



MEASURING STRESS AND RECOVERY IN RUGBY UNION

BY

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In professional sport, coaches are under pressure to perform. In the final game of the English domestic Rugby Union season in 2003, Saracens played Leicester with the winner being offered a chance to play in the European Cup the following season; this was worth approximately £250,000 in extra gate receipts and sponsorship money for the successful club. Saracens lost and the entire coaching staff was sacked, having been in place for only one season (Kitson, 2003).

This pressure can be transferred to the players, as Ireland captain Keith Wood expressed when asked to comment on the appointment of new coaches prior to the start of the Six Nations tournament. “Bringing in extra coaches will put us under pressure to improve, which we need to do.” (2002)

Coaches have a tendency to reward poor performance with an increase in the training load (Foster, 1998), which may exacerbate, not solve, the problem of poor performance. Preventing this requires the careful balance of both the training stimulus and an adequate recovery programme (Kellmann & Gunther, 2000). “Optimal recovery is a well-planned activity that matches the situational needs of an athlete in rest and results in regaining an optimal performance state.” (Hanin, 2002, p. 201).

Measuring the recovery programme and monitoring its success are often more difficult than manipulating training dosages. This is due to the difficulty of accurately recording and quantifying the state of an individual’s recovery and then prescribing correct measures that enhance recovery. It is far easier to quantify the training dose by prescribing more repetitions, longer duration, or an increase in intensity such as higher heart rate or faster speed.

Providing an accurate measure of recovery may be useful to a coach because he can then identify any problems that may be preventing the athlete from achieving peak performance. The actual performance result is the most important one to the coach (Martin, Andersen & Gates, 2000). If the measurement and manipulation of training and recovery does not lead to an increase in performance, then it has not been successful. This measurement not only has to be accurate, it has to be affordable and easy to measure in order to have relevance in the actual coaching environment. Psychological measures have been proven to be as effective as physical measures in diagnosing Training Stresses (Rushall, 1990) so using such a tool may be useful for coaches.

One such measure is the Recovery- Stress Questionnaire for Athletes (REST- Q) devised by Kellmann and Kallus (2001). This is a psychological tool asking questions about the athlete’s current state of recovery and stress across nineteen scales relevant in the recovery process, such as general stress, self-efficacy and emotional

exhaustion. It requires the athlete to answer 52 questions on a scale of 1-6, taking about 10 minutes to complete. This information is then put into a computer programme and a graph is produced comparing the players' current level of stress and recovery to their last test (see graphs for Player A and C). This has been proven to have success in monitoring training dosages in elite training camps (Kellmann, Altenburg, Lormes & Steinacker, 2001, Kellmann & Gunther, 2000). These were residential camps and had the support of a team of professional sport scientists, including psychologists and physiologists, and involved athletes in individual sports.

Rugby Union is a sport where the physical demands are high through exertion and contact. The English domestic season lasts from late August to early May. Keeping players in a physical state that enables peak performance week in, week out is difficult, but can be achieved (Baker, 2001). Ensuring that they are mentally and physically recovered from the demands of the season and outside sources may be more difficult.

This is especially important in younger players - 30% of team sport players in the 16–20 year old age group suffer from staleness (Kentta, Hassmen, Raglin, 2001). Athletes at this age face pressure from conflicting sources including: school/university exams; parental influence; coach influence; peer pressure; relationships; looking for full time employment or moving to full time training for the sport itself. These pressures can lead to staleness, burnout and injury (Cohn, 1990). With many clubs having a youth policy, it is especially important to make sure that they are monitored closely.

Over the course of 2 seasons, in my role as Conditioning Coach, I have been using the REST-Q to help monitor the recovery of the London Welsh Academy players. At the end of the first season, a statistical analysis was run to compare the group averages of stress and recovery with physical fitness, playing performance and likelihood of non-contact injury.

The Problem Statement

“Can the REST-Q accurately reflect the current physical and mental state of recovery and stress of youth rugby union players and predict future playing and physical performance and likelihood of injury and staleness?”

Definitions

Recovery is a process that ensures that “recruitment and effective utilisation of available resources become(s) available again. It is a process of recuperation of different resources in order to be able to resume an interrupted activity” (Hanin, 2002, p. 201).

“Short-term overtraining, called overreaching, which can be seen as a normal part of athletic training, must be distinguished from long-term overtraining that can lead to a state described as burnout, staleness, or overtraining syndrome” (Lehmann, Lormes, Optiz-Gress, Steinacker, Netzer, Foster & Gastmann, 1997, p.7).

Burnout is distinguished from staleness by the athlete's motivation to train. While the symptoms may be similar, a stale athlete is still motivated to train; a burntout athlete is not (Raglin, 1993).

Due to the many causes of poor performance, Overtraining Syndrome (OTS) has recently been redefined as the "Unexplained Underperformance Syndrome (UPS)". This UPS can be distinguished from overreaching, in that the athlete's symptoms do not diminish after two weeks of rest (Budgett, Newsholme, Lehmann, Sharp, Jones, Peto, Collins, Nerurkar, & White, 2000). The terms OTS and UPS may be interchanged due to the nature of some of the previous research using either term.

Limitations and Delimitations

One of the limitations of the study is that the players' activities, external to the training and match environment, were not controlled. The recovery process was not manipulated in this study, it was only measured. The study, therefore, has a low internal validity. The study is, however, set in a real life situation; the results should be able to be applied to many other team sports in a part-time setting and involving youth athletes. This indicates a high external validity. The delimitations of the study include the choice to use just one team of youth male rugby players and not to use other team sports. This is, therefore, a limitation in being able to apply the findings to other team sports. The sample size was also limited to those players turning up to training and did not measure those who dropped out, nor were measurements taken of players before they joined the club later in the season. The decision to measure only the four variables of performance, aerobic fitness, injury and REST-Q scores is also a delimitation. These four aspects may be extrapolated to other team sports and increase the external validity of the study.

Discussion and Recommendations for Future Innovations and Applications

When individual athletes were looked at, using the graphical representation of the REST-Q software, comparisons between tests before significant events proved useful in most cases. The use of the case studies proved useful in determining aspects of the players' lifestyle that affected their performance. This has implications for the coaching staff on how to improve performance for the next season.

Fitness did not appear to be linked to good or bad performance or to burnout, with seven of the players used in the case studies being in the upper quartile of fitness scores throughout the season. The exception was seen in those cases where players joined the Academy mid-way through the season and were not fit enough to cope with the demands of training. These players account for 14 of the 81 players tested, who only tested once, and were not included in the data analysis as they subsequently left the Academy.

The use of the two separate stress and recovery scores did not appear to be of value when analysing a whole team. There was no significant correlation between fitness,

performance, recovery, stress and likelihood of injury. They did not accurately predict likelihood of injury or performance, neither did the fitness scores. The lack of correlation between stress and injury is surprising, given the previous research in this area linking the two factors (Anderson, & Williams, 1988, Blackwell, & McCulloch, 1990, Petrie, 1993).

Case studies

It was decided to look at four different groups of players: players who performed well; players who suffered from burnout; players who suffered from performance slumps; and players who were consistent throughout the season in terms of performance and fitness and did not get injured.

These four groups were decided as typical of the types of athletes that coaches may have in their squads. Case studies have been used in most of the research done using the REST-Q (Kellmann & Kallus, 2001, Kellmann, et al., 2001, Kellmann, et al., 2002) and can be used as a basis for identifying athletes who may be in need of specialist intervention. By looking at those athletes who performed well and consistently and identifying what differentiated them from those who suffered from performance slumps or burnout, it was hoped to use this information to help plan the next season's training. **Two of these players-Player A and Player C- have been highlighted and their graphs are shown.**

High Performers

A total of seven players from the 86 in the Academy were identified as high performers. Two of these gained Welsh caps at U18 and under U19 level, three were promoted to the London Welsh first team squad during the season and the other two were promoted from the U19s to the U21s. Player A showed an improvement in fitness as the season progressed, (level 10.7 to 12.1 on the bleep test), whilst the overall Academy average remained constant. Player A was selected for the Wales U19 squad for the Six Nations tournament.

Whilst talking to these players to find out why they were performing well, no clear distinction was made with fitness routines or recovery strategies. However, of these high performers, six lived with their parents and one was at university. At some stage, all their parents attended their matches and training sessions. Social support has been shown to "contribute to health and well-being by reducing exposure to stress and enhancing coping efforts" (Bianco & Eklund, 2001, p. 85). Player A showed high levels of recovery and lower levels of stress throughout the season. He was studying at school, but did not work to earn money. This may have been a significant reason for his continued success, enabling him to concentrate on his rugby whilst balancing this with recovery at home.

Burnout Players

Four players were identified as having suffered from burnout, which, according to Smith (1986), is defined as a psychological, emotional and physical withdrawal from the sport. All four players were starters at their respective positions, walked away from the academy and did not return. None of these players had suffered from an

apparent lack of form. All players were contacted by telephone or met individually by the coach or the conditioning coach the following week after they announced their departure. All expressed a feeling of fatigue, lack of enjoyment and a difficulty in balancing the rugby with outside demands. One player expressed dissatisfaction with constantly being injured. None of the players felt ready to return and were sticking by their decision.

Player C shows a significant difference between Test 3 and Test 5 on his REST-Q scores. It is easy to identify that something had changed. This test was taken five days before he played his last match for the club and announced his departure immediately following that match, which had been lost. He had been expressing dissatisfaction with himself and with the rest of the team, who, he felt, were not putting in enough effort. Talking to him the following week, he cited his university work as putting him under too much pressure. Such changes in the stress response around the time of exams have been found previously (Deinzer, Kleinedam, Stiller-Winkler, Idel, & Bach, 2000) in non-athletic student populations. At the same time he showed signs of perceived overload as well as tension and anger – key signs of an approach of burnout according to Smith (1986).

Poor performers

Most players suffered from at least one poor performance in the season. Players E and F were identified as having several poor performances in a row and a downward trend in their fitness scores prompted the coach and conditioning coach to take action. Both players were at university, played rugby for their University and were expected to move to the senior team by the end of the season.

Unfortunately both suffered from a performance slump, picked up minor injuries that did not heal properly and did not meet pre-season expectations. Both players' fitness dropped as the season progressed, Player E from level 12.2 to 10.3 and Player F from level 14.1 to 11.8 on the bleep test.

Consistent Performers

Of the nine players who tested in pre-season (Tests 1, 2) and at the end of the season (Test 6), five were identified as having performed consistently throughout the season and did not miss a game through injury. All nine players were regular attendees at training and lived at home. Four of the five consistent performers were in full time employment; the other was studying for A levels.

As the two players (A and C) selected were in full time employment, they did not have the same pressure at the same time as the student players. Student players were likely to have a healthy state of recovery and stress in pre-season because they had completed their exams and were on an academic break. Those in employment were subject to the normal pressures of work and the level of stress could not be measured accurately, so the pre-season REST-Q may not have been an accurate baseline measurement.

Recommendations for Future Innovations and Applications

Compared with previous research that used case studies to highlight the examples encountered during the studies (Kellmann & Kallus, 2001, Kellmann, et al., 2001, Kellmann, et al., 2002), this study showed the importance of external influences on each player. For example, Kellmann (2001) used the REST-Q to highlight the relationship between an increase in a training dose with an increase in stress and a decrease in recovery. When they carried out some research in a different sport, individual differences were noticed, for example, between rowers' responses to training and the REST-Q was used to help adjust their training pattern on a daily basis. As the rowers were living together in a full-time training camp with a full support staff, external influences may have been minimal.

The training camp is a rarefied atmosphere indeed, giving different pressures from those normally experienced by an eighteen year old in his first few months away from home, when he is trying to juggle academic pressure, learn new financial and time management skills and play rugby for two teams each week. By analysing the four different types of players in the case studies and interviewing the players concerned, the importance of external influences became apparent.

The two major external influences were *living away from home* and *playing for additional teams*. The effect of living away from home could be due to missing the structure and support associated with both the school and home environment (Dishman, & Sallis, 1994, Bianco, & Eklund, 2001, Palmer, Burwitz, Smith, & Collins, 1999). The influence of non-athletes in the University environment, enjoying their new found freedom and lack of accountability for the first few months, could have created a new adverse "Perceived Social Norm" (Palmer et al., 1999), where training and good dietary and sleep habits were of secondary importance to fitting in with everyone else.

Dishman, Sallis and Orenstein (1985) found that there were five main indicators of likelihood to adhere to training programmes: training partners, social support, time and opportunities, self-efficacy and perceived vulnerability. Those players at university had plenty of time and opportunities to train alone or with partners. They generally trained and played frequently, but their recovery habits were poor, with too little quality rest, inadequate diet and a poor support structure. This led to an inconsistent or deteriorating performance that could result in burnout.

Those players who were living at home, and either studying for A levels or in full-time employment, had less time and opportunity to train, but generally had better social support and recovery habits, including diet, consistent routines and sleep patterns. This led to a more consistent playing pattern throughout the season. Whilst the players living at home generally appeared to have suffered from more stress/time constraints and the pressure of exams and studying for A levels, they had better coping strategies for dealing with stress. Those players at university had less stress, but were unable to cope with the stress that they faced, having poor social support and

inadequate recovery strategies. These players appeared to be under-recovered compared rather than over-trained.

Playing for additional teams put the athletes under physical and mental pressure. The inability to recover properly from one match to the next led to a decline in fitness and an inability to shake off niggling injuries. The pressure of not being able to say no to coaches at either university, school or at the club led to an increase in stress, which has been shown to affect overall performance (Meehan et al., 2002).

Whilst the REST-Q did not highlight the causes of inadequate performance, it did highlight those players who had poor recovery routines and those who were suffering from stress. The two factors were not always concurrent, reinforcing the fact that the two are indeed different parts of a process leading to underperformance (Kallus, 2002). This enabled the coach to have a more in-depth conversation with the players concerned to find out what problems were causing the players' poor performance. This led to a greater understanding of the motivation and habits of each player. Prior to the use of the REST-Q, the coach may not have looked beyond effort or a run of bad form to discern the cause of the change in performance.

However, the use of the REST-Q at intervals of 6-8 weeks did lead to players being overlooked as symptoms of overreaching did appear between tests. The sheer practicality of testing a total of 81 players, inputting the data and analysing it, meant that a quick response was not always available to individual players. Only those players whose profile changed significantly were highlighted. Some of the changes at the time were not thought of as being significant and the player was not approached. If a player had been identified as overreaching, a recommended rest period could have been put in place and, perhaps, the UPS symptoms could have been avoided. The REST-Q is not a substitute for good individual communication between the coach and his players.

Other subscales that have changed slightly could have altered greatly in the intervening weeks and returned to a normal level eight weeks later. Any changes that were apparent may not have occurred in a straight line, with the player possibly having experience greater or lesser amounts of stress than that shown in the REST-Q. The fact that the REST-Q measures responses over the previous three days makes long-term analysis difficult.

The authors compared individual subscales, such as physical complaints or disturbed breaks, to predict performance, but this was thought to be unwieldy in the team environment and when testing such large numbers of players. Instead, the comparison of the REST-Q profile was found to be most useful in analysing each player and also feeding back the information to the coaching staff and the players themselves. In order for this study to help the players and coaches improve their performance, it was felt that immediate feedback would be most beneficial. A smaller questionnaire, highlighting one or two key subscales such as physical complaints or disturbed breaks, that the authors state are closely related to sickness and performance (Kellmann, & Kallus, 2001), may be easier to measure on a week-to-week basis.

One such seven-point questionnaire, called the Recovery Cue (Kellmann, et al, 2002, Appendix 5), has been developed for use on a weekly basis. The research quotes an unpublished questionnaire, so it has yet to be used in the mainstream, although Canadian teams and athletes have been using it under direction of the National Sport Centre (Botterill, & Wilson, 2002). The potential use is to help athletes with a weekly monitor that will help them understand their own reactions to both training and non-training stressors as well as monitoring their recovery strategies.

Trying to analyse an individual player's REST-Q by comparing it to the group norm proved difficult. Both a statistical analysis and a visual comparison of the REST-Q profile provided little help. The only way to start to spot differences was to compare profiles of the same player at different times. Even this did not always highlight a significant difference that could enable an accurate diagnosis to be made. Those players who benefited from interventions by the coach were those who had also suffered from a drop in performance or an injury and were taken to one side for an individual conversation.

With one season of players' history available, comparisons may be more accurate in the following season, with a greater history of data available and also a greater understanding of the areas of concern that need to be monitored.

Changes for the 2nd season

As a result of identifying the main areas of concern, several changes have been made for the current season. The conditioning coach has taken on the responsibility for educating the players, parents and coaching staff on the need for a balance between training and recovery. An eight-week training macrocycle has been put in place with 2 x 4 week training blocks, with the last week of each block being a recovery week (Table 1).

Table 1.
Sample of 4 week training cycle themes.

Component	Week 1	Week 2	Week 3	Week 4
Strength	Base strength 3sets, 10 reps	Power 4sets, 5 reps	Speed 4 sets, 45 secs recovery Complex legs	Recovery 2 sets, 8 <u>reps@80%</u> week1
Team Fitness	Endurance	Anaerobic Intervals	Speed	Agility
Coaching	Set pieces	Contact Areas	Ball skills	Team Runs

Testing, including the use of the REST-Q, now takes place on completion of the second recovery week. This will help ascertain whether the taper week has helped improve fitness as has been shown in swimmers (Costill, Thomas, Robergs, Pascoe, Lambert, Barr, & Fink, 1991) and allowed adequate recovery as recommended by Kellmann (2001). The bleep test has been replaced with the **yo-yo intermittent recovery test**

Normal signs of overreaching will be reduced after a recovery week, (Budgett, 1990, Kirwan, Costill, Flynn, Mitchell, Fink, Neuffer, & Houmard, 1988) so any anomalies in the REST-Q would indicate possible onset of UPS. An additional testing session will take place at the end of September to allow testing of the new intake of university players. Those players who were with the club in the previous season will be sent training programmes by e-mail to allow them to be match-ready when they arrive at the club.

Those players who do show significant changes in the REST-Q have been recommended to see their doctor to eliminate the possibility of any other clinical cause for the symptoms. Many of the symptoms of UPS are similar to that of melancholic depression (Clow, & Hucklebridge, 2001), so it is important that the doctor has some knowledge of UPS. If UPS is diagnosed, then the player will be rested and a rehabilitation plan put in place.

Each week of the four-week cycle concentrates on different themes of fitness and playing, ensuring variety and allowing all components of fitness to be regularly monitored. Avoiding monotony has long been recommended to assist in the prevention of UPS (Budgett, 1990).

A consensus has been reached amongst the coaching staff that the new university students need more support than in the previous season. The players need to be given help in improving their self-regulation, which may have been largely dependent on parental support previously. Basic time-management skills have been taught, with a more structured off-site training programme given, as well as ideas on how to best implement a study and training routine. Meetings with all players are due to be held, where the coach and support staff will discuss ways to deal with injury and selection issues. Such problem- and emotional-focused coping strategies have been shown to be useful in alleviating stress (Meehan, 2002). In the previous season, players who got injured did not always continue their rehabilitation, or they stopped attending the training sessions for five-six weeks.

The coaching staff realised that their influence is as important as that of the physiotherapists and have decided to have a more active role in communicating with injured players. This has been shown to help restore confidence in athletes and aids their successful rehabilitation (Magyar, & Duda, 2000).

The players were reminded that they are unlikely to start every match of the season and that the squad system is important. It is likely that, until they arrived at the club, they were used to being automatic first choice at their position. With competition for several positions being fierce, players have been told that they will at some point have to accustom themselves to being substitutes or being rested. This may not help alleviate the immediate disappointment of not being selected, but at least the coaches are recognising the adverse effects of incorrect communication of team selection.

Food replenishment and hydration strategies are more robust in the current season, with the post-training meal and post-match refuelling being compulsory. Adequate

water has been made available for all away games on the coach journeys, as this had been previously left to individual players to organise. A two-hour post match ban on alcohol has been recommended to allow the players to rehydrate adequately before the intake of any alcohol. This was a problem on the away games in the previous season. Refuelling has been shown to be key in helping recovery and prevents fatigue (Morgan, Costill, Flynn, Raglin, & O'Connor, 1988).

Handouts have been prepared that will help to educate the players and reinforce the messages that are being communicated by the coaching staff. These handouts will be e-mailed after one of four-weekly team meetings when that specific topic will have been discussed. Examples will be given of different recovery strategies that can take place, including: psychological (emotional based coping, positive reinforcement); passive (progressive muscular relaxation, hot and cold baths, reading, listening to music); and active (gentle exercise, stretching, enjoyable pastimes).

Whilst these educational and supportive tools are being implemented, it has also been emphasised that, as aspiring professionals, the players will have to take an active part in the process. Achieving the goal of winning a match or losing some weight is only worthwhile if they have had some control of the process (Bandura, 1986, Karoly, 1993). Eight of the players receive some funding from the club to help with expenses or university fees. These players have been given short-term goals on performance, attendance at university and training and fitness targets. It is on achievement of these targets that funding will be released. By reviewing the goals on a monthly basis, it is hoped that any negative change in process in these players will be highlighted before a corresponding change in performance occurs.

It is hoped that by planning the season's training in conjunction with the players' individual training, incorporating a regular recovery week and educating the players on how to deal with stressful situations, the players will be able to train harder and also recover more efficiently. The REST-Q will again be used alongside physical testing and subjective performance analysis to help monitor the success of the training cycle. With the coaches being much more aware of the importance of recovery and the dangers of the stress that some of the players face, it is hoped that the chance of underperformance and burnout will be greatly reduced.

Conclusions

When reviewing the problem statement, "Can the REST-Q accurately reflect the current physical and mental state of recovery and stress of youth rugby union players and predict future playing and physical performance, and likelihood of injury and staleness?" two conclusions can be reached: When compared to an individual history of each player, the answer is that it (1) helps diagnose the reason behind poor performance and highlights the current level of stress and recovery, but (2) may not accurately predict future performance and likelihood of injury. When compared to group norms, the answer is no.

The fact that individual comparisons against a group norm are not useful prevents the coach from just looking for a good or bad score to aid in selection. It increases the need for individual attention, looking at the welfare of the player, which assists communication and, hopefully, better coaching practice (Lyle, 1999).

The authors of the REST-Q recommend its use as an individual tool to monitor performance (Kellmann & Kallus, 2001) and also claim that it can be used as a likely predictor of future performance and links to medical complaints. Over the course of this study it was found that individual comparisons were indeed beneficial, but that future performance and likelihood of injury could not be predicted.

Once an accurate history of the player has been built up, then the REST-Q is a useful tool in helping to monitor the current state of a player's recovery and stress status. However, the fact that the questionnaire comprises fifty-two questions, meant that both inputting the data and analysing individual subscales was time-consuming, taking about three hours for forty players. This time may not be available in a part-time sporting environment and, if the REST-Q is to be useful in its application, it must be both easy to use and easy to analyse. Time must also be available to provide feedback to the coaching staff and players.

Once the players who had suffered from a drop in performance, fitness, or suffered from an injury, were approached and a more in-depth analysis and conversation could be held, then the REST-Q proved useful in helping to provide answers to the problem.

The difference in consistency and performance between those players at university, with little or no support structure in place, and those who lived at home with stronger support structures became apparent. As social support and a structured environment have been shown to be important in adhering to exercise (Palmer, et al., 1999), preventing burnout (Smith, 1986) and rehabilitating from injury (Magyar and Duda, 2000), this may not be surprising. However, the fact that university students have more time and opportunity to train, a useful factor in maintaining exercise routines (Dishman & Sallis, 1994), did not mean that they used that time constructively.

The REST-Q was useful in highlighting the fact that, despite their increased time available for training and recovery, the students did not actively pursue constructive recovery strategies that have been proven to help deal with stress and aid performance, such as pursuing a sound nutritional strategy (Morgan, et al., 1988) and getting enough sleep (Kellmann, 2002). The case studies showed the different levels of self-regulation of the players.

The authors had recommended against the use of one composite score for stress and recovery (Kellmann, & Kallus, 2001) and it was hoped that splitting the REST-Q into a stress and a recovery score would allow a simple comparison to be made for the coaching staff to understand. Greater analysis of the relationship between the stress and recovery was hoped for and the case studies seem to reinforce previous research that the two areas are separate processes (Steinacker, & Lehmann, 2002). The REST-Q was useful in differentiating the need for both coping strategies for stressful

situations - injury, selection issues, exams, and financial problems – as well as structuring adequate recovery programmes.

When dealing with youth athletes, the coach should look at developing the person first, the athlete second (Martens, 1996). Looking at a player's performance on the field alone limits the coach's ability to help his young player. If the person is suffering from stress, or is under recovered, then the athlete will not perform. The use of the REST-Q allows a greater understanding of what makes the athlete tick.

How much control the coach has over the external environment is questionable, but at least he can provide assistance or access to advice. If taken, this will help to improve performance to a greater degree than technique, strategy and tactics alone. This was shown in some of the case studies, where poor performance was turned around, showing what improvement can be made if the athlete and coach want to make a difference. The fact that these were athlete-centred approaches, geared to self-regulation as well as performance, showed a more humanistic approach to coaching (Lyle, 1999), rather than a more coach-centred approach previously used by the coach.

One limitation of the study, namely that the external training environment was not controlled, actually proved useful in understanding underperformance because it was this variable external environment that caused differences between players' performances. The time between tests was a limitation because that allowed for fluctuation in recovery and stress levels that may not have been apparent if they had returned to normal within eight weeks.

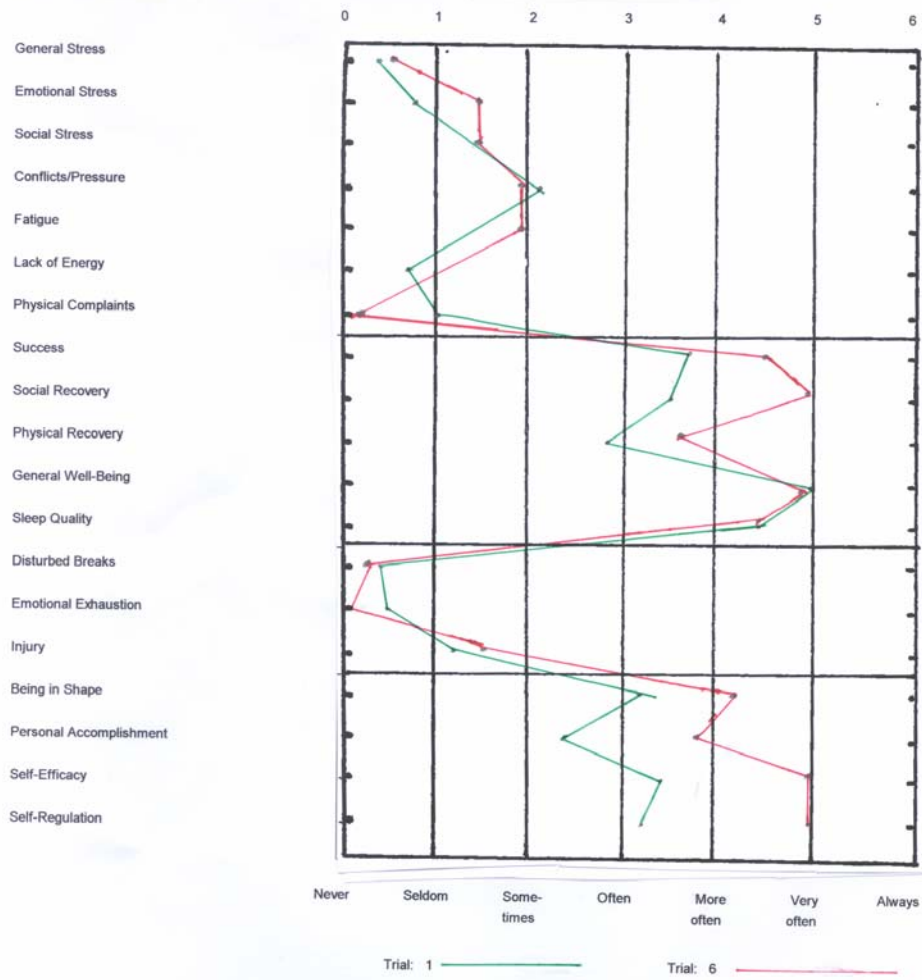
The composite score for stress and for recovery may have been a limitation. A more detailed analysis of the individual subscales as predictors of performance, injury and fitness may have been useful. However, this would not have been possible in this part-time environment and would have reduced the external validity of the study.

Future research may look at the suitability of individual subscales to form part of a shorter, more user-friendly REST-Q, such as the Recovery-Cue (Kellmann, et al., 2002). This may allow more frequent monitoring of a large group of players and, if changes are apparent, more immediate interventions made.

With more advice on recovery and stress-coping strategies and a more structured training programme being given to individuals, a comparison of adherence rates and stress, recovery, performance and fitness scores may be useful. This may lead to a distinction being made as to whether poor performance and training habits are down to a lack of coach education and implementation, or to poor player knowledge and self-regulation of recovery and coping programmes.

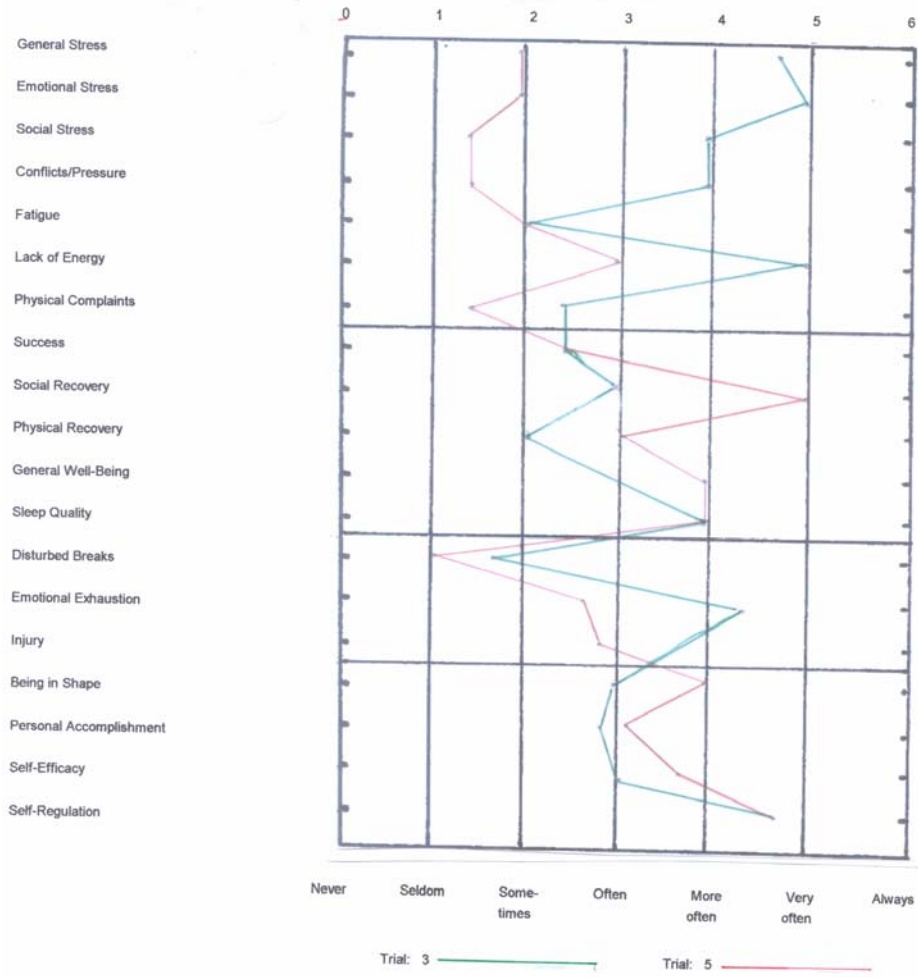
(The two graphs of players 'A' and 'C' follow.)

RESTQ-76 Sport Profile:



PLAYER A

RESTQ-76 Sport Profile:



PLAYER C