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

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Abstract

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

Design: Single cohort, observational study.

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

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

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

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

Introduction

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

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

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

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

Methods

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

Using an observational longitudinal design, players were monitored over a six-week preparatory training period. Prior to this period, players had completed four weeks of active recovery (i.e. transitional phase) and one week of fitness testing. One week of active recovery and regeneration was implemented following the third week of the study period; however, for the purpose of this investigation, training data from the recovery week was not included in our analysis. During the six-week data collection period, training load was monitored using the sRPE method[11] (global and differential), which was recorded after every training session (details below). Players were habituated with this procedure as per the clubs usual monitoring practices.

The training programme was designed and implemented by the clubs coaching and support staff. Training loads were increased linearly during the first three weeks of training (general preparatory phase) and were subsequently tapered throughout weeks four, five and six (specific preparatory phase). All players trained together, or within positional group clusters (forwards, backs). Players typically completed 9–12 training sessions per week, which were distributed evenly across four training days (2–3 per day) and occurred at the same time each week. Training sessions typically involved 4–6 main exercises/drills, and could be identified as one of the following seven distinct training typologies:

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

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

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

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

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

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

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

Results

A total of 1474 individual training sessions were recorded. The mean (± SD) RPE data for each training mode over the six-week training period are presented in Figure 1 and the between-session comparisons of dRPE scores are presented in Table 1. Between-session comparisons of dRPE scores revealed differences ranging from possibly trivial to most likely extremely large for sRPE-B; possibly trivial to most likely extremely large for sRPE-L; likely trivial to most likely extremely large for sRPE-U; and very likely trivial to very likely moderate for sRPE-T. The within-session comparisons of dRPE scores revealed differences ranging from unclear to very likely very large for HIT; likely trivial to very likely very large for RHIE; possibly small to most likely very large for Speed; very likely trivial to most likely moderate for SkCond; most likely trivial to most likely large for Skills; most likely trivial to most likely large for RT; and unclear to most likely very large for URT (Table 3; supplementary file 2).

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

Discussion

In team sports, it is common for practitioners to measure a wide range of external load variables (e.g., global positioning satellite- and accelerometer-derived measures), yet a single measure of internal load is common (e.g., sRPE). This is perhaps surprising given that internal load is the stimulus for both positive[4-6] and negative[1,7] training-related outcomes. Differential ratings of perceived exertion (dRPE) have the potential to provide additional information from that obtained by a single measure by discriminating between different dimensions of effort.[23,24] The main findings of our preliminary investigation into the application of dRPE to team-sport training were that distinct training typologies elicit different dRPE, and the use of dRPE isolates the specific perceptual demands of training.

It has been suggest that differentiating sRPE adds little value to the measurement of exercise intensity during steady-state treadmill running[20] or soccer match-play.[21] Despite this, substantial differences have been reported between dRPE during controlled laboratory exercise[19,23] soccer training,[5] and Australian Football match-play;[24] suggesting that dRPE do indeed represent internal constructs that are perceived differently. The current investigation provides to date the most detailed quantification of dRPE during the team-sport training environment, taking different training modes into account. In agreement with others, we typically found substantial differences in dRPE, both within and between each training mode. Our regression analyses indicate that sRPE-B, sRPE-L, sRPE-U and sRPE-T each make a unique contribution to sRPE, and the input of each measure is dependent upon training mode. These data suggest that within the multidimensional construct of perceived exertion, team-sport athletes are able to recognise the disparity between feelings of breathlessness, muscle fatigue, and also cognitive exertion during a range of training activities with different external loads. We therefore believe that the information obtained from dRPE is meaningful and represents a useful addition to training load monitoring procedures in team sports.

The prescription of different training activities in team sports is likely to result in an internal load specific to each activity, which may not be captured by a single score.[7] Differentiating internal load into its specific physiological mediators can overcome this issue by discriminating between different dimensions of effort,[24] thereby providing a detailed internal load profile. Previously, it has been shown that higher sRPE-B are synonymous with higher heart rates and maximal oxygen consumption, while higher sRPE-L are synonymous with greater attenuations in jumping performance and greater blood lactate accumulation following maximally graded exercise in soccer players.[23] These data, along with known differences in the physiological responses to team-sport training activities, help to contextualise the findings of our investigation. For example; as would be expected, sRPE-B was greatest during field-based training sessions that were predominantly reliant on oxygen-dependent metabolism (HIT, RHIE, SkCond) in comparison with training modes that were not (Speed, Skills, resistance training).[17] The dRPE scores reported in our study also confirm previous findings that running-based HIT is both centrally and peripherally demanding.[15] Furthermore, these data support the notion that the inclusion of maximal upper- and whole-body efforts that are specific to collision sports (i.e. RHIE) augments the intensity of intermittent exercise as a consequence of increased neuromuscular and metabolic demands.[30] Therefore, although the quantification of external load for each training mode was beyond the scope of this study, we feel that our data provide evidence for the validity of dRPE during team-sport training.

Moderate evidence exists for a dose-response relationship between sRPE-derived internal training load and injury,[1,7] physical performance[4,5,22] and competitive match outcome[6] in team-sport athletes. The ability to accurately programme internal load based on the training goals is therefore of great importance, although the individual response to a given external load is often highly variable.[3] Using dRPE to create an internal load profile provides practitioners with a further simple and practical tool for the analysis of individual training responses and prescription of training in team sports.[24] For example, consistently higher sRPE-L scores (e.g., 10%[24]) for a particular player in relation to the team average during HIT may indicate deficits in lower-limb strength and power, and/or metabolic recovery (hydrogen ion buffering, phosphocreatine resynthesis, etc.).[15] On the other hand, if the same player appears to be approaching a state of overreaching, then the practitioner may wish to programme subsequent field-based training loads to offset the lower-limb peripheral response while still providing a purposeful systemic load. Our current data indicates that, in rugby union, this could be achieved by replacing HIT with RHIE. We acknowledge that this information is somewhat speculative and should be interpreted within the confines of the current study until further research can provide more conclusive recommendations for the most appropriate use of dRPE within the training process. Nonetheless, the potential benefits that dRPE may offer within the team-sport training environment are promising and outweigh the increased time commitment required to collect, analyse and interpret the data.[23]

Conclusions

Our investigation exploring the application of dRPE to team-sport training affirms previous observations that dRPE represent different internal constructs, and gives evidence to show that these measures can provide a more detailed quantification of exercise intensity and internal load during training modes commonplace to team sports. Knowledge of the differential responses to a given training stimulus could help inform specific and individualised programming of training strategies designed to maximise physical performance, injury resilience and athlete preparedness; while avoiding injury and illness and a consequence of training load errors. This method may be particularly useful to those responsible for the retrospective (e.g., monitoring & evaluation) and prospective (e.g., planning & programming) analyses of training load data in team sports.

Practical Implications

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

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Tables

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

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

Figures

Figure 1: Global and differential session RPE scores for each training mode. Data are presented as the mean ± SD.

Abbreviations. AU: arbitrary unit, HIT: high-intensity interval training, RHIE: repeated high-intensity effort training, RT: whole-body resistance training, SkCond: skill-based conditioning, sRPE: session rating of perceived exertion, 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 1. Between-session comparisons of differential RPE scores.

		Between-Session Differences (AU; ±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.

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

Training Mode	Total Accumulated Six-Week Training Loads (AU ± SD)					sRPE-TL Regression Analysis: Model[a]		sRPE-TL Regression Analysis: Partial Correlations[b,c] (r; ±90% CL)			
	sRPE-TL	sRPE-B-TL	sRPE-L-TL	sRPE-U-TL	sRPE-T-TL	Adjusted R^2	SEE (AU)	sRPE-B-TL	sRPE-L-TL	sRPE-U-TL	sRPE-T-TL
HIT	8477 ± 2767	8318 ± 2886	8530 ± 2779	3707 ± 2565	3662 ± 2038	0.89	1084	0.36; ±0.41 M*	0.67; ±0.22 L**	0.01; ±0.32 ?	-0.12; ±0.33 ?
RHIE	13505 ± 3975	13120 ± 3422	11414 ± 3204	10657 ± 3604	6531 ± 2773	0.91	1488	0.89; ±0.08 VL****	0.19; ±0.35 ?	-0.05; ±0.40 ?	-0.44; ±0.19 M**
Speed	1958 ± 707	1789 ± 805	2399 ± 1215	1042 ± 510	2698 ± 851	0.66	391	0.51; ±0.47 L*	-0.07; ±0.44 ?	-0.03; ±0.50 ?	0.63; ±0.17 L*
SkCond	25378 ± 6566	25345 ± 6503	23270 ± 6286	15351 ± 6214	15841 ± 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 ± 3713	10026 ± 3569	11362 ± 3897	9724 ± 3448	18302 ± 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 ± 10045	25786 ± 9868	43205 ± 10437	41658 ± 10533	23626 ± 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 ± 2045	3443 ± 1612	2603 ± 1054	7211 ± 2696	3489 ± 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 ± 23806	87410 ± 20489	102429 ± 21150	88568 ± 21166	73696 ± 20469	0.77	11775	0.16; ±0.36 ?	0.55; ±0.32 L*	0.29; ±0.38 S**	-0.28; ±0.37 S**

[a]Tolerance levels for each training mode: 0.146 to 0.796. Tolerance levels for all training combined: 0.141 to 0.367.
[b]**Magnitude of the correlation.** ?: unclear;, T: trivial, S: small;, M: moderate;, L: large;, VL:, very large;. NP: near perfect.
[c]**Uncertainty 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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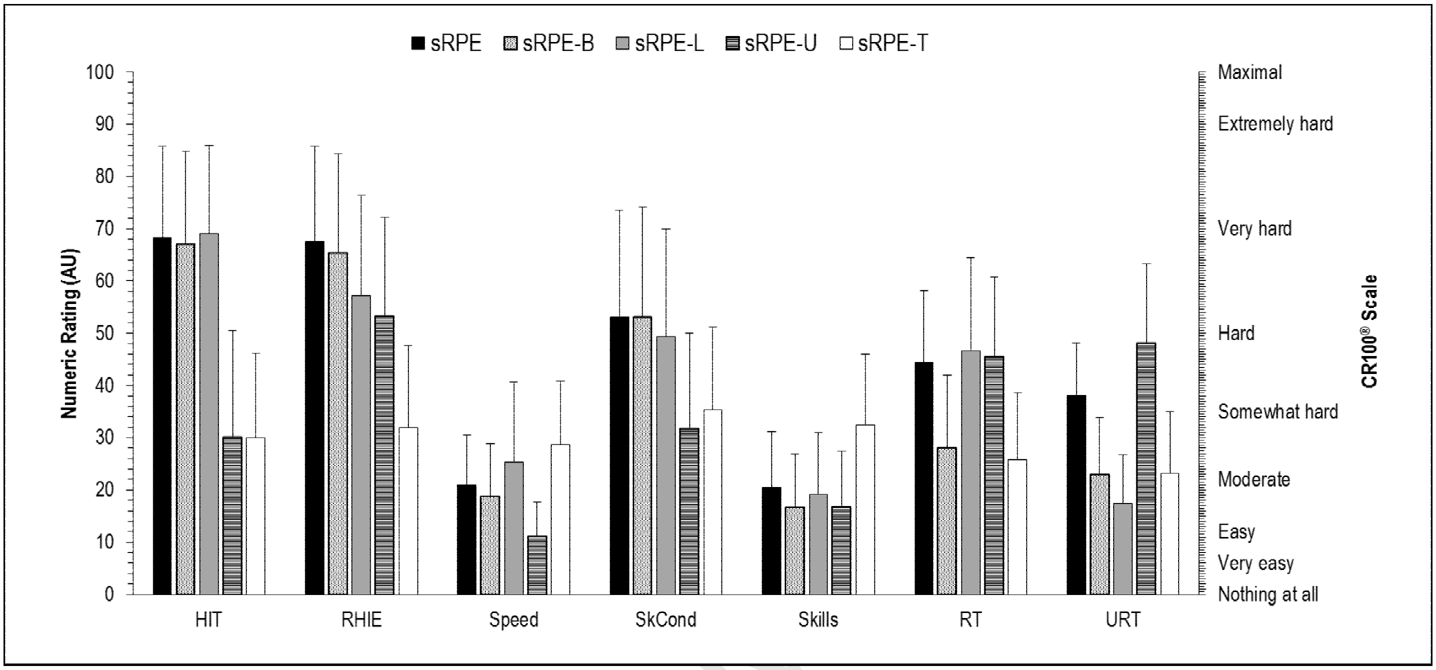
sRPE
sRPE-B
sRPE-L
sRPE-U
sRPE-T
Numeric Rating (AU)
100
90
80
70
60
50
40
30
20
10
0
HIT
RHIE
Speed
SkCond
Skills
RT
URT
Maximal
Extremely hard
Very hard
Hard
Somewhat hard
Moderate
Easy
Very easy
Nothing at all
CR100® Scale