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CHANGE IN TRAINING LOADS IN A TURKISH SUPER LEAGUE FOOTBALL TEAM AT DIFFERENT MATCH FREQUENCIES DUE TO THE COVID-19 PANDEMIC

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Abstract:
By calculating and correctly evaluating the training loads of the athletes who reach fewer training numbers and higher numbers of matches due to the changing training/day numbers, it is possible to both predict the injuries that may occur and make the right choices for their performance in the match. The aim of the study is to calculate and evaluate the training loads in the period when the postponed league competitions due to the COVID-19 pandemic caused different match frequencies and different training/days between two matches in the following weeks of the ongoing league**. Materials and methods:** 20 male professional players (age:28.6±4.01, height:1.80±.07, kg:79.2±6.57, BMI: 24.45±1.43) playing in the Antalyaspor team in the Turkish Football Federation Spor Toto Super Leagues in the 2020-2021 season were included in the study. **Results:** Our study shows the report of the preparation period, 1 game per week and the intense match period played during the pandemic period in professional football players. We can say that the training load variables of different periods are affected by the type of weekly training program, the starting position of the player (first 11), positional differences, training mode and situational factors. **Conclusion:** For this reason, it is one of the results obtained from our study that the training load is higher in the period when there is no competition (preparation period), 1 match per week, and on the contrary, the training loads are very low during the intense match period.

Keywords: acute load, chronic load, football, GPS, training load, ACWR

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1. Introduction

Football is a complex and intermittent sport that involves periods of high intensity and multiple movement patterns within the match (1, 2). The ability to recover and produce high levels of sprint distance between high-intensity exercises is one of the major differences between elite-level footballers and lower-standard footballers (22). The physiological stress associated with the modern football match is further complicated by several interconnected factors, such as psychological, tactical and technical elements that are closely linked to football performance. Injuries in football have a major impact on the performance of both the player and the team, as the player concerned loses training sessions and matches (8, 14, 31). A professional football team of 25 players has been reported to experience approximately 50 injuries per season, which is equivalent to two injuries per player per season (9). A recent meta-analysis shows that the overall injury rate in male professional footballers is 8.1 injuries/1000 hours of training exposure and that this rate does not differ significantly between professional teams of different leagues and levels. This rate is 10 times higher in matches than in training (36 injuries/1000 h in matches versus 3.7 injuries/1000 h in training), with the lower limb being the site of more injuries (6.8 injuries/1000 h exposure) and muscle and ligament injuries being the most common (4.6 injuries/1000 h exposure) (19).

GPS systems used in football provide detailed information on physical variables such as distances travelled at different intensities, accelerations or decelerations, and other technical data such as ball possession (3, 20). Players' performance can be analysed according to their position, their tactical structure on the field, or to create interventions against the opponent's tactics. In addition, internal and external training load monitoring provides useful information for injury prevention/minimising the risk of injury, as it is a variable that significantly affects players' training and match performance and fatigue (21). Accordingly, injury occurrences are influenced by the coach's leadership attitude (9), players' technical capacity, playing style, competition results, league category (3), type of match, congestion of the league fixture or fatigue (28), fatigue may also influence the risk of injury occurrence.

In this context, the aim of our research is to calculate and evaluate the training loads during the period when the league competitions were postponed due to the COVID-19 pandemic, caused different match frequencies in the following weeks of the ongoing league and different training/day numbers between the two matches.

2. Material and Methods

This study was carried out with the follow-up of 4‘-week training periods and league matches in the pre-season and 4’-week training periods in the pre-season and in the season, participating in official competitions in the Turkish Spor Toto Super League in the 2021-2022 season. No training intervention or recommendation was made during the study. Before the start of the study, the team players, the coaches and medical staff in the technical team were given the necessary information about the training of the RPE internal training load monitoring method RPE and the system applied. The 20 participants in the study, who regularly participated in training and league competitions during the 12-week study period, took part in 76 units of training and 10 league competitions lasting 60±10 minutes in total within the training programmes. The internal training load of the players because of these training and league competitions was calculated based on these values. This study was approved by the Local Ethics Committee of XX University (20240606-36). This study also confirms the standards set out by the Declaration of Helsinki. All participants were informed about the procedures and have given written consent. This study was conducted with the participation of 20 male professional players who played in a team in the Turkish Football Federation Spor Toto Super Leagues in the 2020-2021 season. The physical characteristics of the participants in the study are shown in Table 1, and goalkeepers were not included in the study. Only male professional football players participated in the study. The participants consisted of players competing in the Turkish Spor Toto Super League. The participants in the study consisted only of the players in the same team squad.

A. Rate of Perceived Exertion (RPE)

The RPE obtained from the preparation period and competition period training in football players were subjectively evaluated. CR-10 Borg Scale was used in the evaluations (21). On a scale with 11 values, 0 defines rest, while 10 is the level of burnout. The evaluation of the training data was carried out after 30 minutes to get rid of the acute effect that occurred immediately after the training (26). The reason for using the CR-10 Borg Scale in the study is that it is short-term and inexpensive, and it has shown a high correlation (r = 0.82-0.92) with TRIMP methods calculated based on training load and heart rate in a study conducted on football players (27). Training load, ACWR and monotonicity values were determined with RPE.

B. Training Monotony

Psychological characteristics such as training stress and anxiety play an important role in determining the performance of athletes. It can be said that psychological measures are as effective as physical stress measures in defining training stress. As a result, various psychological questionnaires have been applied to monitor changes in training stress, tension and recovery in order to detect early signs of fatigue or overload (10). Coaches should carefully analyse how load calculation methods affect results. In general, coaches have relied on training load for monitoring. The training load calculated from RPE also reveals 2 methods that are important for tracking (5). Adding the parameters of training difficulty and training monotony can reveal exactly what is going on with the athlete during the training process. Training monotony can be introduced as an indicator of daily training variability (5). It is calculated by dividing the daily average load by the daily standard deviation. For accurate calculation, the value ‘0’ should be entered for the days when no training is performed. If the training load is similar every day of the week, the monotonicity value will be high. However, if the training loads are evenly distributed as low and high, the monotonicity value will be at a medium or low level (5). The monotonicity value is calculated by dividing the weekly average load by the standard deviation of the weekly load.

C. Acute / Chronic Workload Ratio Calculation (ACWR)

In 1975, Bannister et al. (17) defined the Acute/Chronic Workload Ratio as 'the performance of an athlete as assessed by the difference between negative function (fatigue) and positive function (physical fitness) in response to training'. Acute load represents the intensity of training and matches performed in 7 days (1 week). Acute load is assessed as 'fatigue' in ACWR. Chronic load represents the average intensity of training and matches performed in 21 days (3 weeks). It shows the athlete's state of 'physical fitness' in the ACRF. The calculation of ACWR is calculated by dividing the acute workload value by the chronic workload ratio. The values of the ratios are important to prevent non-contact injuries or to improve performance. A low ratio (1.50) may predispose to overload injury (11). Optimal values may vary according to branches and categories. While values between 0.80 and 1.30 are called the 'sweet zone', in a study conducted on footballers, values between 1.00 and 1.25 were determined as the most efficient ACWR (11, 21). The methodology, including facilities, equipment, instruments, and procedures, should be presented with enough detail to permit an independent researcher to repeat the study. References should be cited for established methods. enough explanatory detail should be provided for new or unconventional methods.

D. Statistical Analysis

The data obtained in the study were analysed using SPSS 22.0 (SPSS Inc., Chicago, IL, USA), a computer program for statistical analysis. Before all statistical procedures, a normality test was performed to see whether the data showed normal distribution and the Shapiro-Wilk test was applied depending on the number of participants in the normality test. A p-value greater than 0.05 at the end of the normality test means that normality is ensured. After the normality test, descriptive statistics of the data such as mean, standard deviation, rank sum and rank mean were calculated, the confidence interval was determined as 95%, and the results below $p<0.05$ were considered statistically significant.

3. Results

Statistical evaluations related to the age, height, body weight and body mass index of the football players participating in the study are shown in Table 1. There was no statistical difference between the pre-test data related to the anthropometric characteristics of the participants ($p>0.05$), and it was determined that they were a homogeneous group.

Table 1: Demographic data of the participants

N = 20	Minimum	Maximum	Mean	SD
Age, year	18	35	28.60	4.02
Height, cm	1.68	1.92	1.80	0.07
Weight, kg	68	93	79.20	6.57
Body mass index	22	27	24.45	1.43

When the data in Table 2 are examined, it is known that the acute chronic workload ratio is high (minimum 1.10± 0.26-maximum 2.20±0.26) and this situation is known to have a high risk of injury, but the preparation period is the period in which loads are made for the development of football-specific conditional features. In the 1st preparation period, the minimum weekly total load values were 1961±507.11 and the maximum values were 6172±708.05. In this case, since the training load increased gradually as soon as the preparation period started, the occurrence of these variable training load values is known as normal for the preparation period. In the muscle strain values, it is known that the high values in the 1st and 2nd weeks and the lower values in the 3rd and 4th weeks are due to the adaptation process after the loading periods.

Table 2: Physical performance parameters of the first pre-season period

		Minimum	Maximum	Mean	SD
Total distance	Week 1	2493	5174	4098.2	745.42
	Week 2	2927	6173	3876.45	708.05
	Week 3	1327	4925	1862.6	740.60
	Week 4	1961	3990	2854.15	507.11
Monotony	Week 1	0.80	2.20	1.90	0.34
	Week 2	0.80	2.60	1.87	0.39
	Week 3	0.60	1.40	1.19	0.15
	Week 4	0.90	1.40	1.16	0.15
Strain	Week 1	3319	11091	7883.4	2429.68
	Week 2	4879	10243	7101.0	1612.70
	Week 3	1547	2942	2143.15	325.11
	Week 4	1709	4870	3337.9	776.76
ACWR	Week 1	1.20	2.00	1.63	0.23
	Week 2	1.10	2.20	1.57	0.26
	Week 3	0.60	2.00	0.94	0.29
	Week 4	0.70	1.20	0.89	0.12

Note: ACWR: Acute/chronic workload.

Table 3: Physical performance parameters of the second pre-season period

		Minimum	Maximum	Mean	SD
Total distance	Week 1	2315	3285	2766.25	280.52
	Week 2	1553	3718	2647.80	583.52
	Week 3	1901	3361	2507.90	364.15
	Week 4	1922	4013	2558.25	528.30
Monotony	Week 1	1.50	2.50	1.90	0.28
	Week 2	1.10	3.60	1.90	0.54
	Week 3	1.40	3.00	2.08	0.51
	Week 4	1.00	2.00	1.51	0.26
Strain	Week 1	3841	7044.00	5273.65	803.6
	Week 2	2600	9889.00	5135.25	2110.07
	Week 3	3440	9850.00	5204.35	1536.10
	Week 4	2115	6059.00	3860.55	967.10
ACWR	Week 1	0.70	1.20	0.88	0.15
	Week 2	0.50	1.10	0.83	0.18
	Week 3	0.60	1.00	0.79	0.10
	Week 4	0.80	1.30	0.97	0.14

Note: ACWR: Acute/chronic workload.

Table 4: Covid19 period physical performance parameters

		Minimum	Maximum	Mean	SD
Total distance	Week 1	900	3040	2053.00	625.75
	Week 2	1235	3190	2044.25	491.16
	Week 3	1250	3645	2205.95	604.18
	Week 4	1230	2300	1758.25	307.96
Monotony	Week 1	0.80	1.70	1.1250	0.29
	Week 2	0.80	1.80	1.2650	0.26
	Week 3	0.80	2.10	1.2100	0.32
	Week 4	0.80	1.90	1.3250	0.30
Strain	Week 1	985	4434	2256.05	791.22
	Week 2	1297	4944	2557.95	745.17
	Week 3	1629	4233	2551.60	639.50
	Week 4	1010	3240	2289.15	556.66
ACWR	Week 1	0.80	2.60	1.3650	0.43
	Week 2	0.60	3.80	1.5000	0.77
	Week 3	0.80	3.70	1.6150	0.88
	Week 4	0.70	2.90	1.2650	0.60

Note: ACWR: Acute/chronic workload.

4. Discussion

Previous studies on elite male football players (1, 25) reported that the total distance travelled during matches ranged from 10,000 to 11,000 m, while the total distance travelled during training sessions averaged 5,223 to 6,406 m (1). In addition, the averages of high-intensity running distance and player load were determined as 515 ± 213 m and 523 ± 88 AU, respectively (21). In their study, Malone et al. stated that football players with high acute load may face a higher risk of injury compared to football players with low load. They also stated that football players with high chronic loads can tolerate the load better than football players with low chronic loads in sudden loads (21). In the study by Paulauskas et al., in which they examined the changes in weekly load distributions in female basketball players when the training load graphs were examined, it was stated that 9 weeks of the 24-week examination showed a change above a 15% difference rate (22). It has been reported that changes in acute training load rates of more than 15% on a weekly basis may increase the risk of injury (22, 29). Gabbet reported that weekly sudden loading may increase the risk of non-contact injury due to chronic load (16).

Sampson et al. stated that high (Acute Chronic Workload Ratio) ACWR is directly related to low fitness and delayed muscle soreness. In addition, they determined that fitness values and delayed muscle soreness values below normal may increase the risk of injury with high ACWR (24). White et al. reported that the safe ratio range of training load was 1.02-1.14 in their study with football players. They also stated that research conducted in the range of these specified ratios may be safer. In the review study by Griffin on the relationship between Acute Chronic Workload Ratio and injury, it was stated that non-contact injuries are associated with ACWR and these ratios should be monitored (12). In a study conducted by Hulin et al. on cricket athletes, it was stated that high values in external and internal load ACWR calculations may increase the risk of injury (16). Malone et al. observed that 1.00-1.25 ACWR values were associated with a lower risk of injury compared to the reference group (≤ 0.85) (21). Recently, there have been studies on the relationship between ACWR and injury on training load monitoring. However, in these studies, while some researchers advocate the view that ACER is effective in predicting injury, other researchers reject this view (16, 17). Studies indicate that for ratios >2.00, may lead to overtraining syndrome (22). In a study conducted by Thornton et al. in professional team athletes, it was reported that weekly training monotony was associated with the risk of getting sick and fitness status was associated with the risk of getting sick (6). Hader et al. reported that increased monotony value was associated with overtraining syndrome (13).

In a study conducted by Tibana et al. on an elite athlete, it was observed that the lowest monotony value was 0.60, and the highest value was 2.36 (17). Paulauskas et al. stated that in a study conducted in an elite women's basketball team, the lowest monotony value was 0.82, and the highest monotony value was 1.65 (22). Foster and colleagues examined the effect of training load, training monotony, overtraining syndrome and sickness in experienced athletes and argued that sudden increases in training load can predict the probability of athletes getting sick by 84%, and sudden increases in training monotony can predict the probability of getting sick by 77%. Some researchers have demonstrated the importance of a player's tactical role in a football team and its relationship with performance (17, 30).

Analysing physical variables such as total running distance, running at low speeds and running at high speeds have also been associated with physical performance and injury rate (7). However, some authors have emphasised the importance of other performance variables such as acceleration, deceleration, total load or calculation of ACWR (11). The player position that covers the most distance in football is the centre midfield and scientific studies have reported this finding in the Spanish league using the Mediacoach® multi-camera video system. Players exposed to pre-season 1-week loads of ≥1500 to ≤2120 AU were at significantly higher risk of injury compared to the ≤1500 AU control group (OR = 1.95, p = 0.006). Players with increased intermittent aerobic capacity were better able to tolerate incremental 1-week absolute changes in training load than players with lower fitness levels (OR = 4.52, p = 0.011). Players who practised acute: chronic workload ratios >1.00 to <1.25 (OR = 0.68, p = 0.006) ACWR >1.00 to <1.25 (OR = 0.68, p = 0.006) within the season were reported to be at significantly lower risk of injury compared to the control group (≤0.85) (21). In addition to training and match load, many factors influence players' injury risk. For example, previous injury (14), perceived muscle pain, fatigue, mood, sleep ratings (18) and psychological stressors (15), were not accounted for in the current analysis. Perceived degree of difficulty (RPE) has been proposed as an acceptable method to measure training load in team sports (4).

5. Conclusion

Our study shows the reports of the preparation period, 1 match per week and the intensive match period played during the COVID-19 pandemic period in professional football players in the findings. We can say that the training load variables of different periods are affected by the type of weekly training programme, the player's starting status (first 11), positional differences, training mode and situational factors. This research shows us that training loads and injury risks are very high in the non-competition period (preparation period), training loads and injury risks are much higher in the period of one match per week than in the period of two matches per week, and on the contrary, training loads and injury risks are very low in the intensive match period.

Conflict of Interest Statement

The authors declare no conflicts of interest.

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