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ORIGINAL ARTICLE

Monitoring Training Load on Malaysian Rugby 15s Players

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ABSTRACT

Background. In order to minimize overtraining, a reliable method is required to analyze training loads. **Objectives.** The objective of this study was to see if session Rate of Perceived Exertion (sRPE) is a valuable tool for tracking changes in perceived training load and strain among Malaysia rugby 15-a-side players during preparation for a significant game. **Methods.** Twenty-eight (n=28) elite rugby 15's players completed an eight-week training program that included six weeks of intensive training (IT) and two weeks of reduced training (RT). They were put to the Bronco Test before IT (T0), after IT (T1), and after RT (T2). The sRPE approach was used to quantify the perceived training load and strain. Acute: chronic workload ratio (ACWR) was used to determine the training load sensitivity, monotony, and strain among players. **Results.** Results showed that the team stated a higher acute: chronic workload ratio (ACWR) during the first and second week of training and slightly reduced before entering the pre-competition phase and the following week (competitions phase). The result for Bronco Test has shown more remarkable improvement starting from the first week of training, the fourth week of training before entering the competition phase, and the sixth week of training the competition phase. This study's findings suggest a sensitive tool, ACWR, for monitoring changes in training load and strain in team-sport athletes. The change in session rate perceived exertion and total score of well-being/wellness correlated significantly over the training period ($r = -0.41$, $P < 0.05$). **Conclusion.** To conclude, combining the short fatigue questionnaire with the session-RPE approach for perceived changes in training load and strain may provide extra information on the athletes' condition, helping coaches avoid overreaching or overtraining.

KEYWORDS: ***Acute Chronic Workload Ratio (ACWR), Session Rate of Perceived Exertion (sRPE), Bronco Test, Training Load, Training Strain.***

INTRODUCTION

Rugby union is a team sport where 15 players compete against another team. Typically known as Rugby Fifteen or rugby 15s, it is the original version of rugby played on a conventional rugby ground. Officially the game involves two 40-minute halves with only a 10-minute break. Because rugby 15's players must play on a full-sized pitch, they have a potentially larger exercise load than players in rugby 7's or even rugby league game. Thus it has been accepted as physically demanding and requires players to engage in frequent bouts of high-intensity activities such as sprinting, physical collisions, and tackles, separated by short bouts of low-intensity activity such as walking and jogging (1). Therefore, rugby 15's players rely on various fitness components, such as muscular power, speed, agility, and aerobic power perform at a very high-level capacity, inducing higher psychological and physiological stress to the body (1, 2). Furthermore, the cumulative effect of exercise loading during a 15's tournament is anticipated to be difficult, similar to that experienced after rigorous anaerobic exercise

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training (3). In order to serve these psychological and physiological demands of the game, physical training for rugby 15-a-side focuses on developing the physical requirements for competition, including a large volume of resistance training and anaerobic and aerobic conditioning, resulting in significant degrees of perceived exhaustion (4).

The main purposes of strength and conditioning training are to enhance physical performance and reduce the risk of injuries. It necessitates a well-balanced training program concerning training volume, intensity, and rest times. When players work out for a long time, they put themselves under much stress, which might lead to a lack of recovery. For these reasons keeping track of training load (TL) and training, the strain has become an integral part of the physical conditioning program for rugby 15's players. Monitoring training load and strain will allow for much proper evaluation of the effectiveness of the training procedure (TS). Several methods and tactics have been developed to practically track athletes' training status to regulate TL and TS properly (5-8). While heart rate (HR) as a measure of exercise intensity may have several drawbacks, particularly during weight, interval, intermittent, and plyometric training (5), it is still the most extensively used metric for evaluating internal training load (6). Another popular technique for monitoring periodized training programs in various sports since the last decade is the session's rating of perceived exertion (sRPE) which evaluates training load and strain as perceived by the players (7, 8). This monitoring strategy is considered straightforward and practical and has been tested in various individual and team sports (5, 7, 8).

However, as far as the researcher's knowledge, limited studies have been done on performance monitoring using tools such as sRPE with training load and strain on rugby 15's, especially involving Asian elite rugby players. Therefore, the main purpose of this study is to explore this method's use for performance monitoring among elite Malaysian rugby 15's players.

Furthermore, it is commonly acknowledged that psychological elements, such as training stress and anxiety, can significantly impact high-level sporting performance, particularly when they interfere with daily extracurricular activities (9).

Psychological assessments such as sRPE are just as useful in identifying training stress as physical measurements (10). As a result, various psychological questionnaires have been used to track changes in training stress, strain, and recuperation to detect early indicators of exhaustion and/or overtraining (10-13).

As an alternative, Chatard et al. (11) presented the ''short questionnaire of well-being or wellness," which is based on the large questionnaire of the ''French Society for Sports Medicine" (13). It is a visually appealing quiz with five questions about mood state, quality of sleep, general muscle soreness, level of stress, and level of fatigue. Furthermore, this wellness/well-being questionnaire has been proven as a very sensitive tool for detecting differences in training load and performance in swimmers (14). However, there is no information on how the results of this questionnaire change after hard training in team sports players. Furthermore, to our knowledge, there has never been any monitoring of training load and strain in rugby 15-a-side players during training.

MATERIALS AND METHODS

Participants. Twenty-eight members of Malaysia's 15s national rugby team volunteered to take part in the study. Subjects volunteered to participate in this study after learning about the experimental procedures and signing a written informed permission form. Every player competed in national and international tournaments regularly. They trained 5 to 6 times each week on average, for 10 to 12 hours each week, with a total training volume of 3 to 4 hours per day, in addition to a 15-a-side rugby game on the weekend, during the preparation periods for international meets. These players had also competed in four 15-a-side Asia Rugby Championship tournaments each year organized by World Rugby. None of the participants were on any medications and had metabolic or endocrine disorders that would have hampered or limited their capacity to engage in the study entirely. The research was carried out during the 15s Asia Rugby Championship, which was held in Korea, Hong Kong, and Malaysia in May and June 2020.

Procedure. The data were collected between April 2020 and June 2020. Anthropometric measurements and physical tests were carried out three times at the same time of day: firstly prior

to the start of the training program (T0), secondly following a 6-week intensive training session (IT) or overload (T1), thirdly after two weeks of reduced training (RT), sometimes known as tapering, (T2). These examinations were a component of the possibility of keeping track of the players' fitness levels in preparation for a tournament.

Physical Performance Testing. In order to establish test-retest reliability, physical testing was done twice, each time at least 72 hours apart. Following that, respondents were evaluated three times over the training session (T0, T1, and T2) using tests that reflected the many traits needed in a rugby competition. The aerobic and maximum aerobic speeds were measured in the tests. The player performed a run at the playing field or artificial surface. Cones were placed at 20m, 40m, and 60m. Players run to the 20m cones, turn around, and return to the start. Then immediately run to the 40m cones, turn around and come back to the start and run to the 60m cones, turn around and come back to the start. The player repeats this procedure five times. The time players reach the starting line for the last run was noted. Each player was instructed and vocally urged to provide their best effort during all tests. Moreover, the same investigator conducted all physical assessments on an outside artificial grass field throughout the trial.

Training Load Monitoring. Foster et al. (5) used the session-RPE approach to calculate the player's training load, monotony, and strain. For each player, the time (minutes) and intensity of each training session was recorded throughout the study. After each session, each player's global perception intensity was scored on a modified Borg's category ratio scale (5) about 30 minutes later. In a nutshell, each player's training load was computed by multiplying the session duration by the player's impression of global training intensity (i.e., duration x intensity). The average daily TL was also divided by the standard variation of the daily training load calculated over a week to calculate training monotony. The weekly training load and monotony sum was used to calculate the weekly training strain. For both the 6-week IR and 2-week RT, the mean training load and strain were calculated.

Training Session. The training program comprised a 6-week overload and a 2-week reduced training (RT) or taper period. Two of the six to nine weekly training sessions improved the players' physical fitness. The work done throughout these sessions was aimed at increasing aerobic capacity. As a result, players did high-intensity interval runs, physical-technical circuits, and game-like activities in small groups and big places to maintain a high level of effort throughout the 20-to-30-minute series. During the IT period, the intensity and duration of sessions gradually increased, then steadily decreased during the RT period. The players have also participated in speed and coordination sessions. During these sessions, speed, agility, and coordination circuits were built up to increase sprinting performance, agility, and coordination, respectively. Before the field training, two specific-strength training sessions in the gymnasium (duration: 30-45 minutes) were accomplished. Essential exercises for developing force-velocity of both the lower and upper limbs were developed using essential exercises such as squat and overhead split squat with or without external loads, box crossover and box jump, push-ups, draw chest, bench, and inclined bench presses, abdominals, and a variety of plyometric exercises (15).

Statistical Analyses. The data is presented as a mean and standard deviation. A repeated measure analysis of variances (ANOVA) was performed between the mean values for each velocity threshold to determine if there is a significant difference between each threshold. Data were analyzed for normality, followed by Spearman's rank correlation coefficient, which was used to determine the correlation between each internal training load measure. Correlations were used to determine between each of the metrics gathered in this study for a total of correlations. Correlations were used to determine the difference between each of the training load measures and between each of the wellness measures. Data were gathered and analyzed using SPSS 20.0 (IBM, USA).

RESULTS

Anthropometric and Physical Data. Tables 1 and 2 summarize rugby players' anthropometric and physical parameters as they progressed through the training program. The training regimen was linked to a significant improvement in physical fitness in both periods (IT and RT). During the training time, body adaptation grew slightly but not dramatically. Table 3 summarizes all the testing results—Bronco performances after the IT phase (T1). The RT (T2), on the other hand,

resulted in a considerable improvement in bronco testing results.

Training Load and Strain. Table 3 shows the training load, monotony, strain, volume, and total wellness score. During the 6-week IT period, training loads, monotonies, stresses, and volumes developed until they peaked in the fifth week. This rise was accompanied by a rise in the total fatigue score, which peaked in the fifth week. During the 2-week RT, all metrics, on the other hand, declined dramatically. The mean training load and strain, as well as the ACWR score, were obtained during the 6-week IT and 2-week RT periods, as shown in Table 3.

Table 1. Anthropometric and Bronco Test

	Mean ± SD
Age (years old)	28.07 ± 4.81
Height (m)	1.78 ± 0.07
Weight (kg)	97.51 ± 14.61

Table 2. Mean Comparison for Bronco Test between Position

Position (n)	Bronco Test 1, (Minutes) (T0)	Bronco Test 2, (Minutes) (T1)	Bronco Test 3 (Minutes) (T2)
Backline (n=13)	5.40 ± 0.38	5.28 ± 0.34	5.2654 ± 0.10
Forward (n=15)	5.95 ± 0.68	5.80 ± 0.76	5.69 ± 0.52
Combined All (n=28)	5.69 ± 0.62	5.56 ± 0.66	5.49 ± 0.44
Correlation (Sig)	0.001	0.001	0.001
ANOVA (Sig)	0.015	0.030	0.009

Data are presented as Mean ± SD

Table 3. Comparisons Week by Week

	Training Load (AU)	ACWR	Monotony	Volume	Total wellness
Week 1	786.78 ± 701.74	0.98 ± 0.08	1.33 ± 0.64	1019.86 ± 118.40	19.6 ± 0.36
Week 2	842.92 ± 644.07	0.89 ± 0.13	1.30 ± 0.07	850.29 ± 148.10	19.5 ± 0.44
Week 3	748.92 ± 510.85	0.84 ± 0.09	1.30 ± 0.14	731.00 ± 90.64	19.5 ± 0.32
Week 4	704.28 ± 584.38	0.94 ± 0.12	1.40 ± 0.20	795.3 ± 90.646	19.6 ± 0.31
Week 5	695.42 ± 590.76	1.34 ± 0.27	2.62 ±3.53	1095.29 ± 245.54	19.3 ± 0.35
Week 6	458.67 ± 308.68	0.83 ± 0.07	1.30 ± 0.22	586.14 ± 59.82	19.1 ± 0.40
Week 7	582.14 ± 391.58	0.87 ± 0.09	1.70 ±0.16	564.00 ± 71.92	19.3 ± 0.21
Week 8	513.14 ± 431.11	0.88 ± 0.10	1.30 ± 0.11	529.71 ± 75.14	19.4 ± 0.34
Total	6678.22 ± 5157.82	0.95 ± 0.20	1.52 ± 1.30	771.46 ± 233.74	19.4 ± 0.35
ANOVA (Sig.)	0.88	0.001	0.50	0.001	0.27

During the RT, both training load and strain dropped dramatically.
Data are presented as Mean ± SD

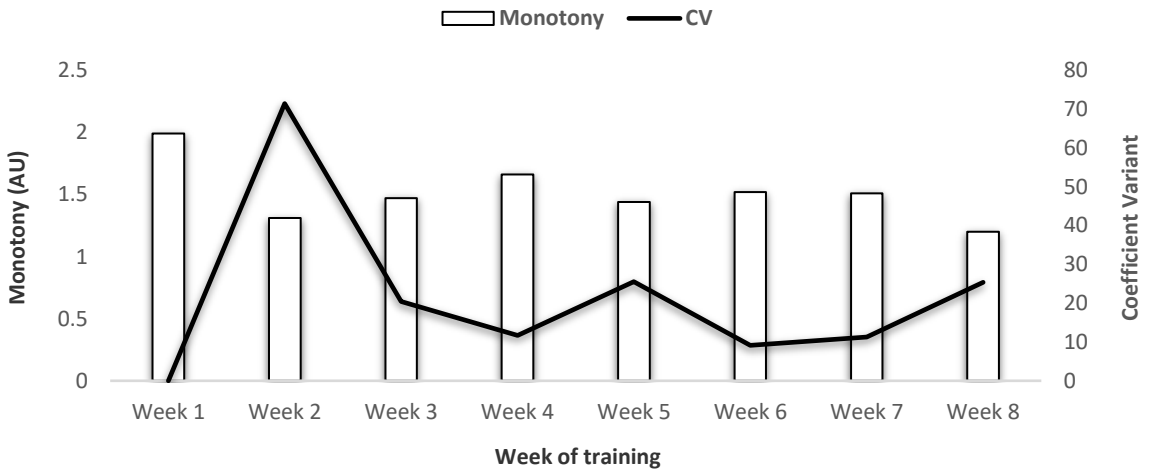

Figure 1. Weekly monotony and between-Weekly Monotony Coefficient Variations (CV%)

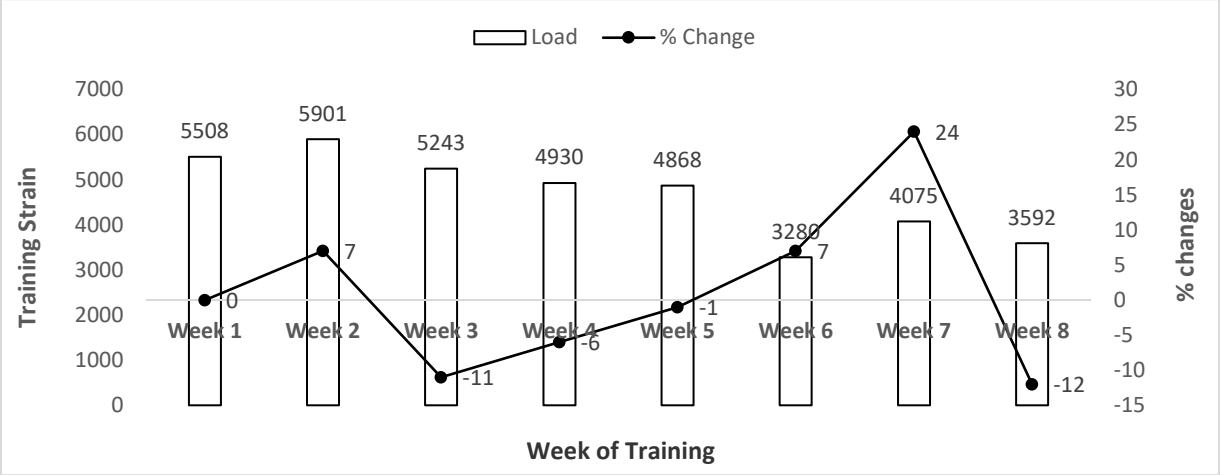

Figure 2. Training Strain and Weekly Changes (%) in Weekly Training Strain during the eighth Week of Training.

Table 4. Correlation between Training Load, ACWR and Monotony

Correlation (Sig)	Training Load	ACWR	Monotony	Volume
Training Load (AU)	-	0.65	0.25	0.71
ACWR	0.65	-	0.001*	0.001*
Monotony	0.25	0.001*	-	0.02*
Volume	0.71	0.001*	0.02	-

Table 5. Correlation Coefficient analysis between Bronco Test, sRPE and Total Wellness Score

Variables	Bronco Test	sRPE	Total Wellness Score
Bronco Test			
r :	-		
p :	-		
sRPE			
r :	0.48**	-	
p :	0.01	-	
Total Wellness Score			
r :	-0.29	-0.41*	-
p :	0.14	0.03	-

Training Load and Strain Correlation. Several relationships have been discovered between the mean training load and strain over the two training sessions. During the 6-week IT, the mean Bronco Test was substantially linked with the mean TL and TS. During the 2-week RT, the mean Bronco Test was also substantially linked with the mean TL and TS (Table 4).

Physical Performance Correlations. Table 5 demonstrates several relationships between the sRPE, Total Wellness Score, and the Bronco Test as a physical performance during the training program. The fluctuation in the percentage of the Bronco test performances recorded during the 6-week IT were both substantially linked with the mean training strain.

DISCUSSION

This study aimed to see if session Rate Perceived Exertion (sRPE) could be used to track changes in perceived training load and strain, as well as physical performance among elite 15's Malaysia rugby players as they prepared for big competitions. This study found that throughout the hard training session, training load (TL) and training strain (TS) increased significantly, which was linked to an increase in the total score of fatigue (TSF), which resulted in a drop in all evaluated performances. During the reduced training duration, on the other hand, the TL and TS decreased dramatically, resulting in a decrease in the TSF and, in turn, an increase in the majority of physical performances. Furthermore, various correlations were discovered between the mean of TSF and the mean of TL and TS and the percentage variation in some physical performance across the training period.

It is widely acknowledged that improving and maintaining physical performance, particularly in highly trained athletes, is a sensitive and complex

psychophysiological process (8). It is based on periodization workouts and necessitates training sessions in which volume and intensity are key factors (10, 11). In this study, the training intensity was higher during a 6-week intensive training session (IT). However, even though it effectively increased Bronco Test performance, as shown in Table 1, it also increased strain percentage, as shown in Figure 2. It is not good for athletes' physiological, as Clemente et al. (12) found that an increase in strain illustrates the possibility of overtraining.

Many good physiological adaptations associated with physical exercise are reversed when sustained excessive training loads are imposed concurrently with inadequate recuperation, potentially resulting in overreaching or overtraining. This explanation can be seen in this study, as shown in Table 1; Bronco Test performance was only slightly improved in (T1) but dramatically improved in (T2), and at the same time, the strain was dramatically increased during intensive training and dramatically decreased during reduced training. Therefore, it was proved that excessive training load only slightly adapts the training performance. However, reversibility can happen due to the reduced training (RT) phase, which decreases the training load, as shown in Table 3.

To avoid overtraining and ensure that the athletic training program results in performance enhancement or, at the very least, maintenance of performance standards, the training load must be monitored, and regular performance testing must be included as part of the training program (15). Due to the difficulty in assessing the many types of stress faced during training, it has been difficult to measure the training loads achieved by team-sport athletes such as rugby players until recently (4). Furthermore, each player may react differently to the same training load, necessitating the need to personalize the fatigued state.

Furthermore, using heart rate monitors during training sessions in rugby, a sport marked by contact, impact, and wrestle drills, as well as a lot of resistance and anaerobic efforts, is challenging and often inappropriate. Fortunately, the session-RPE method for assessing training has been a popular tool for monitoring training periodization in numerous sports during the last decade (16), and several investigators have adopted this strategy (5, 6, 8, 16). The session-RPE was used in this investigation because of its simplicity, low cost, and applicability in various sports, including soccer, rugby union, basketball, and other individual sports (5, 6, 16).

CONCLUSION

In conclusion, as a way to provide extra information on the athletes' condition to avoid overreaching and overtraining, a short fatigue questionnaire with the session-RPE approach for perceived changes in training load and strain can be used by coaches.

APPLICABLE REMARKS

- This study's findings demonstrate reduced performance in the testing during hard training sessions due to the increased training load and strain. Conversely, physical performance increases during a reduced training session. Thus, a coach needs to consider the timing of testing to get valid and reliable data.
- Due to its simplicity, low cost, and applicability in many sports types, a short fatigue questionnaire with the session-RPE approach for perceived changes in training load and strain throughout training is recommended to help the coaches monitor the athletes to avoid overreaching or overtraining.

AUTHORS' CONTRIBUTION

Study concept and design: M.H.B., N.I.M., A.M.N. Acquisition of data: M.H.B. Analysis and interpretation of data: M.H.B., N.I.M., A.M.N. Drafting of the manuscript: M.H.B., N.I.M., A.M.N. Critical revision of the manuscript for important intellectual content: M.H.B., N.I.M., A.M.N. Statistical analysis: M.H.B. Administrative, technical, and material support: M.H.B., N.I.M., A.M.N. Study supervision: N.I.M., A.M.N.

CONFLICT OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

REFERENCES

1. Duthie G, Pyne D, Hooper S. Applied physiology and game analysis of rugby union. *Sports Med*. 2003;**33**(13):973-991. **doi:** 10.2165/00007256-200333130-00003 **pmid:** 14606925
2. Gabbett TJ. Physiological characteristics of junior and senior rugby league players. *Br J Sports Med*. 2002;**36**(5):334-339. **doi:** 10.1136/bjsm.36.5.334 **pmid:** 12351330

3. Takahashi I, Umeda T, Mashiko T, Chinda D, Oyama T, Sugawara K, et al. Effects of rugby sevens matches on human neutrophil-related non-specific immunity. *Br J Sports Med*. 2007;**41**(1):13-18. **doi:** 10.1136/bjsm.2006.027888 **pmid:** 17035481
4. Argus CK, Gill N, Keogh J, Hopkins WG, Beaven CM. Effects of a short-term pre-season training programme on the body composition and anaerobic performance of professional rugby union players. *J Sports Sci*. 2010;**28**(6):679-686. **doi:** 10.1080/02640411003645695 **pmid:** 20397095
5. Foster C, Florhaug JA, Franklin J, Gottschall L, Hrovatin LA, Parker S. A new approach to monitoring exercise training. *J Strength Condition Res*. 2001;**15**(1):109-115. **doi:** 10.1519/00124278-200102000-00019
6. Bangsbo J, Mohr M, Krustrup P. Physical and metabolic demands of training and match-play in the elite football player. *J Sports Sci*. 2006;**24**(7):665-674. **doi:** 10.1080/02640410500482529 **pmid:** 16766496
7. Coutts A, Reaburn P, Piva TJ, Murphy A. Changes in selected biochemical, muscular strength, power, and endurance measures during deliberate overreaching and tapering in rugby league players. *Int J Sports Med*. 2007;**28**(2):116-124. **doi:** 10.1055/s-2006-924145 **pmid:** 16835824
8. Haddad M, Chaouachi A, Castagna C, Wong del P, Behm DG, Chamari K. The construct validity of session RPE during an intensive camp in young male Taekwondo athletes. *Int J Sports Physiol Perform*. 2011;**6**(2):252-263. **doi:** 10.1123/ijspp.6.2.252 **pmid:** 21725110
9. Armstrong LE, VanHeest JL. The unknown mechanism of the overtraining syndrome: clues from depression and psychoneuroimmunology. *Sports Med*. 2002;**32**(3):185-209. **doi:** 10.2165/00007256-200232030-00003 **pmid:** 11839081
10. Kellmann M. Preventing overtraining in athletes in high-intensity sports and stress/recovery monitoring. *Scand J Med Sci Sports*. 2010;**20 Suppl 2**:95-102. **doi:** 10.1111/j.1600-0838.2010.01192.x **pmid:** 20840567
11. Chatard JC, Atlaoui D, Pichot V, Gourné C, Duclos M, Guezennec YC. Training follow up by questionnaire fatigue, hormones and heart rate variability measurements. *Sci Sport*. 2003;**18**(6):302-304. **doi:** 10.1016/j.scispo.2003.09.013
12. Coutts AJ, Reaburn P. Monitoring changes in rugby league players' perceived stress and recovery during intensified training. *Percept Mot Skills*. 2008;**106**(3):904-916. **doi:** 10.2466/pms.106.3.904-916 **pmid:** 18712214
13. Elloumi M, Ben Ounis O, Tabka Z, Van Praagh E, Michaux O, Lac G. Psychoendocrine and physical performance responses in male Tunisian rugby players during an international competitive season. *Aggress Behav*. 2008;**34**(6):623-632. **doi:** 10.1002/ab.20276 **pmid:** 18626966
14. Atlaoui D, Duclos M, Gouarne C, Lacoste L, Barale F, Chatard JC. The 24-h urinary cortisol/cortisone ratio for monitoring training in elite swimmers. *Med Sci Sports Exerc*. 2004;**36**(2):218-224. **doi:** 10.1249/01.MSS.0000113481.03944.06 **pmid:** 14767243
15. Chelly MS, Ghenem MA, Abid K, Hermassi S, Tabka Z, Shephard RJ. Effects of in-season short-term plyometric training program on leg power, jump- and sprint performance of soccer players. *J Strength Cond Res*. 2010;**24**(10):2670-2676. **doi:** 10.1519/JSC.0b013e3181e2728f **pmid:** 20844458
16. Meeusen R, Nederhof E, Buyse L, Roelands B, de Schutter G, Piacentini MF. Diagnosing overtraining in athletes using the two-bout exercise protocol. *Br J Sports Med*. 2010;**44**(9):642-648. **doi:** 10.1136/bjsm.2008.049981 **pmid:** 18703548