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1 **Full Title:** A detailed quantification of differential ratings of perceived exertion during
2 team-sport training

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52 **Abstract**

53 *Objectives:* To investigate the application of differential ratings of perceived exertion (dRPE) to team-
54 sport training.

55 *Design:* Single cohort, observational study.

56 *Methods:* Twenty-nine professional rugby union players were monitored over a six-week intensified
57 training period. Training sessions were classified as: High-Intensity Intervals (HIT), Repeated High-
58 Intensity Efforts (RHIE), Speed, Skill-based Conditioning (SkCond), Skills, Whole-Body Resistance
59 (RT), or Upper-Body Resistance (URT). After each session, players recorded a session rating of
60 perceived exertion (sRPE; CR100[®]), along with differential session ratings for breathlessness (sRPE-
61 B), leg muscle exertion (sRPE-L), upper-body muscle exertion (sRPE-U), and cognitive/technical
62 demands (sRPE-T). Each score was multiplied by the session duration to calculate session training
63 loads. Data were analysed using mixed linear modelling and multiple linear regression, with
64 magnitude-based inferences subsequently applied.

65 *Results:* Between-session differences in dRPE scores ranged from very likely trivial to most likely
66 extremely large and within-session differences amongst dRPE scores ranged from unclear to most
67 likely very large. Differential RPE training loads combined to explain 66–91% of the variance in sRPE
68 training loads, and the strongest associations with sRPE training load were with sRPE-L for HIT ($r =$
69 0.67 ; 90% confidence limits ± 0.22), sRPE-B for RHIE (0.89 ; ± 0.08) and SkCond (0.67 ; ± 0.19), sRPE-
70 T for Speed (0.63 ; ± 0.17) and Skills (0.51 ; ± 0.28), and sRPE-U for resistance training (RT: 0.61 ;
71 ± 0.21 , URT: 0.92 ; ± 0.07).

72 *Conclusions:* Differential RPE can provide a detailed quantification of internal load during training
73 activities commonplace in team sports. Knowledge of the relationships between dRPE and sRPE can
74 isolate the specific perceptual demands of different training modes.

75

76 **Keywords:** RPE; Training Monitoring; Internal Load; Training Demands; Training Prescription;
77 Rugby.

78

79 **Introduction**

80 The monitoring of training loads is commonplace in team sports.^{1,2} Internal load represents the
81 relative psychophysiological response to the training or match workloads performed,³ and is the
82 stimulus for both positive (i.e. fitness and preparedness)⁴⁻⁶ and negative (i.e. fatigue, non-functional
83 overreaching, and injuries/illness)^{1,7} training-related outcomes. Session ratings of perceived exertion
84 (sRPE) provide a practical and valid measure of exercise intensity across a range of team-sport
85 training modes,⁸⁻¹⁰ allowing for the quantification of internal training load (sRPE × training time)¹¹ as
86 a single-item term integrating both training session volume and intensity.

87 Session RPE depend on many factors integrated into a gestalt score.¹² A gestalt rating could,
88 however, represent an oversimplification that is insufficient to capture and fully appraise the entire
89 range of exertion signals during exercise.^{7,12,13} For example, a ‘very hard’ resistance training session
90 (~7 or ~70 on the Borg CR10[®] and CR100[®] scales,¹⁴ respectively) is likely to induce dissimilar
91 metabolic, cardiovascular and neuromuscular responses in comparison with a ‘very hard’, running-
92 based, high-intensity interval training session.^{15,16} Although sRPE do distinguish internal load between
93 contrasting training modes,^{9,17,18} such differences tell little of the underlying psychophysiological
94 disparities that are of importance to those evaluating and prescribing training activities.

95 By focusing perceptual reports on their specific mediators (e.g. central and peripheral
96 exertion),¹⁹ differential ratings of perceived exertion (dRPE) have the potential to provide additional
97 information from that obtained by a single measure. Despite some authors questioning the practical
98 relevance of these measures,^{20,21} others recommend dRPE to be a worthwhile addition to the
99 monitoring of training^{5,22,23} and match^{24,25} loads in team sports.

100 The physical preparation of team-sport athletes encompasses several training modes, each with
101 distinct external demands.^{9,16} Despite this, the majority of research into dRPE has so far been
102 conducted during single exercise modes (e.g., treadmill running^{20,23} cycling,^{19,23} team-sport match-
103 play^{21,24,25}). As such, the application of dRPE to team-sport training warrants further examination
104 before any rigorous conclusions regarding its usefulness can be made. Accordingly, the aim of our
105 study was to provide the first detailed quantification of dRPE during team-sport training and to

106 examine the magnitudes of the differences in dRPE during training activities with disparate external
107 loads.

108

109 **Methods**

110 Twenty-nine professional, male, rugby union players (age: 24 ± 3 y, stature: 181 ± 16 cm, body
111 mass: 99 ± 12 kg, body fat: $17.4 \pm 5.0\%$, Yo-Yo Intermittent Recovery Level 1 [YYIRL1] distance:
112 1780 ± 410 m) from the same English Rugby Football Union Championship club provided voluntary
113 consent to participate in this investigation. This sample included 14 forwards (age: 24 ± 3 y, stature:
114 182 ± 22 cm, body mass: 109.0 ± 6.5 kg, body fat: $19.4 \pm 5.5\%$, YYIRL1 distance: 1650 ± 420 m) and
115 15 backs (age: 23 ± 3 y, stature: 179.7 ± 5.1 cm, body mass: 88.8 ± 7.5 kg, body fat: $15.2 \pm 3.1\%$,
116 YYIRL1 distance: 1900 ± 380 m). The study conformed to the Declaration of Helsinki and received
117 approval from the ethics committee of the School of Social Sciences, Business and Law at Teesside
118 University.

119 Using an observational longitudinal design, players were monitored over a six-week preparatory
120 training period. Prior to this period, players had completed four weeks of active recovery (i.e.
121 transitional phase) and one week of fitness testing. One week of active recovery and regeneration was
122 implemented following the third week of the study period; however, for the purpose of this
123 investigation, training data from the recovery week was not included in our analysis. During the six-
124 week data collection period, training load was monitored using the sRPE method¹¹ (global and
125 differential), which was recorded after every training session (details below). Players were habituated
126 with this procedure as per the clubs usual monitoring practices.

127 The training programme was designed and implemented by the clubs coaching and support
128 staff. Training loads were increased linearly during the first three weeks of training (general
129 preparatory phase) and were subsequently tapered throughout weeks four, five and six (specific
130 preparatory phase). All players trained together, or within positional group clusters (forwards, backs).
131 Players typically completed 9–12 training sessions per week, which were distributed evenly across
132 four training days (2–3 per day) and occurred at the same time each week. Training sessions typically

133 involved 4–6 main exercises/drills, and could be identified as one of the following seven distinct
134 training typologies:

- 135 – *High-Intensity Intervals* (HIT): Intermittent bouts of either long (1–2 min), short (≤ 30 s) or
136 maximal (< 10 s; sprint) running efforts, interspersed with brief active and passive recovery
137 periods (intra-set work: rest ratios typically 2:1, 1:1 and 1:4–6, respectively). One session per
138 week lasting ~30 minutes was executed.
- 139 – *Repeated High-Intensity Efforts* (RHIE): Game- and position-specific efforts (linear and
140 multidirectional sprints, simulated contacts/tackles, grapples, wrestles, static exertions, loaded
141 tasks, etc.) performed at or near to maximal intensity for relatively short work periods (5–10
142 s), followed by equivalent duration rest periods (1:1 work: rest ratio for intra- and inter-set).
143 One session per week lasting ~30 minutes was executed.
- 144 – *Speed*: Physical and technical drills aimed at improving sprint kinematics, running mechanics,
145 acceleration and maximum velocity. One session per week lasting ~30 minutes was executed.
- 146 – *Skill-based Conditioning* (SkCond): Small-sided, intermittent, high-intensity games with
147 modified rules, pitch dimensions and number of players; interspersed with semi-opposed,
148 open gameplay aimed at improving rugby-union-specific fitness and performance of skills and
149 execution of tactics under fatigue. One sessions per week lasting ~75 minutes was executed.
- 150 – *Skills*: Individual-, unit- and team-based drills aimed at developing rugby-union-specific skills
151 (passing, body positioning, etc.), position-specific skills (set-piece, kicking, etc.) and team
152 strategy (attack and defence patterns, etc.). Three to four sessions per week that each lasted
153 ~40 minutes were executed.
- 154 – *Whole-Body Resistance* (RT): Hypertrophy- (3–4 sets of 8–12 reps at ~70–80% 1 repetition-
155 maximum [1RM]) or strength/power-based (3–6 sets of 3–6 reps at ~80–95%/50–70% 1RM)
156 resistance exercises, typically involving compound movements, with auxiliary exercises
157 including isolated resistance, plyometrics, isometric holds and resisted functional/transfer
158 tasks. Three sessions per week that each lasted ~60 minutes were executed.

159 – *Upper-Body Resistance* (URT): As above, but upper-body exercises only. One session per
160 week lasting ~60 minutes was executed.

161 Training sessions involving large volumes of high-speed running (HIT, Speed, SkCond) were
162 performed in the morning, prior to resistance and skills sessions (afternoon), as a means of minimising
163 the risk of running-based soft tissue injuries occurring as a consequence of acute neuromuscular
164 fatigue.

165 After each training session, players individually recorded a sRPE, along with differential
166 session ratings for breathlessness (sRPE-B), leg muscle exertion (sRPE-L), upper body muscle
167 exertion (sRPE-U), and cognitive/technical demands (sRPE-T).²⁴ Ratings were recorded
168 approximately 15–30-minutes following the end of the session.¹¹ Despite this time period being
169 practically feasible when collecting RPE data from large groups (i.e. in the team-sport environment),
170 we acknowledge that a latency effect may exist within this post-session window.²³ Each RPE score
171 was multiplied by the session duration (min) to calculate overall session load.¹¹ In team sports, sRPE
172 have demonstrated good construct validity as measures of exercise intensity and internal load during
173 the aforementioned training activities.⁸⁻¹⁰ Furthermore, dRPE have displayed convergent validity in the
174 measurement of exercise intensity amongst objective physiological measures.²³ The test re-test
175 reliability of RPE in the team sport environment is reported to be high (ICC = 0.99, TEM = 4.0%).¹⁰

176 Ratings were graded using the CR100[®] scale,¹⁴ which provides a more sensitive and precise
177 measure of perceived exertion when compared with the traditional CR10[®] scale.²⁶ Players were fully
178 habituated with the entire range of sensations that correspond to each category of effort within the
179 CR100[®] scale and were clearly explained on the protocols for judging global and differential effort
180 perception prior to each data entry.²⁷ Scores were recorded via a bespoke computer application
181 running on a 7" Android tablet (Iconia One 7 B1-750, Taipei, Taiwan: Acer Inc.). The applications
182 interface consisted of a numerically blinded CR100[®] scale labelled with the idiomatic English verbal
183 anchors,¹¹ in an attempt to minimise passive error caused by integer bias (supplementary file 1). Once
184 players had recorded their RPE using the touch-screen interface, the software uploaded each
185 quantitative score to a cloud-based spreadsheet (Microsoft Excel 2013[®], Redmond, USA: Microsoft

186 Corp.). A single data entry (five RPE scores) lasted <45 seconds per player. Using four tablets in
187 rotation, RPE data for the entire squad was typically collected within a 10-minute period.

188 Prior to analysis, assumptions of normality were checked using visual inspection of the raw data
189 via histograms and Q-Q plots. Raw data was seen to follow a normal distribution, and is therefore
190 presented as the mean \pm standard deviation (SD). We used a mixed effects linear model (SPSS v.21,
191 Armonk, NY: IBM Corp.) to compare a) the within-session differences in dRPE (sRPE-B, sRPE-L,
192 sRPE-U and sRPE-T) and, b) the between-session differences in each RPE measure. This is the
193 appropriate method when handling repeated measures time series data from multiple individuals as it
194 allows for the specification and estimation of fixed (e.g. training mode and RPE type) and random (i.e.
195 within-player) effects.²⁸ Differences are presented with 90% confidence limits (CL) as markers of
196 uncertainty in the estimates. Standardized thresholds of 0.2, 0.6, 1.2, 2.0, and 4.0 multiplied by the
197 pooled between-player SD were used to anchor small, moderate, large, very large and extremely large
198 differences, respectively.²⁹ Inference was then based on the disposition of the confidence interval for
199 the mean difference in relation to these thresholds via the magnitude-based inference approach, using
200 the usual scale of probabilistic terms.²⁹ A difference was deemed unclear if the CL overlapped both
201 substantially positive and negative thresholds by $\geq 5\%$. Multiple linear regression was used to examine
202 the extent to which dRPE could explain the variance in sRPE training load. The magnitude of the
203 dRPE training loads as predictors of sRPE training load was represented using partial correlation, with
204 90% CLs constructed using a bias corrected accelerated bootstrapping technique of 2000 samples with
205 replacement from the original data (SPSS v.21, Armonk, NY: IBM Corp.). The usual scale of
206 correlation magnitudes was used to interpret the correlation coefficients²⁹ and magnitude-based
207 inferences were subsequently applied to describe the uncertainty in the estimates, as previously
208 described.

209

210 **Results**

211 A total of 1474 individual training sessions were recorded. The mean (\pm SD) RPE data for each
212 training mode over the six-week training period are presented in Figure 1 and the between-session
213 comparisons of dRPE scores are presented in Table 1. Between-session comparisons of dRPE scores

214 revealed differences ranging from possibly trivial to most likely extremely large for sRPE-B; possibly
215 trivial to most likely extremely large for sRPE-L; likely trivial to most likely extremely large for
216 sRPE-U; and very likely trivial to very likely moderate for sRPE-T. The within-session comparisons
217 of dRPE scores revealed differences ranging from unclear to very likely very large for HIT; likely
218 trivial to very likely very large for RHIE; possibly small to most likely very large for Speed; very
219 likely trivial to most likely moderate for SkCond; most likely trivial to most likely large for Skills;
220 most likely trivial to most likely large for RT; and unclear to most likely very large for URT (Table 3;
221 supplementary file 2).

222 The mean (\pm SD) sRPE and dRPE accumulated training loads for each mode and all training
223 combined over the six-week training period are presented in Table 2, along with the sRPE training
224 load regression analysis. Differential RPE training loads combined to explain 66–91% of the variance
225 in sRPE training load within each training mode. Regression diagnostics indicated no degrading
226 collinearity between the dRPE training loads (tolerance range: 0.141 to 0.796). Partial correlations
227 revealed that the strongest association between dRPE training loads and sRPE training load for each
228 training mode was with sRPE-L for HIT (likely large [positive]), sRPE-B for RHIE (most likely very
229 large) and SkCond (likely large), sRPE-T for Speed and Skills (possibly large), and sRPE-U for
230 resistance training (RT: likely large; URT: possibly near perfect). Taking all training together, dRPE
231 training loads combined to explain 77% of the variance in sRPE training load (tolerance levels: 0.141
232 to 0.367) and the strongest associations between the dRPE training loads and sRPE training load was
233 with sRPE-L (possibly large [positive]).

234

235 Discussion

236 In team sports, it is common for practitioners to measure a wide range of external load variables
237 (e.g., global positioning satellite- and accelerometer-derived measures), yet a single measure of
238 internal load is common (e.g., sRPE). This is perhaps surprising given that internal load is the stimulus
239 for both positive^{4,6} and negative^{1,7} training-related outcomes. Differential ratings of perceived exertion
240 (dRPE) have the potential to provide additional information from that obtained by a single measure by
241 discriminating between different dimensions of effort.^{23,24} The main findings of our preliminary

242 investigation into the application of dRPE to team-sport training were that distinct training typologies
243 elicit different dRPE, and the use of dRPE isolates the specific perceptual demands of training.

244 It has been suggest that differentiating sRPE adds little value to the measurement of exercise
245 intensity during steady-state treadmill running²⁰ or soccer match-play.²¹ Despite this, substantial
246 differences have been reported between dRPE during controlled laboratory exercise^{19,23} soccer
247 training,⁵ and Australian Football match-play,²⁴ suggesting that dRPE do indeed represent internal
248 constructs that are perceived differently. The current investigation provides to date the most detailed
249 quantification of dRPE during the team-sport training environment, taking different training modes
250 into account. In agreement with others, we typically found substantial differences in dRPE, both
251 within and between each training mode. Our regression analyses indicate that sRPE-B, sRPE-L, sRPE-
252 U and sRPE-T each make a unique contribution to sRPE, and the input of each measure is dependent
253 upon training mode. These data suggest that within the multidimensional construct of perceived
254 exertion, team-sport athletes are able to recognise the disparity between feelings of breathlessness,
255 muscle fatigue, and also cognitive exertion during a range of training activities with different external
256 loads. We therefore believe that the information obtained from dRPE is meaningful and represents a
257 useful addition to training load monitoring procedures in team sports.

258 The prescription of different training activities in team sports is likely to result in an internal
259 load specific to each activity, which may not be captured by a single score.⁷ Differentiating internal
260 load into its specific physiological mediators can overcome this issue by discriminating between
261 different dimensions of effort,²⁴ thereby providing a detailed internal load profile. Previously, it has
262 been shown that higher sRPE-B are synonymous with higher heart rates and maximal oxygen
263 consumption, while higher sRPE-L are synonymous with greater attenuations in jumping performance
264 and greater blood lactate accumulation following maximally graded exercise in soccer players.²³ These
265 data, along with known differences in the physiological responses to team-sport training activities,
266 help to contextualise the findings of our investigation. For example; as would be expected, sRPE-B
267 was greatest during field-based training sessions that were predominantly reliant on oxygen-dependent
268 metabolism (HIT, RHIE, SkCond) in comparison with training modes that were not (Speed, Skills,
269 resistance training).¹⁷ The dRPE scores reported in our study also confirm previous findings that

270 running-based HIT is both centrally and peripherally demanding.¹⁵ Furthermore, these data support the
271 notion that the inclusion of maximal upper- and whole-body efforts that are specific to collision sports
272 (i.e. RHIE) augments the intensity of intermittent exercise as a consequence of increased
273 neuromuscular and metabolic demands.³⁰ Therefore, although the quantification of external load for
274 each training mode was beyond the scope of this study, we feel that our data provide evidence for the
275 validity of dRPE during team-sport training.

276 Moderate evidence exists for a dose-response relationship between sRPE-derived internal
277 training load and injury,^{1,7} physical performance^{4,5,22} and competitive match outcome⁶ in team-sport
278 athletes. The ability to accurately programme internal load based on the training goals is therefore of
279 great importance, although the individual response to a given external load is often highly variable.³
280 Using dRPE to create an internal load profile provides practitioners with a further simple and practical
281 tool for the analysis of individual training responses and prescription of training in team sports.²⁴ For
282 example, consistently higher sRPE-L scores (e.g., 10%²⁴) for a particular player in relation to the team
283 average during HIT may indicate deficits in lower-limb strength and power, and/or metabolic recovery
284 (hydrogen ion buffering, phosphocreatine resynthesis, etc.).¹⁵ On the other hand, if the same player
285 appears to be approaching a state of overreaching, then the practitioner may wish to programme
286 subsequent field-based training loads to offset the lower-limb peripheral response while still providing
287 a purposeful systemic load. Our current data indicates that, in rugby union, this could be achieved by
288 replacing HIT with RHIE. We acknowledge that this information is somewhat speculative and should
289 be interpreted within the confines of the current study until further research can provide more
290 conclusive recommendations for the most appropriate use of dRPE within the training process.
291 Nonetheless, the potential benefits that dRPE may offer within the team-sport training environment are
292 promising and outweigh the increased time commitment required to collect, analyse and interpret the
293 data.²³

294

295 **Conclusions**

296 Our investigation exploring the application of dRPE to team-sport training affirms previous
297 observations that dRPE represent different internal constructs, and gives evidence to show that these

298 measures can provide a more detailed quantification of exercise intensity and internal load during
299 training modes commonplace to team sports. Knowledge of the differential responses to a given
300 training stimulus could help inform specific and individualised programming of training strategies
301 designed to maximise physical performance, injury resilience and athlete preparedness; while avoiding
302 injury and illness and a consequence of training load errors. This method may be particularly useful to
303 those responsible for the retrospective (e.g., monitoring & evaluation) and prospective (e.g., planning
304 & programming) analyses of training load data in team sports.

305

306 **Practical Implications**

- 307 • In team sports, distinct training modes necessitate the need for differentiation of internal load
308 to help further understand training dose-response.
- 309 • Differential RPE represent different dimensions of effort and therefore provide a more
310 detailed quantification of internal load during team-sport training.
- 311 • Disassociations between dRPE loads may help inform individualised training and recovery
312 strategies via a systems analysis approach to training load monitoring.
- 313 • Differential RPE should be a supplement, not a replacement, to sRPE.

314

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383 **Tables**

384 *Table 1.* Between-session comparisons of differential RPE scores.

385 *Table 2.* Total accumulated training loads and sRPE training load regression analysis

386

387 **Figures**

388 *Figure 1:* Global and differential session RPE scores for each training mode. Data are presented as the
389 mean \pm SD.

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391 Abbreviations. AU: arbitrary unit, HIT: high-intensity interval training, RHIE: repeated high-intensity
392 effort training, RT: whole-body resistance training, SkCond: skill-based conditioning, sRPE: session
393 rating of perceived exertion, sRPE-B: session rating of perceived breathlessness, sRPE-L: session
394 rating of perceived leg muscle exertion; sRPE-T: session rating of perceived cognitive/technical
395 demand, sRPE-U: session rating of perceived upper-body muscle exertion, URT: upper-body
396 resistance training

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Table 1. Between-session comparisons of differential RPE scores.

		Between-Session Differences (AU; $\pm 90\%$ CL) ^{a,b}					
		HIT	RHIE	SkCond	Skills	Speed	RT
sRPE-B	RHIE	1.3; ± 3.6 (T ^{**})	–	–	–	–	–
	SKCond	13.8; ± 3.4 (M ^{**})	12.4; ± 2.7 (M ^{**})	–	–	–	–
	Skills	50.4; ± 3.1 (EL ^{****})	49.1; ± 2.3 (EL ^{****})	36.6; ± 2.0 (VL ^{****})	–	–	–
	Speed	48.9; ± 3.9 (EL ^{****})	47.6; ± 3.4 (EL ^{****})	35.1; ± 3.1 (VL ^{****})	1.5; ± 2.8 (T [*])	–	–
	RT	39.0; ± 3.1 (VL ^{****})	37.7; ± 2.4 (VL ^{****})	25.2; ± 2.0 (L ^{****})	11.4; ± 1.5 (M ^{****})	9.9; ± 2.8 (M ^{****})	–
	URT	43.6; ± 4.0 (VL ^{****})	42.3; ± 3.4 (VL ^{****})	29.8; ± 3.2 (VL ^{****})	6.8; ± 2.8 (M [*])	5.3; ± 3.7 (S ^{**})	4.6; ± 2.9 (S ^{**})
sRPE-L	RHIE	11.7; ± 4.2 (M [*])	–	–	–	–	–
	SKCond	19.6; ± 4.0 (M ^{****})	7.9; ± 3.1 (S ^{****})	–	–	–	–
	Skills	50.0; ± 3.6 (EL ^{**})	38.3; ± 2.7 (VL ^{****})	30.4; ± 2.3 (VL ^{****})	–	–	–
	Speed	44.1; ± 4.6 (VL ^{****})	32.4; ± 3.9 (VL ^{**})	24.5; ± 3.6 (L ^{****})	5.9; ± 3.3 (S ^{****})	–	–
	RT	22.6; ± 3.6 (L [*])	10.9; ± 2.8 (M [*])	3.0; ± 2.3 (T [*])	27.4; ± 1.7 (VL ^{****})	21.5; ± 3.3 (L ^{**})	–
	URT	51.0; ± 4.6 (EL ^{****})	39.3; ± 3.9 (EL ^{**})	31.4; ± 3.7 (VL ^{****})	1.0; ± 3.3 (T [*])	6.9; ± 4.3 (M [*])	28.4; ± 3.4 (VL ^{****})
sRPE-U	RHIE	23.6; ± 3.7 (L [*])	–	–	–	–	–
	SKCond	1.9; ± 3.5 (T ^{**})	21.7; ± 2.8 (M ^{****})	–	–	–	–
	Skills	13.2; ± 3.2 (L [*])	36.8; ± 2.4 (VL ^{****})	15.0; ± 2.0 (L ^{***})	–	–	–
	Speed	19.1; ± 4.0 (VL ^{****})	42.7; ± 3.4 (EL ^{****})	21.0; ± 3.2 (VL ^{****})	5.9; ± 2.9 (M ^{**})	–	–
	RT	15.5; ± 3.2 (M ^{****})	8.1; ± 2.4 (S ^{****})	13.6; ± 2.1 (M ^{****})	28.6; ± 1.5 (VL ^{****})	34.6; ± 2.9 (EL ^{****})	–
	URT	19.2; ± 4.1 (L [*])	4.4; ± 3.5 (S [*])	17.3; ± 3.2 (M ^{****})	32.3; ± 2.9 (VL ^{****})	38.3; ± 3.8 (EL ^{****})	3.7; ± 2.9 (S [*])
sRPE-T	RHIE	-2.0; ± 3.4 (T [*])	–	–	–	–	–
	SKCond	-5.2; ± 3.2 (S ^{**})	-3.2; ± 2.5 (S [*])	–	–	–	–
	Skills	-2.5; ± 2.9 (T [*])	-0.5; ± 2.2 (T ^{****})	2.7; ± 1.9 (S [*])	–	–	–
	Speed	1.1; ± 3.7 (T ^{**})	3.1; ± 3.2 (S [*])	6.4; ± 2.9 (S ^{****})	3.6; ± 2.7 (S ^{**})	–	–
	RT	4.2; ± 3.0 (S ^{**})	6.1; ± 2.2 (S ^{****})	9.4; ± 1.9 (M ^{**})	6.7; ± 1.4 (S ^{****})	3.0; ± 2.7 (S [*])	–
	URT	6.0; ± 3.7 (S ^{**})	8.0; ± 3.2 (M [*])	11.2; ± 3.0 (M ^{****})	8.5; ± 2.7 (M ^{**})	4.9; ± 3.5 (S ^{**})	1.8; ± 2.7 (T [*])

^a**Magnitude of the difference.** T: trivial; S: small; M: moderate; L: large; VL: very large; EL: extremely large.

^b**Uncertainty of the difference.** *: possibly (25%–75% [likelihood of the true difference being...]); **: likely (75%–95%); ***: very likely (95%–99.5%); ****: most likely (>99.5%).

Abbreviations. AU: arbitrary unit; CL: confidence limits; HIT: high-intensity interval training; RHIE: repeated high-

intensity effort training; RT: whole-body resistance training; SkCond: skill-based conditioning; sRPE-B: session rating of perceived breathlessness; sRPE-L: session rating of perceived leg muscle exertion; sRPE-T: session rating of perceived cognitive/technical demand; sRPE-U: session rating of perceived upper-body muscle exertion; URT: upper-body resistance training.

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Table 2. Total accumulated training loads and session RPE training load regression analysis.

Training Mode	Total Accumulated Six-Week Training Loads (AU \pm SD)					sRPE-TL Regression Analysis					
	sRPE-TL	sRPE-B-TL	sRPE-L-TL	sRPE-U-TL	sRPE-T-TL	Model ^a		Partial Correlations ^{b,c} (r ; $\pm 90\%$ CL)			
						Adjusted R ²	SEE (AU)	sRPE-B-TL	sRPE-L-TL	sRPE-U-TL	sRPE-T-TL
HIT	8477 \pm 2767	8318 \pm 2886	8530 \pm 2779	3707 \pm 2565	3662 \pm 2038	0.89	1084	0.36; ± 0.41 M*	-0.67; ± 0.22 L**	0.01; ± 0.32 ?	-0.12; ± 0.33 ?
RHIE	13505 \pm 3975	13120 \pm 3422	11414 \pm 3204	10657 \pm 3604	6531 \pm 2773	0.91	1488	0.89; ± 0.08 VL****	0.19; ± 0.35 ?	-0.05; ± 0.40 ?	-0.44; ± 0.19 M**
Speed	1958 \pm 707	1789 \pm 805	2399 \pm 1215	1042 \pm 510	2698 \pm 851	0.66	391	0.51; ± 0.47 L*	-0.07; ± 0.44 ?	-0.03; ± 0.50 ?	0.63; ± 0.17 L*
SkCond	25378 \pm 6566	25345 \pm 6503	23270 \pm 6286	15351 \pm 6214	15841 \pm 6618	0.84	2880	0.67; ± 0.19 L**	0.53; ± 0.39 L*	-0.28; ± 0.34 S**	0.07; ± 0.46 ?
Skills	12051 \pm 3713	10026 \pm 3569	11362 \pm 3897	9724 \pm 3448	18302 \pm 5441	0.84	1579	0.29; ± 0.30 S**	0.48; ± 0.29 M**	0.11; ± 0.35 ?	0.51; ± 0.28 L*
RT	40765 \pm 10045	25786 \pm 9868	43205 \pm 10437	41658 \pm 10533	23626 \pm 9398	0.86	3985	0.37; ± 0.29 M*	0.49; ± 0.27 M**	0.61; ± 0.21 L**	-0.37; ± 0.23 M*
URT	5704 \pm 2045	3443 \pm 1612	2603 \pm 1054	7211 \pm 2696	3489 \pm 1630	0.87	992	0.04; ± 0.37 ?	0.33; ± 0.37 M*	0.92; ± 0.07 NP*	-0.03; ± 0.36 ?
All training	107181 \pm 23806	87410 \pm 20489	102429 \pm 21150	88568 \pm 21166	73696 \pm 20469	0.77	11775	0.16; ± 0.36 ?	0.55; ± 0.32 L*	0.29; ± 0.38 S**	-0.28; ± 0.37 S**

^aTolerance levels for each training mode: 0.146 to 0.796. Tolerance levels for all training combined: 0.141 to 0.367.

^bMagnitude of the correlation. ?: unclear, T: trivial, S: small, M: moderate, L: large, VL: very large, NP: near perfect.

^cUncertainty of the correlation. *: possibly (25%–75% [likelihood of the true correlation being...]); **: likely (75%–95%); ***: very likely (95%–99.5%); ****: most likely almost certainly (>99.5%).

Abbreviations. AU: arbitrary unit, CL: confidence limits, HIT: high-intensity interval training, RHIE: repeated high-intensity effort training, RT: whole-body resistance training, SD: standard deviation, SEE: standard error of the estimate, SkCond: skill-based conditioning, sRPE-TL: global training load [CR100[®] derived], sRPE-B-TL: breathlessness (central) training load, sRPE-L-TL: leg muscle (lower peripheral) training load, sRPE-T-TL: technical (cognitive) training load, sRPE-U-TL: upper-body muscle (upper peripheral) training load, URT: upper-body resistance training.

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