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**Title:** Understanding the relationship between coach and athlete perceptions of training intensity in youth sport

**Running title:** The relationship between coach and athlete perceptions of intensity

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**1 Abstract**

2 To alleviate issues arising from the over/under prescription of training load, coaches  
3 must ensure that desired athlete responses to training are being achieved. The present  
4 study aimed to assess the level of agreement between the coach intended (pre-session)  
5 and observed (post-session) rating of perceived exertion (RPE), with athlete RPE during  
6 different training intensities (easy, moderate, hard). Coach intended RPE was taken  
7 prior to all field based training sessions over an 8 week in-season period. Following  
8 training, all coaches and athletes, whom were participants in hockey, netball, rugby and  
9 soccer were asked to provide an RPE measure for the completed session. Sessions were  
10 then classified based on the coaches intended RPE, with a total of 28, 125 and 66 easy,  
11 moderate and hard training sessions collected respectively. A univariate analysis of  
12 variance was used to calculate within-participant correlations between coach  
13 intended/observed RPE and athlete RPE. *Moderate* correlations were found between  
14 coach intended and athlete RPE for sessions intended to be moderate and hard whilst a  
15 *small* correlation was found for sessions intended to be easy. The level of agreement  
16 between coach and athlete RPE improved following training with coaches altering their  
17 RPE to align with those of the athlete. Despite this, *moderate* and *small* differences  
18 between coach observed and athlete RPE persisted for sessions intended to be easy and  
19 moderate respectively. Coaches should therefore incorporate strategies to monitor  
20 training load to increase the accuracy of training periodisation and reduce potential  
21 over/under prescription of training.

22 **Keywords:** Periodisation, Training Load, Soccer, Rugby, Hockey,

23

24

25

26 **INTRODUCTION**

27 The periodisation of training for youth athletes is a complex process, as the coach must  
28 foster the development of the athlete across years rather than on a week to week basis,  
29 commonly seen within senior sport (5). Regardless of whether the focus of training is  
30 on developing talent or athleticism, the long-term development of the youth athlete  
31 requires the coach to integrate a broad range of activities whilst also balancing exposure  
32 to competitive events and training (22). The manipulation of training volume and  
33 intensity must be systematic, stimulating continued physical adaptations through  
34 progressive overload whilst guarding against maladaptive training outcomes such as  
35 non-functional overreaching and overuse injury through the integration of sufficient  
36 recovery (9). Although a key factor in the successful long-term development of a youth  
37 athlete requires practitioners to utilise relevant training load monitoring tools (21), it is  
38 an undeniably challenging task.

39 Youth athletes frequently participate in multiple sports or across multiple age  
40 groups and playing standards within the same sport (25), meaning periodisation must be  
41 inclusive of the entirety of the youth athletes training schedule. Subsequently, all the  
42 youth athletes' coaches should work synergistically to construct a training program  
43 providing a sufficient stimulus to facilitate positive physiological adaptation and prevent  
44 deconditioning whilst also avoiding an excessive ratio of workload-to-recovery (23). As  
45 20% of school and club level athletes in the United Kingdom have suffered from non-  
46 functional overreaching and overuse injuries at some point in their careers (23), the  
47 combination of training load and recovery does not appear to be co-ordinated.

48 To optimise periodisation and maintain the workload-recovery ratio, coaches  
49 must ensure training sessions delivered achieve the desired internal response (6).  
50 Tracking an athletes rating of perceived exertion (RPE) provides the coach with a  
51 simple, quick and valid (16,19,20) method of quantifying the athletes' acute response to  
52 training. However, despite the precise nature of RPE, there is a lack of agreement  
53 between the intended session RPE set by the coach, the RPE observed by the coach and  
54 the athletes' RPE (5,6,27).

55 Research within swimming (27) and running (11) has found coaches to  
56 underestimate RPE for low intensity sessions but overestimate for high intensity  
57 sessions despite the association improving with athlete age and experience (2).  
58 Additionally, Murphy et al., found tennis coaches underestimated perceived intensity  
59 (24). The lack of agreement between coach intended/observed RPE and the athletes'  
60 perceptions of session intensity is exacerbated further in team sports where individual  
61 characteristics such as fitness and experience can influence RPE (14). Coaches must be  
62 cognizant of the perceptions of individual players within the team rather than assuming  
63 a global perception of intensity for the entire team. Research investigating the  
64 relationship between athlete and coach perceptions of session intensity within team  
65 sports is limited to elite standard youth soccer players (5,6). This research showed  
66 intended coach RPE underestimates athlete RPE for easier sessions and overestimates  
67 the athletes RPE for harder (5) sessions whilst the coaches observed session intensity  
68 underestimates athlete RPE on an individual level (6). Without a precise comprehension  
69 of the perceived training intensity on an individual level, athletes are at a risk of a  
70 maladaptive training response.

71           There is a reduced margin for error in youth sport where school and social stress  
72 can accumulate alongside fatigue derived from training load to increase the  
73 susceptibility of non-functional overreaching and overuse injury (23). Therefore,  
74 coaches must be confident that they are accurately prescribing and evaluating session  
75 intensity to avoid inappropriate training loads through the over/under prescription  
76 through a training session. As previously mentioned, periodisation requires planned  
77 fluctuations of training volume and intensity to promote overload and eventual super-  
78 compensation (4). Therefore, the school or club coach will vary session intensity based  
79 on the periodized schedule. Although previous literature (5) has investigated the  
80 influence of session intensity on the harmony between coach and athlete RPE, the  
81 coaches' perception of intensity was obtained prior to the session as an intended RPE.  
82 Recent research (6) has shown soccer coaches to change their perception of intensity  
83 post session, rather than maintain perceptions based on their originally intended RPE.  
84 Therefore, the aim of the present study was to assess the level of agreement between  
85 coaches intended RPE, coaches observed RPE and athletes RPE in youth rugby, soccer  
86 and hockey following training sessions the athletes perceived to be easy, moderate or  
87 hard.

88

## 89 **METHOD**

### 90 **EXPERIMENTAL APPROACH TO THE PROBLEM**

91 The study used an observational and longitudinal research design, whereby data were  
92 collected over an 8 week in-season training period from April to May 2016. Coaches  
93 were instructed to carry out their training sessions as normal with no interference from  
94 the researcher. All participants typically completed 2 training sessions per week

95 structured around a competitive fixture. Players and coaches were familiar with the RPE  
96 collection method as it was regularly used within the school program prior to the  
97 commencement of the study. Only data obtained from field based training sessions were  
98 analysed.

99

## 100 **SUBJECTS**

101 Thirty-seven adolescent athletes including 9 female hockey (age  $17.4 \pm 0.8$  years, height  
102  $164.7 \pm 6.4$  cm, body mass  $60.0 \pm 6.3$  kg), 8 female netball (age  $17.6 \pm 0.6$  years, height  
103  $167.8 \pm 4.2$  cm, body mass  $58.0 \pm 7.2$  kg), 10 male rugby union (age  $17.2 \pm 0.4$  years,  
104 height  $179.9 \pm 5.4$  cm, body mass  $83.6 \pm 11.5$  kg) and 10 male soccer (age  $17.2 \pm 0.8$   
105 years, height  $174 \pm 0.05$  cm, body mass  $73.6 \pm 7.1$  kg) players were recruited from an  
106 independent school in the United Kingdom. Four coaches (one per sport) were recruited  
107 to take part. All coaches had >5 years coaching experience with 3 of the coaches  
108 (rugby, hockey, netball) having coached at senior international level and 1 coach  
109 (soccer) at elite youth level. All coaches had worked with the study participants for >1  
110 year. Coaches, players and parents provided informed written consent prior to  
111 participation. Ethics approval was granted by the Leeds Beckett University's ethics  
112 committee.

113

## 114 **PROCEDURES**

115 Prior to all field-based training sessions, coaches were asked to rate the intended  
116 intensity of the training session, providing a RPE measure to the lead researcher. The  
117 RPE selection was made non-verbally, by pointing to the desired text descriptor on a  
118 modified Borg category ratio-10 (CR-10) scale. Following the training session, coaches

119 were asked to provide another RPE measure to the lead researcher using the same  
120 method, this time relating to the intensity they thought the training session was.  
121 Coaches were instructed to provide intended and observed RPE's for individual players  
122 within the session rather than providing a global RPE for the entire squad. Athletes who  
123 took part in each of the training sessions were asked to provide an RPE measure in the  
124 same manner as the coaches with measurements taken in isolation from other  
125 participants to avoid external influence on selection. Measures of RPE were taken  
126 approximately 30 minutes following each training session to avoid any influence the  
127 activities completed towards the end of each training session had on RPE (12).

128 Sessions were grouped as easy (1-2), moderate (3-4) and hard (5-10) based on  
129 the intended session RPE of the coach with the corresponding athlete/coach observed  
130 RPE aligned to each response. A total of 28, 125 and 66 easy, moderate and hard  
131 training sessions were analysed respectively.

132

### 133 **STATISTICAL ANALYSIS**

134 A univariate analysis of variance with participants controlled for as a random factor was  
135 used to calculate within-participant correlations and associated 95% confidence  
136 intervals (95%CI) between coach intended RPE, coach observed RPE and athlete RPE  
137 for easy, moderate and hard training sessions (3). The univariate analysis of variance  
138 provided a partial ETA squared value which was subsequently square rooted to provide  
139 a value of  $r$ . The magnitude of the correlation was classified per the following  
140 thresholds;  $r = 0.1-0.29$  *small*,  $0.3-0.49$  *moderate*,  $0.5-0.69$  *large*,  $0.7-0.89$  *very large*,  
141  $0.9-0.99$  *nearly perfect*,  $1$  *perfect* (18). Statistical analyses were carried out using the  
142 SPSS statistical analysis software for mac (version 24.0, SPSS Inc., Chicago, IL, USA).



143 Differences between the mean values for coach intended, coach observed and  
144 athlete RPE for easy, moderate and hard session intensities were assessed using a  
145 customised excel spreadsheet (17). The threshold for a change to be considered  
146 practically important (the smallest worthwhile change; SWC) was set at 0.2 x observed  
147 participant standard deviation (SD), based on Cohen's *d* effect size (ES) principle. The  
148 magnitude of difference was classified as <0.2 *trivial*, 0.21 to 0.6 *small*, 0.61 to 1.2  
149 *moderate*, 1.21 to 2.0 *large* and >2.0 *very large* (18). Effect sizes are presented with  
150 associated 90% confidence intervals (18). The probability that the magnitude of change  
151 was greater than the aforementioned effect size thresholds was rated as follows; <0.5%  
152 *almost certainly not*, 0.5-5% *very unlikely*, 5-25% *unlikely* 25-75% *possible*, 75-95%  
153 *likely*, 95-99% *very likely* and 100% *almost certainly* (18).

154

## 155 RESULTS

156 Table 1 displays the mean and standard deviations (SD) of coach intended RPE, coach  
157 observed RPE and athlete RPE for all training sessions grouped together as well as  
158 sessions intended to be easy, moderate and hard.

159

160 \*\*\*INSERT TABLE 1 NEAR HERE\*\*\*

161

162 Table 2 displays the correlation coefficients and 95% confidence intervals for coach  
163 intended RPE, coach observed RPE and athlete RPE for all training sessions grouped  
164 together as well as sessions intended to be easy, moderate and hard.

165

166 *Coach Intended RPE vs. Athlete RPE*

167 Figure 1 displays the regression plots for the agreement between coach intended RPE  
168 and athlete RPE. There was a *moderate* correlation ( $r=0.39$ ; 0.27 to 0.49) between  
169 coach intended RPE and athlete RPE when all sessions were considered together.  
170 Separating training sessions into those intended to be easy, moderate and hard provides  
171 further understanding of the relationship between coach intended RPE and athlete RPE.  
172 *Moderate* correlations were found between coach intended RPE and athlete RPE for  
173 sessions intended to be both moderate and hard, whilst a *small* correlation was found  
174 between athlete RPE and sessions the coach intended to be easy

175 There was *almost certainly* a *moderate* difference between coach intended RPE  
176 and athlete RPE for sessions intended to be easy (Effect Size = ES (ES; 1.17; 0.7 to  
177 1.65) and *likely small* differences between athlete RPE and sessions the coach intended  
178 to be moderate (ES; -0.36; -0.56 to -0.11) and hard (ES; -0.46; -0.72 to -0.20)  
179 respectively.

180

181 **\*\*\*INSERT FIGURE 1 NEAR HERE\*\*\***

182

183 *Coach Observed RPE vs. Athlete RPE*

184 Figure 2 displays the regression plots for the agreement between coach observed RPE  
185 and athlete RPE. There was a *large* correlation ( $r= 0.63$ ; 0.54 to 0.70) between coach  
186 observed RPE and athlete RPE when all training sessions were considered together.  
187 When training sessions were separated into the coach intended intensities, there was a  
188 *large* correlation between coach observed RPE and athlete RPE for sessions intended to  
189 be easy, a *small* correlation for sessions intended to be moderate and a *very large*  
190 correlation for sessions intended to be hard.

191 There was a *likely moderate* difference between coach observed RPE and athlete  
192 RPE for sessions intended to be easy (ES 0.83; 0.4 to 1.28), a *likely small* difference  
193 (ES -0.29; -0.46 to -0.11) for sessions intended to be moderate and a *possibly trivial*  
194 difference for sessions intended to be hard (ES -0.05; -0.24 to 0.36).

195

196

\*\*\*INSERT FIGURE 2 NEAR HERE\*\*\*

197

198

\*\*\*INSERT TABLE 2 NEAR HERE\*\*\*

199

## 200 **DISCUSSION**

201 This study investigated the level of agreement between the intended RPE set by the  
202 coach and the post session RPE of the athlete as well as the agreement between the  
203 coach and athlete post session RPE at different session intensities (easy, moderate,  
204 hard). The study found a lack of agreement between the intended session RPE of the  
205 coach and the RPE of the athlete. *Small* and *moderate* within participant correlations  
206 were found following sessions intended to be easy, moderate and hard respectively.  
207 Despite the lack of synchronisation between intended training intensity and the intensity  
208 perceived by the athletes, the agreement between coach and athlete RPE improved  
209 following training with *large* and *very large* correlations found between coach observed  
210 and athlete RPE for sessions intended to be easy and hard respectively. A *moderate*  
211 correlation was found for sessions intended to be of a moderate intensity.

212 In line with previous research in both swimming (27) and running (11), intended  
213 coach RPE underestimated session intensity for easy sessions but overestimated

214 intensity for sessions perceived to be hard. Despite similar findings, the correlation  
215 coefficients between intended coach RPE and athlete RPE found in swimming ( $r=0.84$ )  
216 and running ( $r=0.75$ ) were larger than the correlation coefficient found within the  
217 present study ( $r=0.39$ ). The different sports analysed in the respective studies may  
218 explain the dissimilarity in findings. When prescribing a training load for an individual  
219 swimmer or runner, the coach can be more vigilant on the workload completed during  
220 the session (e.g. control of meters swam/ran, time taken) facilitating a higher level of  
221 agreement between intended intensity and athlete RPE. Alternatively, the team sports  
222 (rugby, hockey, netball and soccer) analysed within this study offer a more complex  
223 challenge to the coach as certain players will naturally acquire a higher training load  
224 due to factors such as playing position or drill selection (5). Therefore, the coach must  
225 plan training intensities on an individual basis rather than applying an intended RPE for  
226 the entire squad.

227         Although research within team sports is sparse, *small* correlations between  
228 coach intended RPE and athlete RPE have been found in elite youth soccer ( $r=0.24$ ) (5).  
229 In agreement with the present study, individuals found premeditated easy sessions to be  
230 harder than the coach intended but found harder sessions to be easier than intended.  
231 A potential reason for the lack of agreement between coach intended RPE and athlete  
232 RPE is the elevated perception of training intensity experienced by the athletes on  
233 training days intended to be easier. Training at a higher than intended intensity can  
234 contribute to a greater than anticipated level of muscle soreness post training (26),  
235 indicative of exercise-induced micro-trauma and an ensuing rise in muscle damage (8).  
236 As a result, the residual fatigue experienced by the athlete may limit performance in  
237 subsequent training sessions with previous literature demonstrating exercise induced

238 muscle damage to restrict anaerobic performance (1), high-speed running performance  
239 (8) and distance covered at a lower intensity (7). Additionally, literature examining the  
240 relationship between external training load markers and perceptions of session intensity  
241 within team sports has found that increased high speed running distance (15) and total  
242 distance (14) covered to correlate with athlete RPE. Therefore, the residual fatigue  
243 accumulated by athletes in the present study by training harder than intended on easy  
244 training days may have limited their ability to train at the required intensity on training  
245 days intended to be hard.

246 A lack of harmony between the intended session intensity and athlete RPE can  
247 lead to errors in training periodisation (6). Training sessions that were intended to be  
248 hard, were on average, perceived to be less intense by the athlete. To maintain or  
249 improve physiological characteristics it is essential the prescribed training load provides  
250 a sufficient stimulus to promote adaptation, otherwise the youth athlete is left at risk of  
251 deconditioning (4). An insufficient accumulation of load may leave the athlete  
252 physically incapable of handling the stress placed upon them in match play or in a block  
253 of more demanding training sessions, pre-disposing the athlete to injury (13).

254 Alternatively, as training sessions become less intense to promote recovery,  
255 athletes who are perceiving sessions to be harder than expected are at risk of non-  
256 functional overreaching or overuse injury through the accumulation of excess training  
257 load (10). Problems arising through the inadvertent accumulation of load may be  
258 exacerbated for school or club sport athletes who compete in various sports or for  
259 various teams within the same sport (25). A consistent underestimation of training load  
260 across multiple training sessions, on top of school and social stress may predispose the  
261 youth athlete to a level of stress they are unable to cope with leading to overuse injury

262 or non-functional overreaching (10). Therefore, it is important that coaches are aware of  
263 the external training variables which contribute to elevated perceptions of intensity in  
264 their sport. Although previous research (14,15) has distinguished the training load  
265 factors which lead to higher RPE's in elite team sports it remains an under researched  
266 area within youth team sports with further research required. Such findings would  
267 provide coaches with the information necessary to plan more informed training  
268 sessions, increasing the likelihood of achieving the desired internal response.

269 As well as successfully achieving an intended training response, another  
270 important element in effective periodisation is accurately observing the intensity post  
271 session. Regardless of the intended session RPE, if the coach can accurately distinguish  
272 how hard a session was, they can make amendments to future training sessions to ensure  
273 the required training load is met. In line with previous research in youth soccer (6), this  
274 study found coaches to alter their post session RPE from the intended session RPE to be  
275 more in tune with the athletes perception of training intensity. Despite improved  
276 synchronisation of coach and athlete RPE, discrepancies continued to exist between  
277 perceptions of intensity for sessions intended to be easy and moderate. Previous  
278 research in elite youth tennis (24) and soccer (6) found the coach to underestimate  
279 session RPE in comparison to the athletes however the magnitude of correlation was not  
280 established for different session intensities. This study offers a greater insight into the  
281 relationship between observed coach and athlete RPE by assessing the level of  
282 agreement for easy, moderate and hard training sessions.

283 Following training sessions that were initially intended to be hard, coaches  
284 altered their perception of training intensity to align with athlete RPE. However,  
285 *moderate* and *small* differences between coach observed RPE and athlete RPE persisted

286 for sessions intended to be easy and moderate respectively. When assessing session  
287 intensity, coaches will focus on the difficulty of the session and provide an RPE based  
288 on the training activity alone. However, RPE can be affected by external sources of  
289 stress such as school work or social problems (23) meaning that the athlete RPE's  
290 analysed in the present study may not be a direct representation of the training session,  
291 restricting the correlation between coach observed and athlete RPE. Accounting for an  
292 individual's non-training related stress is a complex challenge and coaches should look  
293 to quantify load by recording individual RPE responses post training rather than relying  
294 on their own observations.

295 Although the present study considered youth athletes from 4 different sports  
296 (rugby, hockey, football and netball), there was an insufficient number of training  
297 sessions to differentiate the magnitude of correlations for the individual sports.  
298 Therefore, no inferences can be made regarding the influence of the sport played  
299 between coach intended/observed RPE and athlete RPE. Future research should seek to  
300 establish the correlation between coach and athlete RPE for each sport separately to  
301 ascertain if the level of agreement is affected by sport.

302

### 303 **PRACTICAL APPLICATIONS**

304 A mismatch between the coaches intended training intensity and the post session RPE  
305 of the athlete can lead to errors in periodisation. An overestimation of RPE, as seen in  
306 this study for intended hard and moderate sessions, can leave the athlete at risk of  
307 deconditioning via an insufficient training stimulus to promote physiological adaption  
308 (4). Alternatively, an underestimation of load as seen during intended easy training  
309 sessions may predispose the athlete to overuse injury or non-functional overreaching

310 through an inability to handle the excess load (10). If intended training loads are not  
311 being achieved, the coach can still make necessary adjustments to training by increasing  
312 or decreasing session intensity in upcoming sessions so that training loads realign with  
313 the intended periodisation. The modification of training load would require the coach to  
314 be able to accurately observe the intensity of the training session before making  
315 subsequent changes. This study indicates that although the coach modifies their  
316 intended RPE following training, the observed RPE still *moderately* underestimates  
317 RPE for easy sessions with a *small* overestimation of athlete RPE for intended moderate  
318 sessions. It is recommended that coaches put in place training load monitoring strategies  
319 such as quantifying load through individual RPE responses following training, rather  
320 than relying on their own perception of session intensity. Such strategies would increase  
321 the accuracy of training periodisation reducing the problems arising from an over/under  
322 prescription of training load.

323

#### 324 **REFERENCES:**

- 325 1. Ascensao, A, Rebelo, A, and Oliveira, E. Biochemical impact of a soccer match  
326 — Analysis of oxidative stress and muscle damage markers throughout recovery.  
327 *Clin Biochem* 41: 841–51, 2008.
- 328 2. Barroso, R, Cardoso, RK, Carmo, EC, and Tricoli, V. Perceived exertion in  
329 coaches and young swimmers with different training experience. *Int J Sports*  
330 *Physiol Perform* 9: 212–216, 2014.
- 331 3. Bland, JM and Altman, DG. Calculating correlation coefficients with repeated  
332 observations: Part 1--Correlation within subjects. *BMJ*. 310: 446, 1995.



- 333 4. Bompa, T and Buzzichelli, C. *Periodization Training for Sports*. 3rd ed. Human  
334 Kinetics, 2015.
- 335 5. Brink, MS, Frencken, WGP, Jordet, G, and Lemmink, KAPM. Coaches' and  
336 players' perceptions of training dose: Not a perfect match. *Int J Sports Physiol*  
337 *Perform* 9: 497–502, 2014.
- 338 6. Brink, MS, Kersten, AW, and Frencken, WGP. Understanding the mismatch  
339 between coaches' and players' perceptions of exertion. *Int J Sports Physiol*  
340 *Perform* 1–25, 2016.
- 341 7. Carling, C, Dupont, G, Carling, C, and Dupont, G. Are declines in physical  
342 performance associated with a reduction in skill-related performance during  
343 professional soccer match-play? 414, 2017.
- 344 8. Carling, C, Gregson, W, Wong, DP, and Bradley, PS. Match Running  
345 Performance During Fixture Congestion in Elite Soccer : Research Issues and  
346 Future Directions. *Sport Med* 605–613, 2015.
- 347 9. Carter, J, Potter, A, and Brooks, K. Overtraining syndrome : causes,  
348 consequences, and methods for prevention. *J Sport Hum Perf* 2: 1–14, 2014.
- 349 10. Difiori, JP, Benjamin, HJ, Brenner, J, Gregory, A, Jayanthi, N, Landry, GL, et al.  
350 Overuse Injuries and Burnout in Youth Sports: A Position Statement from the  
351 American Medical Society for Sports Medicine. *Clin J Sport Med* 24: 3–20,  
352 2014.
- 353 11. Foster, C, Brice, G, and Foster, C. Differences in perception of training by

- 354 coaches and athletes Differences in perceptions of training by coaches and  
355 athletes. *South African J Sport Med* 8: 3–7, 2001.
- 356 12. Foster, C, Florhaug, JA, Franklin, J, Gottschall, L, Hrovatin, LA, Parker, S, et al.  
357 A new approach to monitoring exercise training. *J strength Cond Res* 15: 109–  
358 15, 2001.
- 359 13. Gabbett, TJ. The training-injury prevention paradox: should athletes be training  
360 smarter and harder? *Br J Sports Med* 50: 1–9, 2016.
- 361 14. Gallo, T, Cormack, S, Gabbett, T, Williams, M, and Lorenzen, C. Characteristics  
362 impacting on session rating of perceived exertion training load in Australian  
363 footballers. *J Sports Sci* 33: 1–9, 2014.
- 364 15. Gaudino, P, Iaia, FM, Strudwick, AJ, Hawkins, RD, Alberti, G, Atkinson, G, et  
365 al. Factors influencing perception of effort (session rating of perceived exertion)  
366 during elite soccer training. *Int J Sports Physiol Perform* 28: 860–864, 2015.
- 367 16. Gomes, R V, Moreira, A, Lodo, L, Capitani, CD, Aoki, MS, Foster, C, et al.  
368 Ecological validity of session RPE method for quantifying internal training load  
369 in tennis. *Int J Sports Sci Coach* 10: 729–737, 2015.
- 370 17. Hopkins, W. A spreadsheet to compare means of two groups. *Sport Sci* 11: 22–  
371 23, 2007.
- 372 18. Hopkins, WG, Marshall, SW, Batterham, AM, and Hanin, J. Progressive  
373 statistics for studies in sports medicine and exercise science. *Med Sci Sports*  
374 *Exerc* 41: 3–12, 2009.

- 375 19. Impellizeri, FM, Rampinini, E, Coutts, AJ, Sassi, A, and Marcora, SM. Use of  
376 RPE-based training load in soccer. *Med Sci Sport Exerc* 36: 1042–1047, 2004.
- 377 20. Kelly, DM, Strudwick, AJ, Atkinson, G, Drust, B, and Gregson, W. The within-  
378 participant correlation between perception of effort and heart rate-based  
379 estimations of training load in elite soccer players. *J Sports Sci* 34: 1–5, 2016.
- 380 21. Lloyd, R, Cronin, J, Faigenbaum, A, Haff, G, Howard, R, Kraemer, W, et al. The  
381 national strength and conditioning association position statement on long-term  
382 athletic development. *J Strength Cond Res* 30: 1491–1509, 2016.
- 383 22. Lloyd, R, Oliver, JL, Faigenbaum, AD, Howard, R, De Ste Croix, MBA,  
384 Williams, CA, et al. Long-Term Athletic Development- Part 1. *J Strength Cond*  
385 *Res* 29: 1439–1450, 2015.
- 386 23. Matos, NF, Winsley, RJ, and Williams, CA. Prevalence of nonfunctional  
387 overreaching/overtraining in young english athletes. *Med Sci Sports Exerc* 43:  
388 1287–1294, 2011.
- 389 24. Murphy, AP, Duffield, R, Kellett, A, and Reid, M. Comparison of athlete-coach  
390 perceptions of internal and external load markers for elite junior tennis training.  
391 *Int J Sports Physiol Perform* 9: 751–756, 2014.
- 392 25. Phibbs, P, Jones, B, Roe, G, Read, D, Darrall-Jones, J, Weakley, J., et al. We  
393 know they train, but what do they do? Implications for coaches working with  
394 adolescent rugby union players. *Int J Sport Sci Coach* 1–23, 2016.
- 395 26. Seiler, S. What is Best Practice for Training Intensity and Duration Distribution

396 in Endurance Athletes? *Br Rev Int J Sport Physiol Perform* 5: 276–291, 2010.

397 27. Wallace, LK, Slattery, KM, and Coutts, AJ. The ecological validity and  
 398 application of the session-RPE method for quantifying training loads in  
 399 swimming. *J Strength Cond Res* 23: 33–38, 2009.

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 401 **Table 1; Coach intended RPE, athlete RPE, and coach observed RPE for Easy,**  
 402 **Moderate and Hard training sessions (Mean  $\pm$  SD).**

Coach Intended RPE (AU)	Athlete RPE (AU)	Coach Observed RPE (AU)
All training sessions ( $3.6 \pm 1.2$ )	$3.5 \pm 1.8$	$3.5 \pm 1.1$
Intended Easy sessions ( $1.9 \pm 0.3$ )	$3.8 \pm 2.2$	$2.3 \pm 0.9$
Intended Moderate sessions ( $3.2 \pm 0.4$ )	$2.9 \pm 1.2$	$3.1 \pm 0.4$
Intended Hard sessions ( $5.2 \pm 0.6$ )	$4.5 \pm 2.1$	$4.6 \pm 1.1$

403 Data are presented as mean  $\pm$  SD, RPE (Rating of Perceived Exertion), AU (Arbitrary  
 404 Units).

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**Table 2; Relationships between coach intended RPE, athlete RPE and coach observed RPE for Easy, Moderate and Hard training sessions.**

	Coach Intended RPE		
	Easy	Moderate	Hard
Athlete RPE	r= 0.39; 95% CI 0.02-0.67	r= 0.27; 95% CI 0.1-0.43	r= 0.46 95% CI 0.25-0.63
Coach Observed RPE	r= 0.54; 95% CI 0.09-0.76	r= 0.20; 95% CI 0.02-0.36	r= 0.79; 95% CI 0.68-0.87

RPE (Rating of Perceived Exertion), CI (Confidence Intervals).

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