fatigue manifests with other symptoms, which can be detected before a decrease in performance occurs.[6,7] These monitoring methods are generally reliant on measures of the psychological and physiological state, with the overall aim to measure the well-being of the athlete in response to the recently applied training load.[8,9]

Despite the numerous studies and reviews on monitoring, no gold standard monitoring structure for teams has been identified.[10–13] An explanation for this is that frequent monitoring of athletes is not easily managed due to the often limited resources and time required to conduct a

monitoring session. In team sports, there are diverse training activities within the team yet the players have to be managed simultaneously. This adds an extra logistical challenge to monitoring. Coaches find monitoring to be a time-consuming process, requiring human and technological resources that they often lack. This results in a lack of support from the coaches.

The fitness and medical support staff are also challenged and often lack confidence in the measurements, making it more difficult for them to convince the coach of their need to implement a monitoring programme.[14] This is supported by a study of support staff of high-level football clubs which revealed that their lack of confidence of which variables to measure leads them to record several variables to ensure they do not miss any important information.[14] They highlighted that the lack of evidence for the reliability, validity and usefulness of the measurements is a barrier for their effectiveness.[14] This accounts for the monitoring choices of teams not always reflecting the most current evidence in the literature.[9,10,14,15] These compromises are likely to reduce the efficacy of the monitoring programme, which further reduces support from coaches.

In summary, there is no practical, well-researched monitoring protocol that teams can implement with confidence. Therefore, the first aim of this study was to identify the structures rugby union teams currently use to monitor training load and the training load response. The next aim was to identify the prerequisites of a player monitoring protocol that rugby coaches and support staff regard as important for the protocol to be adopted and implemented regularly.

METHODS

DESIGN AND METHODOLOGY

A questionnaire was compiled to assess firstly the monitoring systems rugby coaches currently use, and secondly the prerequisites of a monitoring protocol that would improve its usability. The questionnaire was derived from the information used in the High Performance

Centre of South Africa's monitoring programme, combined with practical experience of our research unit in monitoring and coaching. The questionnaire was created on an online survey platform, SurveyMonkey Inc. (Palo Alto, California, USA, www.surveymonkey.com), and was designed to take 10 minutes to complete. The questionnaire had 37 questions, which were predominantly closed-ended providing respondents with a predetermined set of answers. This approach reduced the demand on the respondents and standardized the data for statistical analysis. For some questions, the option to provide more information was made available to respondents (Supplement 1). The study protocol was approved by the UCT Human Research Ethics Committee (HREC REF: 089/2016).

PARTICIPANTS

Information about the study and link to the online questionnaire was emailed to 76 coaches and support staff working with rugby teams from school to professional level. There were no gender or experience requirements of the respondents, although 96% of potential participants contacted were male. A short description of the study and link to the questionnaire was posted on the SA Rugby Union website and twitter page, and was included in the Team Handbook given to the 20 teams competing in the 2016 Gold Cup competition. Teams in this competition were the highest-placed, non-university club teams in the 2015 season in South Africa, Namibia and Zimbabwe.

STATISTICAL ANALYSIS

Frequency analysis was conducted for each question. Results were presented as absolute frequency counts or percentage of respondents. For appropriate questions, results were grouped according to the level of rugby involvement and presented as a percentage of respondents in that group.

Certain questions required participants to select factors of their choice and then rank these chosen factors in order of importance. The frequency of factors chosen as most important are displayed in figures and % of responses described according to the following criteria: *All* = 100% of relevant participants; *Most* = ≤ 75%; *Majority* = 55-75%; *Approximately half* = ± 50%; *Approximately a third* = ± 30%; *Minority* = > 30%.

Respondents were asked to rank the importance of including certain factors in a self-report questionnaire using a Likert scale of importance (*Very Important, Important, Moderately Important, Of Little Importance or Unimportant*). Answers were then grouped as "Accept" (*Very Important + Important*) or "Reject" (*Of Little Importance + Unimportant*) for each factor.

RESULTS

Current monitoring practices

Fifty-five respondents completed the questionnaire (Table 1). The proportion of respondents for each level of play is shown in the table. *Most* respondents (n=52) worked with 15's rugby, and three respondents worked in 7's rugby. *Most* respondents (n=39) were a coach in their team. Twenty-four (44%) respondents indicated that someone other than themselves implements the monitoring structures within their team. These respondents were then asked to describe the position of the person who does implement them (Table 1).

Training load

Thirty-seven (67%) respondents rated monitoring the training load as *Very Important* and 16 (29%) rated it as *Important* All levels of rugby involvement used either "Minutes training per session/week", "Number of sessions/week", "Number of specific drills" and "session RPE" to monitor their training load. One University level team used GPS and heart rate (HR) monitoring equipment, and four club level teams used HR monitors.

Training load response

Twenty-seven (49%) respondents rated monitoring the response to the training load as *Very Important*, and 26 (47%) rated it as *Important.* Table 2 displays how frequently respondents implement the various methods of fatigue/recovery monitoring, with respondents grouped according to level (professional, club, university, school) of rugby involvement. No respondents reported using *Hormone profiling* or *Blood measures* to monitor fatigue/recovery in their players. All variables, except heart rate measures, were most frequently implemented for *5 – 10 minutes*. Heart rate measures were most frequently implemented for *> 60 minutes*.

The *majority* (61%) of respondents rated *"to reduce injuries"* as their most important reason for monitoring the player's response to the training load. "*To reduce injuries*" was the most important reason for monitoring given by both the coaches (50%) and support staff (42%) (Figure 1). Sixteen (29%) respondents stipulated that they currently monitor fatigue/recovery in their player's more than once a week. Of the remaining respondents, 29 (45%) reported that they monitor less than once a week as they do not feel they have the resources to monitor more frequently.

Ideal athlete monitoring protocol

Respondents reported that in an ideal situation they would like to spend 5 – 10 minutes monitoring the player's fatigue/recovery at every session. Figure 5 displays the characteristics of a player monitoring protocol considered necessary for the respondents to use it frequently.

Both coaches (92%) and support staff (90%) considered "*Muscle soreness"* to be the most important factor to include in a self-report questionnaire (Figure 3).

DISCUSSION

Current monitoring practices

The first aim of this study was to identify the procedures teams currently use to monitor training load and the training load response. The second aim of this study was to identify the prerequisites rugby coaches and support staff require in a player monitoring protocol. The population in this study was unique as it included coaches and support staff from rugby teams ranging from amateur to professional level. This differs from similar previous studies,[9,10,14] which only included coaches and support staff from elite or professional teams.

The first finding of this study was that *majority* of respondents felt that it is *'very important'* to monitor both the training load and response to the training load of the players. The most popular methods respondents used to monitor the training load were those that are relatively easy to record and do not require expensive equipment. In contrast, a large portion of professional teams incorporated micro-technologies in their training load monitoring. A study by Akenhead and Nassis (2016), assessed the monitoring tools used by professional football teams and showed all teams reported using GPS and HR equipment at every training session.[14] A review of fatigue monitoring trends used in elite and professional teams of a variety of sports by Taylor et al. (2012), was in agreement with these findings, with all respondents of field based sports making use of GPS equipment.[9]

In this study, direct observation was the most frequently used method to monitor player fatigue/recovery. This was followed by performance tests and self-report measures. Self-report measures and performance tests were the most frequently used measures to monitor the player's response to the training load in the studies by Akenhead and Nassis (2016), and Taylor et al. (2012).[9,14] Respondents in both studies indicated that they implement a self-report measure daily,

which is in agreement with the responses in our study. Self-report measures receive much attention as they are a simple and cost-effective means to monitor the response to the training load.[15] Additionally, they have been shown to be more sensitive to impaired well-being and training load imposed stress than objective measures, and have the potential to detect signs of fatigue at their earliest stages before decrements in performance occur.[16–19] Direct observation and self-report measures are both subjective means to monitor player fatigue/recovery. They are popular because of the simplicity and cost effectiveness of their administration and individuality of the measurement. A limitation is that they depend on subjective measures, which provides the opportunity for athletes to manipulate responses towards a favorable outcome.[20] Another limitation of direct observation is that it is difficult to record accurately, which makes it difficult for coaches to review the past.

Despite a large amount of research exploring biochemical parameters for fatigue assessment,[21] no respondents reported using blood markers or hormone profiling to monitor fatigue/recovery in their players. There is much inconsistency in results of studies using blood and hormone markers to detect fatigue, resulting in no biological markers being identified that reliably detect the level of fatigue of an athlete.[17,21]

Interestingly, each option offered as a means to monitor player fatigue/recovery was implemented by the *majority* of respondents from professional teams. Professional teams also used the most equipment based monitoring systems. In the study by Akenhead and Nassis (2016), respondents reported using over 50 different variables to monitor training load, and that most made use of multiple assessments to monitor fatigue/recovery.[14] The reason for the implementation of multiple monitoring structures by professional teams may be due to these teams being able to afford the equipment based monitoring systems and to employ staff with the knowledge and

expertise to implement them. Alternatively, it may be due to the recent rise in the number of monitoring methods and lack of clear guidelines.[14] As a result, teams use a variety of measurements to ensure they do not miss anything.

All respondents had reasons for monitoring fatigue/recovery in their players; with the *majority* of respondents indicating that injury reduction was their primary reason for monitoring. Injury reduction was also the primary reason for monitoring the player's response to the training load indicated by respondents in the studies by Akenhead and Nassis (2016), and Taylor et al. (2012).[9,14] Of respondents who indicated that they monitor fatigue/recovery in their players less than once a week, *most* indicated that a lack of resources was their reason for this. A *minority* of respondents indicated that they did not have the time, or did not feel it was necessary to monitor more than once a week. This indicates that respondents are open to monitoring more frequently, but that they understand monitoring to be dependent on specific resources. In the study by Akenhead and Nassis (2016), respondents indicated that limited human resources were the greatest barrier against effective monitoring.[14] It appears that coaches associate monitoring with requiring a certain level of equipment and human-based resources for it to be effective.

Ideal athlete monitoring protocol

Arguably the most important outcome of this study was that respondents would like to spend 5 – 10 minutes monitoring fatigue/recovery at every session. This shows that respondents place great importance on monitoring, but that they would only like to allocate a short period of time to executing it. '*Immediate feedback'* was rated by the *majority* of respondents as the most important characteristic an athlete monitoring protocol should fulfill, followed closely by *'time efficient'*. The *majority* of respondents also indicated that an ideal monitoring protocol needs to be

'inexpensive' and *'easy to administer'*. Respondents in the study by Akenhead and Nassis (2016), added that knowing the reliability and validity of an assessment was important to them.[14]

Coaches rely on monitoring systems to produce output variables which inform on the athlete's state of fatigue or fitness, before a change in performance occurs. The effectiveness of the monitoring system is thus dependent on the quality of these output variables.[14] It is essential that monitoring systems are tested for clinimetric principles to identify what magnitude of output constitutes a meaningful change when testing an athlete.[6,22] In addition to a system being reliable, the measurement error and smallest worthwhile change need to be known. The measurement error should be smaller than the smallest worthwhile change for the system to be considered effective.[9,23]

A connection needs to be made between research and practice for the desired uptake of monitoring in team sports to occur. Monitoring systems need to be based on scientific principles yet be easy to implement and of a short nature to make them practically applicable. The findings in our study highlight the disconnect between the research and practice of monitoring systems, and are in agreement with previous work.[9,10,14,15,24] In addition, the findings in this study provide prerequisites for an ideal athlete monitoring system, which would be both scientifically suitable and practically applicable for monitoring in team sports.

PRACTICAL APPLICATION

There is no single marker identified in the literature that can inform on all aspects of an individual's well-being; it follows that no single test, when administered in isolation, will be able to provide a comprehensive picture of the athlete.[9,10,14,19] It has been recommended that a combination of external and internal load measures may provide a more detailed picture of the well-being of an athlete.[5] The results in this study and previous similar studies support this, with respondents indicating they are not certain which is the best marker to use and thus use multiple

assessments of a variety of markers.[9,10,14] Respondents in these studies, however, went on to indicate that a lack of equipment and human resources were limiting factors when implementing monitoring structures.[14] This highlights the need for the development of a monitoring protocol that satisfies both scientific principles and the coach's demands. Combining the information gathered in this study, with recommendations from the literature, the prerequisites of an ideal athlete monitoring protocol have been identified. It follows that a monitoring protocol that fulfills these prerequisites should satisfy both scientific principles and the coach's demands.

The prerequisites of an ideal monitoring protocol for rugby players:

- Immediate feedback
- Time-efficient: Completed in 5 – 10 minutes
- Easy to administer
- Inexpensive: Does not rely on expensive equipment or large amounts of human resources
- Can be completed by the whole team simultaneously
- Non-fatiguing (i.e. should not interfere with training)
- Non- invasive
- Reliable
- Valid
- Sensitive to change

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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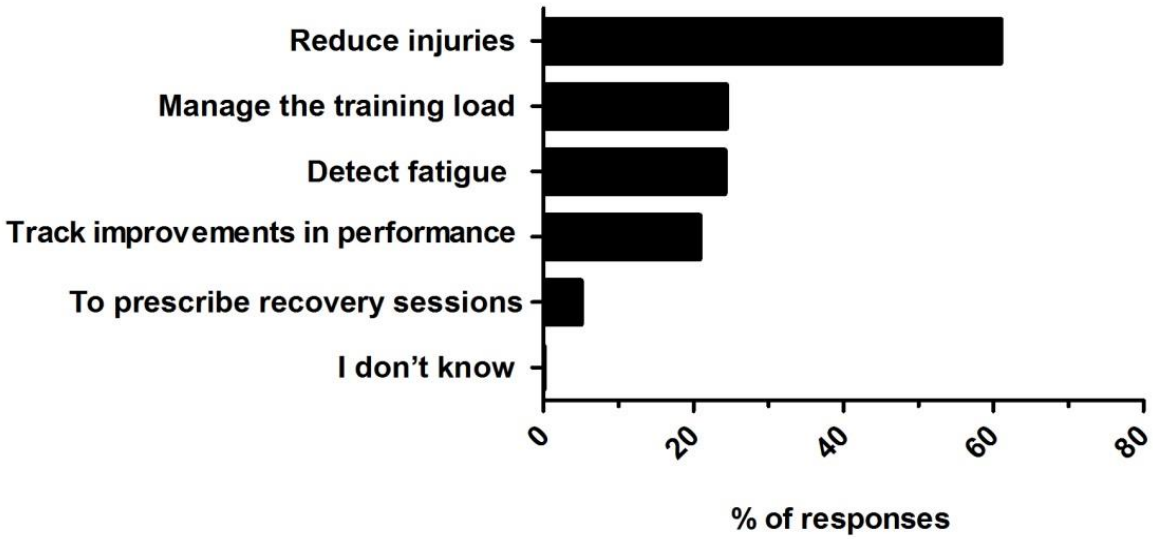

Figure 1: Frequency distribution of the reasons ranked as most important for monitoring by respondents (n = 55)

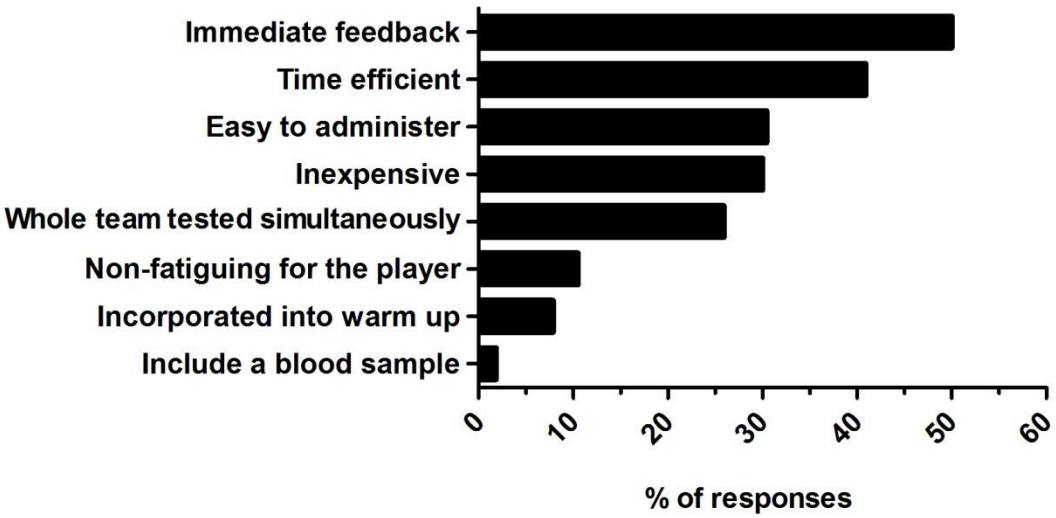

Figure 2: Frequency distribution of the characteristics of an ideal monitoring protocol ranked as most important by respondents (n = 55)

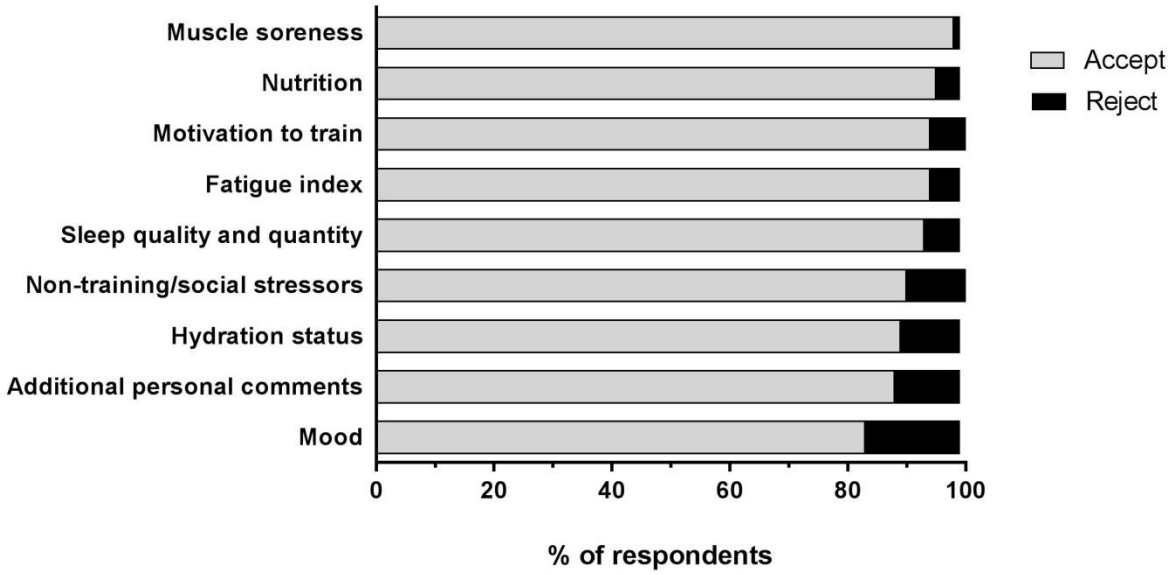

Figure 3: Importance of factors to include in a self-report questionnaire. "Accept" = Combined 'Very Important' and 'Important', "Reject" = Combined 'Of Little Importance' and 'Unimportant' (n = 55)

Table 1: Position of individual who implements the monitoring structures within the team (*n-55).*

	Club	Professional	University	School	**Total**
Head coach	17	2	0	1	**20**
Coach	4	0	0	0	**4**
Strength and Conditioning specialist	2	8	5	2	**17**
Biokineticist	1	3	2	0	**6**
Physiotherapist	1	0	1	0	**2**
Exercise Scientist	2	1	2	0	**5**
Sport massage therapist	1	0	0	0	**1**
Manager	0	0	0	0	**0**
Total	**28 (51%)**	**14 (25%)**	**10 (18%)**	**3 (5%)**	**55**

Table 2: Frequency of implementation of methods used to monitor the fatigue/recovery in players (n = 55).

	Self-report measures				Performance tests				Heart rate measure				Power measures				Direct observation			
	S	**C**	**U**	**P**	**S**	**C**	**U**	**P**	**S**	**C**	**U**	**P**	**S**	**C**	**U**	**P**	**S**	**C**	**U**	**P**
Every session	0	10	0	6	0	9	0	3	0	2	0	5	0	7	0	1	2	18	4	5
Once a day	0	0	1	0	0	1	0	2	0	0	0	0	0	0	0	4	0	3	0	2
Once a week	0	6	2	1	1	9	2	1	0	1	0	2	1	3	0	0	1	3	2	2
Multiple times/week	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	2	0	0
Monthly	0	0	1	0	0	1	1	1	0	1	1	0	0	2	2	0	0	0	0	0
Total	**29**				**32**				**13**				**21**				**44**			

*S = School, C = Club, U = University, P = Professional

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International Journal of Sports Physiology and Performance

Supplementary

Training load: The intensity and volume of training prescribed to the player

1. What methods do you currently use to monitor the training load of the players?

	Yes	No
Session rating of perceived exertion	○	○
Heart rate measures	○	○
GPS data	○	○
Minutes spent training per session/week	○	○
Number of sessions per week	○	○
Number of specific drills (e.g. Scrums, line outs)	○	○

Other (please specify)

2. What is your view towards monitoring the training load of the players?

- ○ Very Important
- ○ Important
- ○ Moderately Important
- ○ Of Little Importance
- ○ Unimportant

Training load response: The body's internal response to the external training load placed on it

3. What is your view towards monitoring the player's response to the training load?

- ○ Very Important
- ○ Important
- ○ Moderately Important
- ○ Of Little Importance
- ○ Unimportant

4. Do you use a self-report measure to monitor the fatigue/recovery of the players?

- ◯ Yes
- ◯ No

5. How frequently, and for how long at each session, do you use a self-report measure to monitor fatigue/recovery in the players?

	N/A	< 5 minutes	5-10 minutes	10-15 minutes	15-30 minutes	30-60 minutes	> 60 minutes
Every session	◯	◯	◯	◯	◯	◯	◯
Daily	◯	◯	◯	◯	◯	◯	◯
Weekly	◯	◯	◯	◯	◯	◯	◯
Multiple times/week	◯	◯	◯	◯	◯	◯	◯
Monthly	◯	◯	◯	◯	◯	◯	◯

6. Do you use performance tests (e.g. sprints) to monitor fatigue/recovery of the players?

- ◯ Yes
- ◯ No

7. How frequently, and for how long at each session, do you use performance tests to monitor fatigue/recovery in the players?

	N/A	< 5 minutes	5-10 minutes	10-15 minutes	15-30 minutes	30-60 minutes	> 60 minutes
Every session	◯	◯	◯	◯	◯	◯	◯
Daily	◯	◯	◯	◯	◯	◯	◯
Weekly	◯	◯	◯	◯	◯	◯	◯
Multiple times/week	◯	◯	◯	◯	◯	◯	◯
Monthly	◯	◯	◯	◯	◯	◯	◯

8. Do you use hormone profiling (e.g testosterone in blood/saliva) to monitor fatigue/recovery of the players?

- ◯ Yes
- ◯ No

9. How frequently, and for how long at each session,do you use hormone profiling (e.g testosterone in blood/saliva) to monitor fatigue/recovery in the players?

	N/A	< 5 minutes	5-10 minutes	10-15 minutes	15-30 minutes	30-60 minutes	> 60 minutes
Every session	○	○	○	○	○	○	○
Daily	○	○	○	○	○	○	○
Weekly	○	○	○	○	○	○	○
Multiple times/week	○	○	○	○	○	○	○
Monthly	○	○	○	○	○	○	○

10. Do you use other blood measures (e.g. Creatine kinase) to monitor fatigue/recovery of the players?

- ◯ Yes
- ◯ No

11. How frequently, and for how long at each session, do you use other blood measures (e.g. Creatine kinase) to monitor fatigue/recovery in the players?

	N/A	< 5 minutes	5-10 minutes	10-15 minutes	15-30 minutes	30-60 minutes	> 60 minutes
Every session	◯	◯	◯	◯	◯	◯	◯
Daily	◯	◯	◯	◯	◯	◯	◯
Weekly	◯	◯	◯	◯	◯	◯	◯
Multiple times/week	◯	◯	◯	◯	◯	◯	◯
Monthly	◯	◯	◯	◯	◯	◯	◯

12. Do you use heart rate measures to monitor fatigue/recovery of the players?

- ◯ Yes
- ◯ No

13. How frequently, and for how long at each session, do you use heart rate measures to monitor fatigue/recovery in the players?

	N/A	< 5 minutes	5-10 minutes	10-15 minutes	15-30 minutes	30-60 minutes	> 60 minutes
Every session	◯	◯	◯	◯	◯	◯	◯
Daily	◯	◯	◯	◯	◯	◯	◯
Weekly	◯	◯	◯	◯	◯	◯	◯
Multiple times/week	◯	◯	◯	◯	◯	◯	◯
Monthly	◯	◯	◯	◯	◯	◯	◯

14. Do you use other power measures (e.g. Jump height) to monitor fatigue/recovery of the players?

- ◯ Yes
- ◯ No

15. How frequently, and for how long at each session, do you use power measures (e.g. Jump height) to monitor fatigue/recovery in the players?

	N/A	< 5 minutes	5-10 minutes	10-15 minutes	15-30 minutes	30-60 minutes	> 60 minutes
Every session	○	○	○	○	○	○	○
Daily	○	○	○	○	○	○	○
Weekly	○	○	○	○	○	○	○
Multiple times/week	○	○	○	○	○	○	○
Monthly	○	○	○	○	○	○	○

16. Do you use direct observation to monitor fatigue/recovery of the players?

- ○ Yes
- ○ No

17. How frequently, and for how long at each session, do you use direct observation to monitor fatigue/recovery in the players?

	N/A	< 5 minutes	5-10 minutes	10-15 minutes	15-30 minutes	30-60 minutes	> 60 minutes
Every session	○	○	○	○	○	○	○
Daily	○	○	○	○	○	○	○
Weekly	○	○	○	○	○	○	○
Multiple times/week	○	○	○	○	○	○	○
Monthly	○	○	○	○	○	○	○

18. What are your reasons for using a training load response monitoring system?

	Yes	No
I don't know	☐	☐
Detect fatigue	☐	☐
To prescribe recovery sessions	☐	☐
Reduce injuries	☐	☐
Track improvements in performance	☐	☐
Manage the training load	☐	☐

Other (please specify)

19. Rank the reasons for monitoring fatigue/recovery from most important to least important with 1 signifying most important.

- ☐ I don't know
- ☐ Detect fatigue
- ☐ To prescribe recovery sessions
- ☐ Reduce injuries
- ☐ Track improvements in performance
- ☐ Manage the training load

20. How frequently would you like to monitor your players fatigue/ recovery in an ideal situation?

- ○ At every session
- ○ Once a day
- ○ Multiple times per week
- ○ Once a week
- ○ Monthly

21. What is the maximum amount of time you would like to spend on a single monitoring session, knowing the protocol you are using is efficient and resourceful?

- ○ 5 – 10 mins
- ○ 10 – 15 mins
- ○ 15 – 30 mins
- ○ 30 – 60 mins
- ○ > 60 mins

22. If you are currently monitoring your players fatigue/recovery less than once a week what are the reasons for this? (More than one answer allowed)

- ☐ I am monitoring more than once a week
- ☐ Monitoring takes too much time
- ☐ Do not have the resources to do more monitoring
- ☐ Do not feel it is necessary to do monitoring more than once a week

23. Rank the reasons for monitoring fatigue/recovery less than once a week from most important to least important with 1 signifying most important

- [ ] I am monitoring more than once a week
- [ ] Monitoring takes too much time
- [ ] Do not have the resources to do more monitoring
- [ ] Do not feel it is necessary to do monitoring more than once a week

24. Do you alter the training load based on information from the monitoring session?

- ○ To a great extent
- ○ Somewhat
- ○ Very little
- ○ Not at all

25. If you do adjust the training load in response to your monitoring session, how do you do so? (More than one answer allowed)

- [ ] Modify the number of subsequent training sessions
- [ ] Modify the number of subsequent recovery sessions
- [ ] Modify the intensity/duration of subsequent training sessions

26. Rank the the ways in which you adjust the training load from most important to least important with 1 signifying most important.

- [ ] Modify the number of subsequent training sessions
- [ ] Modify the number of subsequent recovery sessions
- [ ] Modify the intensity/duration of subsequent training sessions

27. What characteristics of an athlete monitoring protocol are needed for you to make use of it? (More than one answer allowed)

- [ ] Inexpensive
- [ ] Time efficient
- [ ] Easy to administer
- [ ] Be able to administer on whole team simultaneously
- [ ] Include a blood sample
- [ ] Non-fatiguing to the player
- [ ] Incorporated into warm up
- [ ] Immediate feedback

Other (please specify)

28. Rank the characteristics an athlete monitoring protocol needs to fulfill from most important to least important with 1 signifying most important.

	Inexpensive
	Time efficient
	Easy to administer
	Be able to administer on whole team simultaneously
	Include a blood sample
	Non-fatiguing to the player
	Incorporated into warm up
	Immediate feedback

29. What are your thoughts on including the following aspects in a self-report questionnaire?

	Very Important	Important	Moderately Important	Of Little Importance	Unimportant
Nutrition	○	○	○	○	○
Sleep quality and quantity	○	○	○	○	○
Mood	○	○	○	○	○
Motivation to train	○	○	○	○	○
Hydration status	○	○	○	○	○
Muscle soreness	○	○	○	○	○
Non-training/social stressors	○	○	○	○	○
Fatigue index	○	○	○	○	○
Additional personal comments	○	○	○	○	○

Demographics

30. What is your main position?

- ○ Head coach
- ○ Coach
- ○ Strength and Conditioning Specialist
- ○ Biokineticist
- ○ Physiotherapist
- ○ Exercise Scientist
- ○ Other (please specify)

31. Who implements the monitoring structures in your team?

- ○ Yourself
- ○ Someone else

32. Who implements the monitoring structures in your team?

- ○ Head Coach
- ○ Coach
- ○ Strength and Conditioning Specialist
- ○ Biokineticist
- ○ Physiotherapist
- ○ Exercise Scientist

Other (please specify)

33. What level of rugby do you mainly work with?

- ○ University
- ○ Club
- ○ Professional

34. Please state the name of the University

35. Please specify what league of club

- ○ Super League A
- ○ Super League B
- ○ Super League C

36. Do you mainly work with 7's or 15's players?

- ○ 7's
- ○ 15's