

Analysis of Training Load Perception of Young Soccer Players Based on Some Variables

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Abstract

The aim of this study is to examine the perception of training load of young soccer players during a five-week preparation period, based on their positions of play, VO_2 max and years licensed and to compare the perceptions of the players with the training load planned by their coach. 17 young soccer players of Beşiktaş Football Club's U16 team who participated in the pre-season training prior to the 2018-2019 season volunteered to participate in this study. The height of the players is 175.38 ± 4.83 cm, body weight is 64.24 ± 4.59 kg, body mass index is 20.91 ± 1.54 kg/m² and body fat percentage is 8.45 ± 3.39 . During the 5-week preparation period, the players assessed the rate of perceived exertion of the sections of each training session by using the Borg Scale, on a scale from 1 to 10. The SPSS package program (SPSS 24) was used for statistical analysis of the research data. The Shapiro-Wilk test was used to assess normality and Levene's test was used to assess homogeneity. It was determined that the data distribution was normal. An independent t-test was implemented for comparison of the two groups, and a one-way ANOVA test was implemented for the comparison of multiple groups. The statistical results were evaluated at $p < 0.05$ significance level. As a result, the players' VO_2 max values and the years of licensed soccer play may have an influence on their perception of the training load. The coaches' and young soccer players' perception levels of preparation period training load are compatible.

Keywords: Football, Soccer, Rate of perceived exertion, Player, Coach, RPE

1. Introduction

In order to prevent injuries in performance sports and to keep the performance high during the season, the training level of the athletes should be optimal. This requires the monitoring of the training load. Some methods have been developed by the researchers in order to track and monitor the training load. The training load is evaluated under two headings: internal and external load. The internal load refers to the physiological load that builds on the athlete during training.

It is the condition of the internal load that largely determines the compliance with the training program. The heart rate (HR), the rate of perceived exertion (RPE) and the lactate measurements can be given as examples for the internal load measurements (McGuigan, 2017). Although the most common measurement method is the heart rate, this method is costly due to the necessary equipment. Therefore, it is suggested to use the S-RPE method (Session Rating of Perceived Exertion) developed by Foster et al. (1995), as it is both cost-effective and valid (Rodriguez-Marroyo & Antonan, 2015).

The S-RPE is obtained using a modified BORG category ratio (0-10). Although HR-based measurements and RPE-based measurements do not support each other, it is stated that the RPE method can be a better method for determining internal loads, and it can be an indicator of psychological stress besides physiological stress. Furthermore, it is stated that heart rate cannot be a good indicator of determining exercise intensity under certain conditions, such as cognitive demands, motivation status and intermittent nature of soccer training (Rodriguez-Marroyo & Antonan, 2015). In one study, it was stated that there is a relationship between the percentage of HR reserve and the S-RPE measurements performed during 30-minute continuous and intermittent training at different intensities (Foster et al., 1995). In another study conducted with young soccer players, it is indicated that there is a significant correlation between HR responses and RPE responses (Impellizzeri et al., 2004). In a study conducted with young male taekwondo athletes, it was indicated that there is a weak correlation between the RPE and HR responses during high-intensity exercises (Haddad et al., 2011).

The S-RPE method can be a very practical and useful method for coaches to create periodization strategies, and to control and monitor internal load (Impellizzeri et al., 2004). Training load (TL), expressed in arbitrary units (AU), is calculated by multiplying the RPE value by the duration of the session, and is credited as a practical, cost-effective and valid method to measure the amount of internal training load in soccer (Impellizzeri et al., 2004).

When the literature is examined, the number of studies in which the young elite Turkish soccer players' perception of training load is determined is quite low. In this context, our study has importance. The aim of this study is to examine the perception of training load of young soccer players during the five-week preparation period based on their positions, VO_2 max and years licensed, and to compare the players' perceptions of the training load planned by their coach.

2. Method

2.1 Research Group

Seventeen young soccer players of Beşiktaş Football Club's U16 team who participated in the pre-season training prior to the 2018-2019 season volunteered to participate in this research.

2.2 Anthropometric Measurements

The height was taken with a stadiometer when the athlete was in anatomical posture, at the inspiration stage, with the head in the frontal plane and touching the vertex point. The body weight was taken with the athlete in anatomical posture on the scale without sportswear and shoes.

Skinfold thicknesses were measured, as suggested by Harrison et al. (1988), in 7 areas (Biceps, Triceps, Subscapula, Suprailiac I, Suprailiac II, Abdominal and Calf) with a skinfold caliper (Holtain, England); circumference (Biceps, Biceps in Flexion, Wrist and Calf) and diameter (Humerus and Femurepicondyl) measurements were taken twice by the same person from the right side of the body with a Harpendenkaliper (Holtain, England) and the averages of these values were used in the calculations.

2.3 Training Process

For the season preparation, the soccer players were put through an adaptation training program of 3 days a week for 2 weeks, followed by a training program of 4-5 days a week for 5 weeks.

2.4 Borg Scale

During the 5-week preparation period, the players assessed the rate of perceived exertion of the sections of each training session by using the Borg Scale, on a scale from 1 to 10 (Borg, 1982). After the exercises in the main part of each training session, the Borg scale was shown to the players, the degree of difficulty perceived by the players for the exercises was recorded and by multiplying this by the duration of exercises, the perception scores were calculated. The average difficulty perception scores of the daily, weekly and preparatory training sessions were determined by addition of the perceived scores of the training session.

2.5 Data Analysis

The Microsoft Excel 2010 software was used to classify and calculate the perception scores of the data obtained at the end of the study, and the SPSS Statistics software package (version 24) was used for the statistical analysis of these data. The Shapiro-Wilk test was used to assess normality and Levene's test was used to assess homogeneity. It was determined that the data distribution was normal, and an independent t-test was implemented for comparison of the two groups, while the one-way ANOVA test was implemented for the comparison of multiple groups. The statistical results were evaluated at $p < 0.05$ significance level.

3. Results

Table 1. The physical characteristics of soccer players

Variables	N	Mean	Std.
Height (cm)	17	175.38	4.83
Body Weight (kg)	17	64.24	4.59
Body Mass Index (kg/m ²)	17	20.91	1.54
Body Fat Percentage (%)	17	8.45	3.39

Table 1 presents the descriptive information of the soccer players. The height of the players is 175.38 ± 4.83 cm, body weight is 64.24 ± 4.59 kg, body mass index is 20.91 ± 1.54 kg/m² and body fat percentage is 8.45 ± 3.39 .

Table 2. T test results: rating of perceived exertion of soccer players based on their positions

Weeks	Position Group	N	Mean	Std.	t	p
Avg. Load Perceived in Week 1	Defense	8.00	166.55	11.88	-0.44	0.67
	Attack	9.00	169.07	11.59		
Avg. Load Perceived in Week 2	Defense	8.00	204.47	9.89	-0.93	0.36
	Attack	9.00	210.64	16.28		
Avg. Load Perceived in Week 3	Defense	8.00	262.13	16.55	-0.61	0.55
	Attack	9.00	267.62	20.18		
Avg. Load Perceived in Week 4	Defense	8.00	378.94	23.77	0.50	0.63
	Attack	9.00	373.42	22.01		
Avg. Load Perceived in Week 5	Defense	8.00	310.88	32.34	1.11	0.29
	Attack	9.00	295.29	25.39		
Avg. Load Perceived in Prep. Period	Defense	8.00	274.15	12.72	0.25	0.81
	Attack	9.00	272.55	13.75		

Note. $p < 0.05$.

When the RPE values of the players were examined based on their positions, no difference was found in the perceptions of the defenders and attackers in comparison with the preparation week. When the data were examined, it was found that the RPE values of attackers in the first week (169.07 ± 11.88), second week (210.64 ± 16.28) and third week

(267.62±20.18) were higher than that of the defenders. However, it was found that the defense players' average perceptions of difficulty in the fourth week (378.94±23.77), fifth week (310.88±32.34) and preparation period (274.15±12.72) were higher than that of the attackers.

Table 3. ANOVA test results: players' rating of perceived exertion based on VO₂ max values

Weeks	VO ₂ Max Groups	N	Mean	Std.	F	p	Tukey
Avg. Load Perceived in Week 1	50 or more	7.00	160.91	8.45	3.254	0.069	
	Between 48-50	5.00	169.84	11.39			
	Below 48	5.00	175.68	10.94			
	Total	17.00	167.88	11.43			
Avg. Load Perceived in Week 2	50 or more	7.00	202.57	6.73	1.052	0.375	
	Between 48-50	5.00	208.70	18.23			
	Below 48	5.00	214.00	15.63			
	Total	17.00	207.74	13.62			
Avg. Load Perceived in Week 3	50 or more	7.00	253.03	12.05	3.811	0.048	2>1
	Between 48-50	5.00	277.36	19.52			
	Below 48	5.00	269.52	16.11			
	Total	17.00	265.04	18.20			
Avg. Load Perceived in Week 4	50 or more	7.00	367.43	21.72	1.277	0.309	
	Between 48-50	5.00	376.10	16.62			
	Below 48	5.00	387.95	26.43			
	Total	17.00	376.01	22.30			
Avg. Load Perceived in Week 5	50 or more	7.00	297.26	37.53	1.029	0.383	
	Between 48-50	5.00	294.60	17.88			
	Below 48	5.00	318.16	22.61			
	Total	17.00	302.62	29.05			
Avg. Load Perceived in Prep. Period	50 or more	7.00	265.27	13.57	3.763	0.049	3>1
	Between 48-50	5.00	274.92	2.86			
	Below 48	5.00	282.94	12.13			
	Total	17.00	273.30	12.88			

Note. $p < 0.05$.

In Table 3, when the RPE values of the players based on the VO₂ max values were examined, among the perceived mean scores of the third week, a significant difference was found

between the group having the VO₂ max value of “48-50 ml/kg/min” and the group having the VO₂ max value of “50 and above” at the $p < 0.048$ level, in favor of the group with a VO₂ max value of 48-50 ml/kg/min.

Table 4. ANOVA test results: rating of perceived exertion of soccer players based on the licensed years variable

Weeks	Years Licensed	N	Mean	Std.	t	p
Avg. Load Perceived in Week 1	5 years	7.00	174.29	9.80	2.14	0.05
	6 years	10.00	163.40	10.68		
Avg. Load Perceived in Week 2	5 years	7.00	213.96	14.84	1.66	0.14
	6 years	10.00	203.38	11.46		
Avg. Load Perceived in Week 3	5 years	7.00	269.46	13.29	0.83	0.38
	6 years	10.00	261.94	21.11		
Avg. Load Perceived in Week 4	5 years	7.00	378.00	30.29	0.30	0.80
	6 years	10.00	374.63	16.35		
Avg. Load Perceived in Week 5	5 years	7.00	319.63	25.16	2.27	0.04
	6 years	10.00	290.72	26.38		
Avg. Load Perceived in Prep. Period	5 years	7.00	281.12	10.38	2.38	0.03
	6 years	10.00	267.83	11.93		

Note. $p < 0.05$.

When the t-test results of the players based on the licensed years variable in Table 4 were examined, a significant difference was detected between the 5-year and 6-year licensed players' first week perceptions at $p < 0.05$ level, the fifth week perceptions at $p < 0.04$ level and the preparation period perceptions at $p < 0.03$ level.

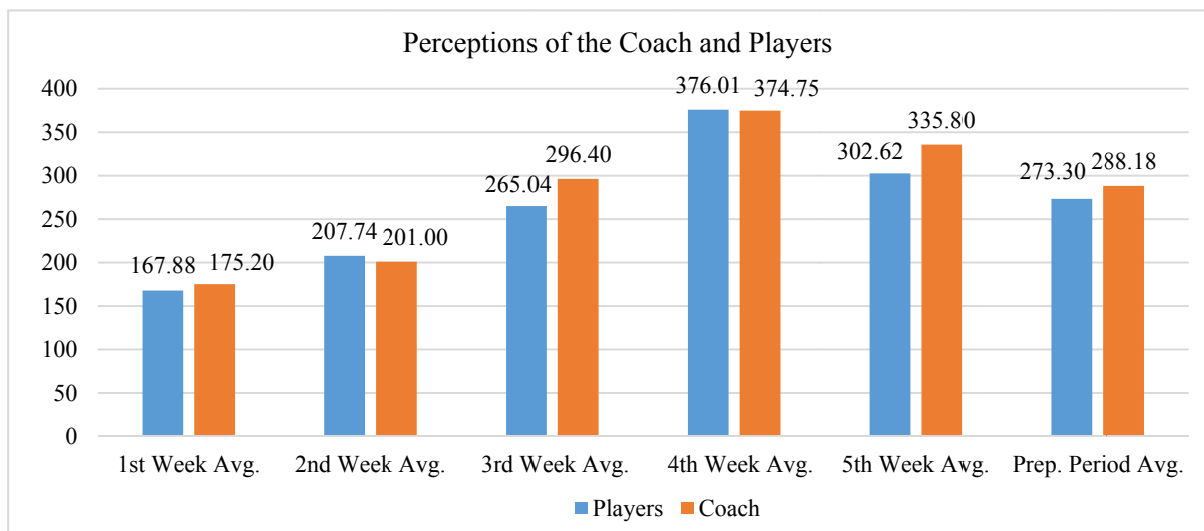


Figure 1. Comparison of rating of perceived exertion of coach and players

There was no statistical difference between the levels of difficulty perceived by the coach and the players during the preparation period. When Figure 1 is examined, it is determined that the average perception of the coach in the first, third, fifth week and preparation period is higher than the perceptions of the players.

4. Discussion

This research is one of the first studies to examine the Turkish elite young soccer players' perception of the load planned by their coaches based on various variables. In this research, the training load perceptions of the young elite soccer players based on their position, VO_2 max and licensed years were examined and the soccer players' training load perceptions were compared.

The evaluation of the physical load by monitoring the training and match load is very important for training planning (Akubat et al., 2012). Previous studies have identified the relationship between the athletes' perceived load and training load (Coutts et al., 2003; Day et al., 2004; Impellizzeri et al., 2004; Wallace et al., 2009; Malone et al., 2017).

When the players' RPE values based on their positions were examined, no difference was found in the perceptions of the defenders and attackers in comparison with their perception of the preparation week. This shows that the perception of the team players does not create variability based on the position they play. It was observed that the perceptions of the defensive players had a tendency to increase compared to that of the offensive players during the preparation period. In a study supporting the findings of our study, the differences between the total body load of the defenders, midfielders and strikers and the RPE values of training periods were analyzed. No significant difference was reported in the RPE of the training based on the player's positions. However, it was noted that the midfielders had a tendency to decrease the RPE values when compared to the defenders and strikers (Gomez-Piriz et al., 2011). Moreover, our data are consistent with studies on volleyball

players, which show that, regardless of the tactical position the players take, all positions agree on the perceived degree of difficulty among the coaches and players (Andrade et al., 2014). In another study (Jatene et al., 2019), a significant difference was detected between the RPE of soccer players in the goal-keeper position and the RPE of players in other positions. Moreover, a significant difference has been reported between the RPE values of players in center midfielder and wide midfielder positions.

As a result of analyses conducted, when the RPE values of the players based on the VO_2 max values were examined, among the perceived mean scores of the third week, a significant difference was found between the group having the VO_2 max value of “48-50 ml/kg/min” and the group having the VO_2 max value of “50 and above” at the $p < 0.048$ level, in favor of the group with a VO_2 max value of “48-50 ml/kg/min”. In the literature, there are no studies that correlate the RPE of soccer players based on the VO_2 max values. Research is generally related to the soccer players’ level of lactate, heart rate and perceived difficulty during training (Aslan et al., 2012, Fanchini et al., 2015, Kelly et al., 2016). In order to evaluate the external training load of soccer players, Jaspers et al. (2018) used machine learning and determined that distances covered above 20 km/h (0.428) have less impact on the RPE values than distances covered at 15 km/h (0.487) and 15-20 km/h (0.507).

Following the t-test of the players, based on the licensed years variable, a significant difference was detected between the 5-year and 6-year licensed players’ first week perceptions at $p < 0.05$ level, the fifth week perceptions at $p < 0.04$ level and the preparation period perceptions at $p < 0.03$ level. It was determined that 5-year licensed players had higher perceptions in the first week, fifth week and preparation period compared to the players with a 6-year license. In their study, Malone et al. (2017) stated that soccer players with 0-1 year of training experience had higher RPE values and players with 7 years or more training experience had lower RPE values.

In one study, it was reported that the young elite players (U17 and U19) perceived their training load higher than the coach wanted (Brink et al., 2014). In this regard, we can assume that adult professional players may have better experience in determining their intended training load (Foster et al., 2001).

There was no statistical difference between the levels of difficulty perceived by the coach and the players during the preparation period. When Figure 1 is examined, it is determined that the average perception of the coach in the first, third, fifth week and preparation period is higher than the perceptions of the players. However, in general, it can be said that the coach has achieved the goal of gradually increasing training practice on his players in the preparation period plan and that there is a harmony between the players and the coach. These results are consistent with previous studies comparing the relationship between training programs planned by coaches and RPE values of athletes and swimmers. In these studies, strong correlations were detected between the intensity of training perceived by athletes and coaches (Foster et al., 2001; Wallace et al., 2009).

As a result, the positions of young soccer players did not make a difference for the rate of perceived exertion. However, years licensed and VO_2 max values may be a distinguishing

factor for training load perception. In addition, we can say that there is good harmony between the young players and their coach, and the coach provides a well-structured preparation period.

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