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## Applications of the session RPE system in professional rugby union

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<b>Corresponding Author:</b>	Eamonn Flanagan, PhD. Edinburgh Rugby Limerick, UNITED KINGDOM
<b>Corresponding Author Secondary Information:</b>	
<b>Corresponding Author's Institution:</b>	Edinburgh Rugby
<b>Corresponding Author's Secondary Institution:</b>	
<b>First Author:</b>	Tom Comyns, PhD.
<b>First Author Secondary Information:</b>	
<b>Order of Authors:</b>	Tom Comyns, PhD. Eamonn Flanagan, PhD.
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# **APPLICATIONS OF THE SESSION RPE SYSTEM IN PROFESSIONAL RUGBY UNION**

Authors: Tom Comyns, PhD., CSCS<sup>1</sup>, Eamonn P. Flanagan, PhD., CSCS<sup>2</sup>

Affiliation: <sup>1</sup> Irish Institute of Sport, National Sports Campus, Co. Dublin, Ireland

<sup>2</sup> Edinburgh Rugby, Murrayfield Stadium, Edinburgh, UK

Address:

Dr. Tom Comyns, 53 Newtown Park, Annacotty, Limerick, Ireland

Dr. Eamonn Flanagan, 75/4 Warrender Park Road, Edinburgh, EH9 1ES, UK.

Telephone:

Dr. Tom Comyns: (00353) 863617298

Dr. Eamonn Flanagan: (0044) 7764178953

Email: [eamonn.flanagan@gmail.com](mailto:eamonn.flanagan@gmail.com)

Running title: Applications of the Session RPE System

Key words: Training load; training monotony; training strain; periodisation; tapering; training load management; rugby union



Photo: Dr. Tom Comyns



Photo: Dr. Eamonn Flanagan

**Author bio:**

Dr. Tom Comyns is a strength and conditioning coach for the Irish Institute of Sport and a consultant lecturer in Sport Science at the University of Limerick and Dublin City University.

Dr. Eamonn Flanagan is strength and conditioning coach for Edinburgh Rugby.

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**APPLICATIONS OF THE SESSION RPE SYSTEM IN PROFESSIONAL RUGBY  
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1 Running title: Applications of the session RPE system

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3 Key words: Training load; training monotony; training strain; periodization; tapering;

4 training load management; rugby union

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7 **Lead Summary**

8 This article instructs strength and conditioning practitioners in the use of the session  
9 RPE system of training load monitoring in the context of the professional rugby union  
10 environment. An explanation of the system and the research underpinning its validity  
11 and reliability is presented. The use of the system to manage squad and individual  
12 player training plans within weeks and across weeks is detailed. Common errors which  
13 can be encountered when using the system within professional rugby union are  
14 addressed.

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4 **15 Introduction**  
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8 16 Rugby union is an intermittent high-intensity sport, in which activities that rely on  
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10 17 maximal strength, speed and power are interspersed with periods of lower intensity  
11  
12 18 aerobic activity and rest (12). It is a collision based field sport requiring high levels of  
13  
14 19 endurance, strength, power, agility and speed, as well as proficiency with rugby related  
15  
16 20 skills (1). These components comprise the training modalities used in professional rugby  
17  
18 21 union and the monitoring of such a vast range of modalities is central to performance.  
19  
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23 23 Training for success is a balance between achieving peak performance and avoiding the  
24  
25 24 negative consequences of excessive training. Training volumes and intensities that are  
26  
27 25 not optimal do not have the desired physiological adaptations, while those that are  
28  
29 26 excessive increase injury risk and impair sporting performance. An appropriate  
30  
31 27 periodization of the training stimulus applied to a player is important to obtain optimal  
32  
33 28 sporting performance.  
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37 29  
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39 30 Numerous techniques and methods are available to strength and conditioning coaches  
40  
41 31 to quantify the training stimuli that rugby players are exposed to. These include heart  
42  
43 32 rate monitoring and time motion analysis via Global Positioning Satellite (GPS) units (5).  
44  
45 33 Whilst these equipment and methods have proven to be accurate and to provide detailed  
46  
47 34 information on the training stimuli, from our experience there are disadvantages  
48  
49 35 associated with their utilization (5). These devices can be expensive especially with an  
50  
51 36 extended training squad, and the data analysis can be extensive. Multiple data sets are  
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53 37 also produced, which can be difficult to interpret and utilize by coaches.  
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39 An alternative method for quantifying the training stimuli is the session rate of perceived  
40 exertion (session RPE) method developed by Foster et al. (10). Session RPE is a  
41 simple, reliable, non-invasive and valid method based on the Borg's Category Ratio-10  
42 (CR-10) scale (1). The athlete rates the intensity of the session using the CR-10 and this  
43 value is multiplied by the session duration to get a training load (TL) score for the  
44 session. These session load values are used to calculate two other important variables -  
45 training monotony and training strain. Research has shown that the session RPE method  
46 is a reliable and simple tool to assess training load in steady-state aerobic training (9,  
47 10), intermittent-aerobic training (9) and strength training (6). The validity of the method  
48 has been specifically investigated in training sessions for collision based field sports (3).  
49 Recently, Clarke et al. (3) demonstrated strong correlations between session RPE and  
50 heart rate training impulse and stated that the method is inexpensive, practical and  
51 accurately measures individual's response to field training sessions. Anecdotally, it is  
52 known that the session RPE is a widely used method of quantifying training intensity and  
53 volume in professional rugby union.

54

55 **Session RPE method: an explanation**

56 The session RPE method monitors training by examining simple markers of both training  
57 volume and training intensity. Foster et al. (8, 9 and 11) developed the session RPE  
58 method based on a rating of perceived exertion for a session and the duration of the  
59 session. By using these two variables both the volume (duration) and the intensity (RPE)  
60 are factored into this method of monitoring. To calculate the measure of session  
61 intensity, the player is asked to rate the intensity of the session 30 minutes after  
62 completion of the session (9). This is undertaken by asking them 'How was your  
63 workout?' and having them rate it against a modified rating of Borg's CR-10 (9) which  
64 can be seen in table 1.

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65 << Table 1 about here >>

66 The delay in asking the player/ athlete to rate the intensity of the session is done to  
67 ensure that the rating reflects the global intensity of the session (9). If the rating was  
68 taken immediately post-session a particularly difficult or easy section at the end of the  
69 session could dominate the player/ athlete's rating (9). The RPE rating should reflect a  
70 single global rating of the intensity for the entire training session, according to Foster et  
71 al. (9). This RPE rating is then used in conjunction with the entire duration of the session  
72 to calculate the session training load (TL). TL is calculated by multiplying the session  
73 RPE by the duration of the session (figure 1).

74

75 << Figure 1 about here >>

76

77 For example, if a rugby training session lasted 85 minutes in length and the player gave  
78 a RPE rating of 5 (hard) for the session intensity then the following is the calculation of  
79 the TL for that session:

$$TL = 85 \times 5 = 425 \text{ arbitrary units (AU)}$$

81

82 By recording the session duration and session RPE for each session during a typical  
83 training week and calculating each individual session training load, two more important  
84 monitoring variables can be derived - training monotony and training strain. In order to  
85 accurately calculate these variables each session load needs to be calculated and rest  
86 days must carry a TL value of 0.

87

88 Training monotony is a measure of day-to-day training variability during a training week  
89 (7). McGuigan and Foster (13) referred to monotony as the variability of training for the  
90 training period. It is calculated by dividing the mean session training load by the standard

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91 deviation of the training load over a one-week period. If the training load is equally high  
92 on each day of the week the training monotony value will be high. Alternatively, if high  
93 and low load training days are interspersed throughout the training week, a moderate or  
94 low training monotony score will be derived.

95  
96 Both the overall weekly training load score, which is the product of all the individual  
97 session training load values throughout the week, and the training monotony score are  
98 used to calculate training strain (7). Training strain is a value that represents the overall  
99 stress that the athlete was exposed to throughout the training week. It is derived by  
100 multiplying the weekly training load (including the game load) by the training monotony  
101 score. A higher training load week together with a high monotony score yields excessive  
102 training strain values.

103  
104 An electronic spreadsheet can be created to calculate each individual session training  
105 load, weekly training loads and weekly training monotony and strain. Table 2 illustrates  
106 an example of such a spreadsheet. To use such a system each player's session RPE  
107 and session duration in minutes for each session must be entered. For rest days on  
108 which no training is undertaken, a training load value of zero must be entered.

109 << Table 2 about here >>

110 **Squad training load management**

111 The primary use of the session RPE method is to provide coaches with an overview of  
112 workload for athletes (or squads of athletes) across varying training modalities over time.  
113 Coutts et al. (4) described the periodization of professional rugby league training across  
114 a full training year using the session RPE system variables of training load, training  
115 monotony and training strain. Higher training loads were completed in preparatory

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116 macrocycles of training and training loads for strength training and conditioning were  
117 reduced during phases with high competition demands. Coutts et al. (4) showed that a  
118 periodized approach can be used in team sports and the authors support the use of the  
119 session RPE system as a practical method to guide and assess periodized training  
120 programs.

121 We have used this method extensively at two professional rugby teams. Training load,  
122 monotony and strain is tracked from week to week across periodized training blocks and  
123 provides coaches with a visual impression of the periodized plan as experienced by the  
124 athlete (9). Figure 2 displays a set of session RPE data for a professional rugby team  
125 across a 24 week period. This data would represent a “fit to play” squad which  
126 comprises of fully fit players participating in all modalities of training. Injured players or  
127 players on adapted training plans are not included in this dataset. Each player’s weekly  
128 training load, monotony and strain is calculated and then pooled into a squad average.

129 << FIGURE 2 ABOUT HERE >>

130

131 This period represented a pre-season phase leading into the first half of a competitive  
132 season. Weeks 1-6 represent the early pre-season phase. Weeks 8-12 represent the  
133 late pre-season phase. Weeks 7 and 19 represents a holiday week for the athletes. The  
134 in-season phase runs from week 13 to week 24 and includes one competitive game in  
135 each week. Graphically representing workload in this manner allows the coach to assess  
136 where heavy and light weeks have occurred and whether or not the athletes’ perception  
137 of training is consistent with the periodized plan. Our observations of periodized planning  
138 in professional rugby are that greatest training loads are accumulated in the early pre-  
139 season phase with average weekly loads of 2400-2600AU. In the in-season phase, the

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4 140 weekly workload notably reduces to values of approximately 1800-1900AU. These in-  
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6 141 season loads include loads accumulated in competitive games. An example of a within-  
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8 142 week breakdown of the training loads for the different components of training, e.g. rugby  
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10 143 team session, is provided in figure 3.

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14 144 << FIGURE 3 ABOUT HERE >>

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17 145 By plotting training monotony and strain along with training load between weeks it allows  
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19 146 coaches to identify weeks in which the training load has not been appropriately managed  
20  
21 147 and arranged within the week. Weeks of high monotony (and resultantly high strain) can  
22  
23 148 be identified and coaches can strive to organise training in a more optimal manner to  
24  
25 149 maintain training loads but reduce training monotony and training strain. An example of  
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27 150 this can be seen in weeks 2, 3 and 8, 9 where monotony rises above 1.2 units and  
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29 151 training strain increases 30-40% above training load (see figure 2). Figures 4 and 5  
30  
31 152 demonstrate the effect that within-week training load organisation can have on training  
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33 153 monotony and strain. In week A and week B Saturday represents a game day over  
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35 154 which coaches have no control of load management.

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41 155 << FIGURES 4 & 5 ABOUT HERE >>

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44 156 Throughout both weeks players accumulate the same absolute training loads (2125) but  
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46 157 when the organisation of training is monotonous from day to day this leads to a sub-  
47  
48 158 optimal training plan and unnecessarily high training strains. Week A alternates heavy  
49  
50 159 and moderate days and has an additional day off within the week. Week B follows a  
51  
52 160 more homogenous training load across the week. Although there is a tapering of training  
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54 161 load throughout the week toward the game day, the result of this homogeneity is an  
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56 162 elevated training monotony which leads to approximately 30% increase in training strain.

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163 Foster (7) has recommended that alternating hard and easy training days reduces  
164 training monotony and strain and this balanced approach to load management may help  
165 reduce incidences of illness and overtraining (7).

166 A strong advantage of the session RPE system is to allow coaches to assess the impact  
167 of programmed taper or “light” weeks. There is an established need for periodic  
168 reductions in training load to treat and prevent overtraining (14). The technique of  
169 systematically decreasing training load to facilitate physiological fitness is known as a  
170 taper.

171 An extensive review of the factors involved in tapering is available (14). Based on the  
172 scientific literature, when an appropriate and successful taper is implemented, athletes  
173 can expect improvements in power, strength, serum testosterone levels and mood state  
174 and decreases in muscle damage, sleep disturbance and cortisol levels (14). From our  
175 experience in professional rugby union, tapering can be achieved by reductions in  
176 training frequency, duration, intensity or volume or a combination of these factors.

177 It has been recommended that for experienced athletes in anaerobic sports that the key  
178 variable for manipulation when tapering is overall training volume (14).  
179 Recommendations have been made for magnitudes of volume reduction based on the  
180 duration of “normal” training carried out up to the taper week. Volume reduction in the  
181 context of controlled training, such as strength training, is very easy to assess and  
182 control via the number of repetitions (reps x sets) or volume load (reps x absolute load).  
183 However, attempting to assess volume reduction across all the aspects of professional  
184 rugby training such as on-field training, speed training and conditioning is much more  
185 difficult and less measurable. The session RPE method offers a unique opportunity to  
186 assess tapering volume reductions holistically across all aspects of training.



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4 187 The session RPE systems allows coaches to compare the overall training load across  
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6 188 the tapering week to previous “normal” training weeks and assess whether or not the  
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8 189 planned changes in training load have resulted in a similar reduction to the actual  
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10 190 training load. By assessing the weekly training loads in this context it allows coaches to  
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12 191 assess if the programmed reduction has had the desired effect. In reference to figure 2,  
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14 192 planned “download” weeks were implemented in weeks 5, 11, 17 and 24 and training  
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16 193 loads are notably lower in these weeks. Our observations have been that athletes  
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18 194 generally accumulate 70-80% of the training load in download weeks compared with the  
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20 195 average of the other weeks in that training block. It has been our experience that quite  
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22 196 drastic reductions in programmed training volume are required to have measurable,  
23  
24 197 appreciable effects on training load perception by players. This may include a significant  
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26 198 reduction of number of exercises, sets and repetitions in strength training sessions (20-  
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28 199 30% volume reduction), reduced on-field training time (10-15 minutes less per session)  
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30 200 and a reduction in overall training frequency through the elimination of extra, short-  
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32 201 duration conditioning sessions for some players.  
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## 42 203 **Individual player management**

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45 204 The session RPE method can assist in managing players with acute injury in their return  
46  
47 205 to full training. Players with short-term acute injuries (4-6 weeks) or in the latter stages of  
48  
49 206 long term injury are often capable of following adapted training plans and are often only  
50  
51 207 restricted from performing specific types of training such as full contact rugby training.  
52  
53 208 Coaches can use the RPE system to help develop injured players training to “mirror” full  
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55 209 team training even if some of their sessions have to be adapted in nature. The RPE  
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57 210 system assists the returning player in training in the same pattern of exercise and  
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211 recovery as fully fit players so that when they can return to full training they can adapt  
212 more readily and their body is ready to exercise and recover at the same frequency as  
213 the full training squad.

214 The RPE system can also be used in the management of chronic injuries. Some players  
215 in the professional rugby environment are unable to follow a full weekly training plan due  
216 to chronic injury management. Such players often need to be managed in a week-by-  
217 week or day-by-day manner depending on their specific condition and symptoms. In  
218 conjunction with medical staff, strength and conditioning coaches can track what type of  
219 loads (magnitude, training frequency etc) are associated with increases in chronic injury  
220 symptoms. Coaches can develop a personal profile of what loads and strains are  
221 tolerable. This can help with individual planning and scheduling and assist in making  
222 more informed decisions as to what sessions will the player participate in or whether or  
223 not they should have time restrictions on their involvement in specific sessions. Figure 6  
224 demonstrates the training loads of a player with a chronic injury gradually returning from  
225 an adapted training plan to a full training plan.

226 << FIGURE 6 ABOUT HERE >>

227 **Common errors and omissions**

228 There are a number of potential errors which need to be avoided when using the session  
229 RPE system in the professional rugby environment. As with any data collection system,  
230 consistency of data collection must be as closely adhered to as possible. With the  
231 session RPE method consistency must be maintained in the collection of RPE scores  
232 from players and in the timing of sessions. As previously stated, players should report

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233 RPE scores within 30 minutes of the cessation of training and should refer to a  
234 consistent scale when giving these scores.

235 Consistency is highly important when timing session or game duration also. Coaches  
236 should decide ahead of the season's data collection whether or not they plan to include  
237 warm-up duration in their overall session time and adhere to this decision throughout the  
238 season. The game-day warm-up presents a particularly unique problem in maintaining  
239 data collection consistency. The game-day warm-up is generally much longer in duration  
240 than warm-ups used in day-to-day rugby sessions. The game-day warm-up typically  
241 lasts 20-30 minutes. It is also drastically different to the game itself and can be much  
242 less in terms of intensity and physical effort. Including the game-day warm-up as part of  
243 the game duration can overestimate the training load of the game as the respective RPE  
244 scores of both modalities are generally much different. We recommend omitting the  
245 warm-up phase from the training load of the game or scoring it separately and following  
246 this protocol for the duration of the season.

247 We recommend using the actual time players spend on the pitch, rather than the  
248 standardised game time of 40 minutes per half. With in-game stoppages a half of rugby  
249 can often last over 45 minutes. This actual game time, rather than an artificial game  
250 clock time should be used for most accurate training load calculations.

251 Another common error associated with using the RPE method in the team sport  
252 environment relates to the inclusion of zero values on non-training days. On a non-  
253 training day, a zero value for training load should be recorded and these zero values  
254 should be included in calculations of weekly training loads, monotony and strain. The  
255 associated zero training load values have a significant effect on training monotony and

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4 256 strain. If these zero values are not recorded and included in the relevant calculations  
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6 257 then training monotony and strain will appear artificially high.  
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10 258 Coaches should exercise caution in comparing raw training load, monotony and strain  
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12 259 values between players. If a particular player is exhibiting a higher recorded training  
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14 260 load, for example, than another player this does not necessarily mean that he has  
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16 261 accumulated a higher actual training load. From our experience, some players are  
17  
18 262 simply “high raters” and will rate will consistently rate sessions of the same work output  
19  
20 263 on a higher level to their teammates. This is likely due to a differing individual subjective  
21  
22 264 interpretation of the RPE scale. It is perfectly valid to compare raw time scores between  
23  
24 265 players but in terms of training loads we suggest comparing individual players to the “fit  
25  
26 266 to play” squad average to assess individual differences in trends of training load rather  
27  
28 267 than in absolute values. In figure 6 an individual players training load is plotted with  
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30 268 respect to the “fit to play” squad average. While we do not deem it valid to compare the  
31  
32 269 absolute values between the player and the squad average we think this type of  
33  
34 270 graphical representation is a useful method to compare the individual’s trend of training  
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36 271 loads to the squad trend. This allows us to assess if the individual has a similar outline of  
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38 272 training load from week to week to the squad average. Has the player had taper weeks  
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40 273 when the squad has had taper weeks? Has the overall outline of the player from week to  
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42 274 week matched that of the squad?  
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49 275 As previously stated, one of the common goals of using the session RPE system is to  
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51 276 establish weekly training loads (and monotony and strain values) for the playing squad.  
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53 277 Calculating this squad average data can be wrought with errors and must be  
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55 278 approached with caution. Within the professional rugby environment, players can often  
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57 279 be on adapted training schedules due to acute or chronic injury or due to involvement in  
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59 280 alternative playing squads. The inclusion of such players in the weekly average  
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4 281 calculations can artificially reduce the squad data. At the end of each training week, we  
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6 282 recommend the selection of a “fit to play squad” or a “training squad”. This could  
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8 283 comprise of players who have completed the entire week’s training and playing  
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10 284 schedule. This should give coaches a truer reflection of the training loads accrued by the  
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12  
13 285 planned training schedule.

## 16 286 **Conclusion**

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19 287 The session RPE system is a reliable and valid measure to provide strength and  
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21 288 conditioning practitioners with simple and subjective markers of overall training load. The  
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23 289 system can be used to provide information on within-week and across-week training  
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25 290 loading within the professional rugby environment. Practitioners, however, should be  
26  
27 291 keenly aware that it is a simple and subjective measure and is best used in tandem with  
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29 292 other monitoring systems such as time motion analysis via GPS of rugby training  
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31 293 sessions and volume load monitoring of strength training sessions. These systems  
32  
33 294 provide very detailed, objective and accurate markers of the external loads experienced  
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35 295 within specific training systems while heart rate monitoring provides detailed and  
36  
37 296 objective information regarding the internal load experienced during rugby training. This  
38  
39 297 is a scope of information which is beyond the session RPE system. However, the  
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41 298 session RPE system provides more subjective information of the internal load  
42  
43 299 experienced by players across all modalities of training and helps bridge the gap  
44  
45 300 between objective internal and external training monitors and players’ perception of  
46  
47 301 training load.

## 52 302

## 54 303

## 56 304 **Figure captions**

57 305 Figure 1: Training load is the product of session time and session RPE  
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306 Figure 2: An example dataset of training load, stain and monotony over the course of a  
307 24-week period of a rugby season.

308 Figure 3: An example of a within week training load breakdown for the different  
309 components of rugby training.

310 Figure 4: Week A - An example of a well organised training week which attempts to  
311 minimise training monotony and training strain.

312 Figure 5: Week B - An example of a poorly organised training week which does not  
313 minimise training monotony and training strain.

314 Figure 6: The training loads of a player with chronic injury returning from an adapted  
315 training plan to a full training plan.

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317 **Table captions**

318 Table 1: The session RPE scale.

319 Table 2: An example of a spreadsheet layout for calculating training load, monotony and  
320 strain.

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322 REFERENCES

323 1. Appleby, B, Newton, RU, Cormie, P. Changes in strength over a 2-year period in  
324 professional rugby union players. *J. Strength Cond. Res.* 26(9): 2538-2546,  
325 2012.

326 2. Borg, G. Psychophysical basis of perceived exertion. *Med. Sci. Sports Exerc.* 14:  
327 363-367, 1982.

328 3. Clarke, N, Farthing, JP, Norris, SR, Arnold, BE, and Lanovaz, JL. Quantification  
329 of training load in Canadian Football: Application of Session-RPE in collision-  
330 based team sports. *J. Strength Cond. Res.* December 2012 (Published online  
331 ahead of print).

332 4. Coutts, A, Sirotic, A, Catterick, C, and Knowles, H. Monitoring training loads in  
333 professional rugby league. In: *Science and Football VI: Proceedings of the Sixth*  
334 *World Congress on Science and Football.* Reilly T, Korkusuz F, ed. London:  
335 Routledge, 2009. pp. 272-277.

336 5. Cunniffe, B, Proctor, W, Baker, JS, and Davies, B. An evaluation of the  
337 physiological demands of elite rugby union using global positioning system  
338 tracking software. *J. Strength Cond. Res.* 23(4): 1195-1203, 2009.

339 6. Day, M, McGuigan, MR, Brice, G, and Foster, C. Monitoring exercise intensity  
340 during resistance training using the session-RPE scale. *J. Strength Cond. Res.*  
341 18: 353-358, 2004.

342 7. Foster, C. Monitoring training in athletes with reference to overtraining syndrome.  
343 *Med. Sci. Sports Exerc.* 30(7): 1164-1168, 1998.

344 8. Foster, C, Daines, E, Hector, L, Snyder, A, and Welsh, R. Athletic performance in  
345 relation to training load. *Wis. Med. J.* 95: 370-374, 1996.

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346 9. Foster, C, Florhaug, JA, Franklin, J, Gottschall, L, Hrovatin, L, Parker, S,  
347 Doleshal, P, and Dodge, C. A new approach to monitoring exercise training. J.  
348 Strength Cond. Res. 15: 109-115, 2001.

349 10. Foster, C, Hector, LL, Welsh, R, Schrage, M, Green, MA, and Snyder, AC.  
350 Effects of specific versus cross-training on running performance. Eur. J. Appl.  
351 Physiol. 70(4): 367-372, 1995.

352 11. Foster, C, and Lehmann, M. Overtraining syndrome. In: Running Injuries. Gnuten  
353 N, ed. Philadelphia: WB Saunders, 1997. pp. 173-188.

354 12. Nicholas, CW. Anthropometric and physiological characteristics of rugby union  
355 football players. Sports Med. 23: 375-396, 1997.

356 13. McGuigan, MR, and Foster, C. A new approach to monitoring resistance training.  
357 J. Strength Cond. Res. 26(6): 42-47, 2004.

358 14. Wilson, JM, and Wilson, GJ. A practical approach to the taper. Strength Cond. J.  
359 30: 10-17, 2008.

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FIGURE 1

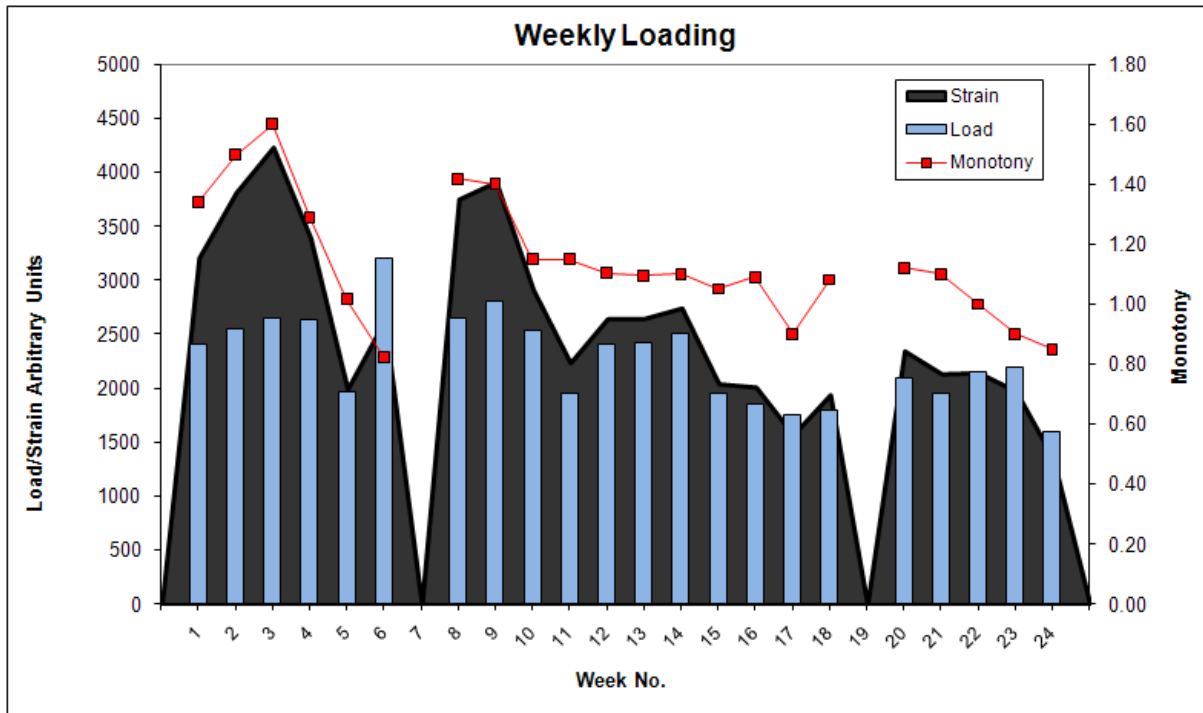
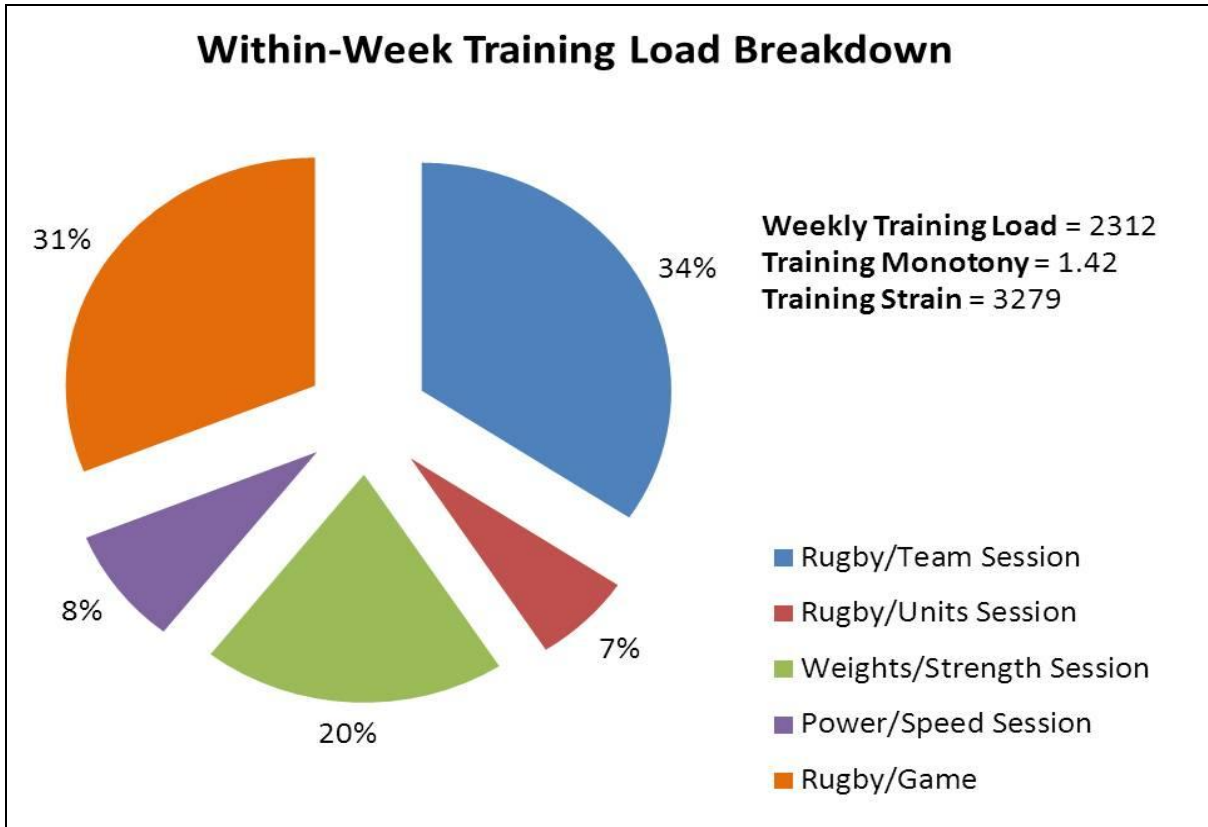
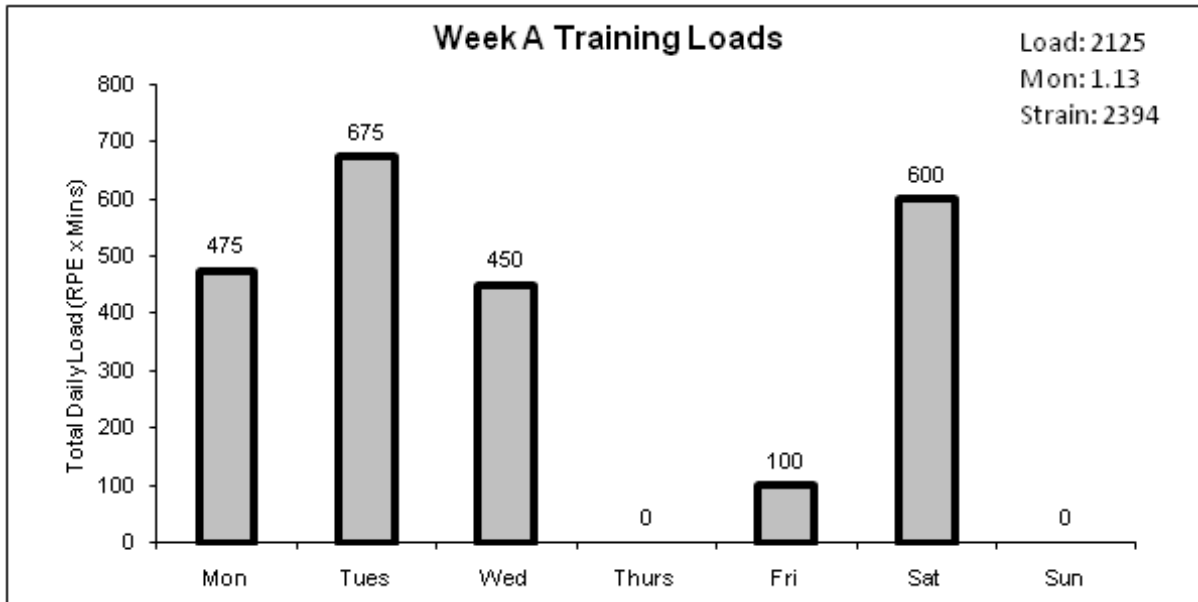


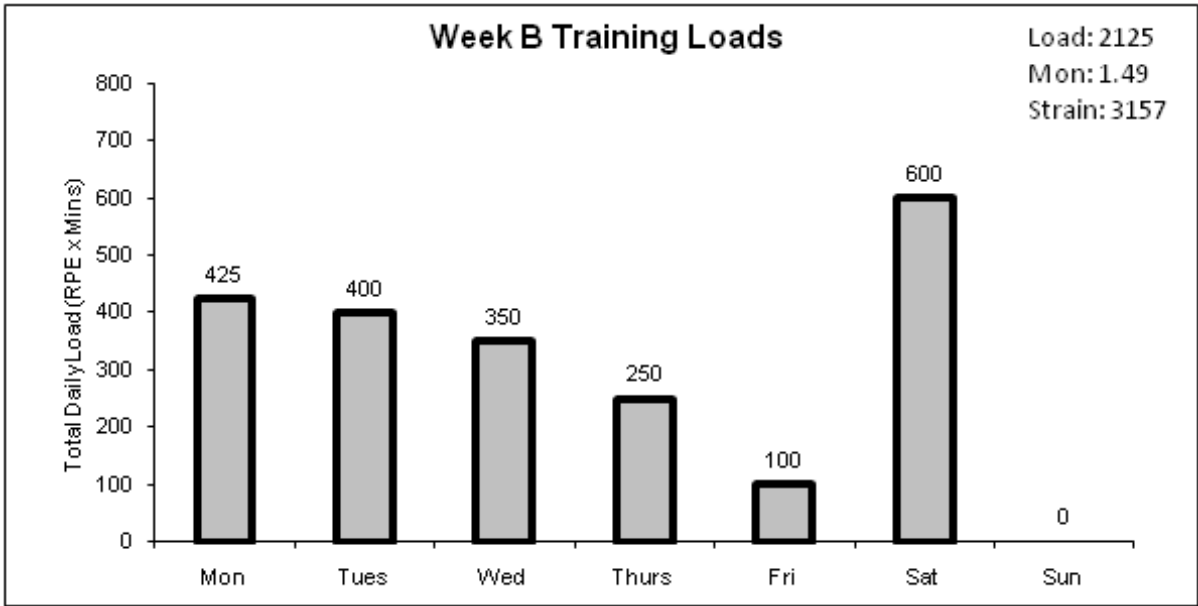
FIGURE 2



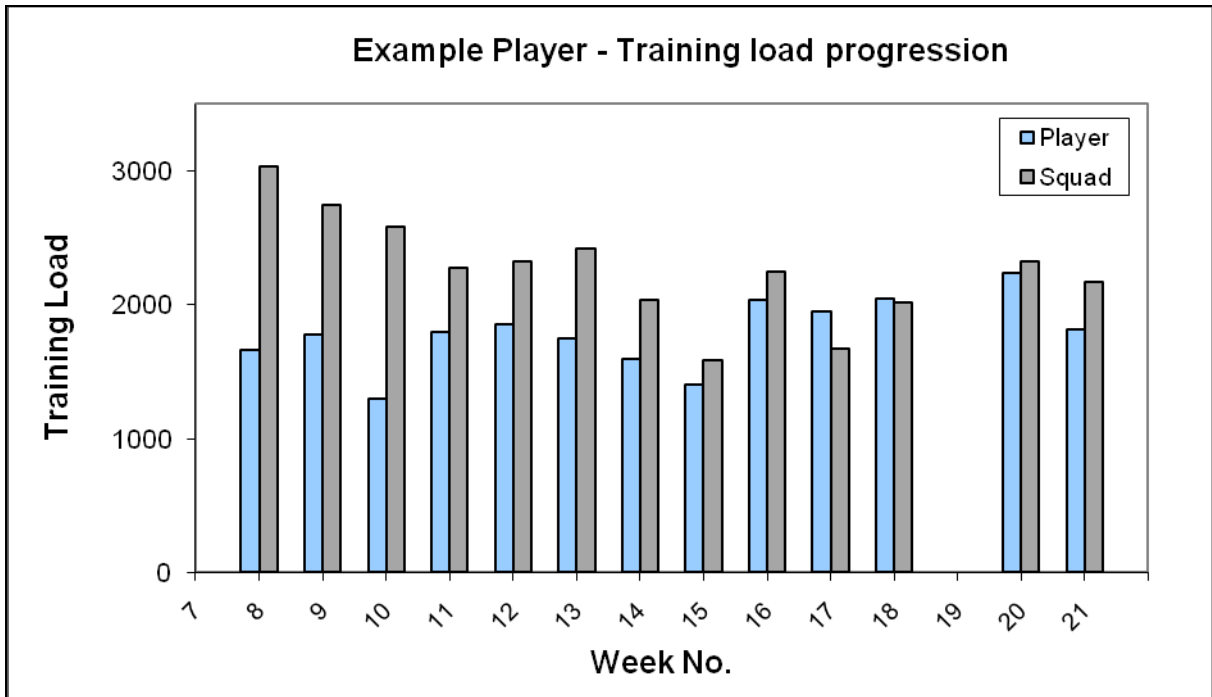
**FIGURE 3**



**FIGURE 4**



**FIGURE 5**



**FIGURE 6**

RATING	DESCRIPTOR
0	Rest
1	Very, very easy
2	Easy
3	Moderate
4	Somewhat hard
5	Hard
6	
7	Very hard
8	
9	
10	Maximal

TABLE 1

DAY	SESSION	SESSION-RPE	SESSION DURATION (MINS)	SESSION TL	DAILY TL
Monday	Weights/ Strength	4	45	180	<b>300</b>
	Speed	4	30	120	
Tuesday	Rugby Training (Units)	6	80	480	<b>480</b>
Wednesday	Weights/ Strength	4	35	140	<b>290</b>
	Conditioning	6	25	150	
Thursday	Rugby Training (Team)	5	65	325	<b>325</b>
Friday	Rest Day	0	0	0	<b>0</b>
Saturday	Rugby Game	8	65	520	<b>520</b>
Sunday	Rest Day	0	0	0	<b>0</b>
			<b>Weekly Training Load</b>		<b>1915</b>
			<b>Average Daily Training Load</b>		<b>274</b>
			<b>Training Monotony</b>		<b>1.32</b>
			<b>Training Strain</b>		<b>2533</b>

TABLE 2