



# Türkiye Voleybol Federasyonu

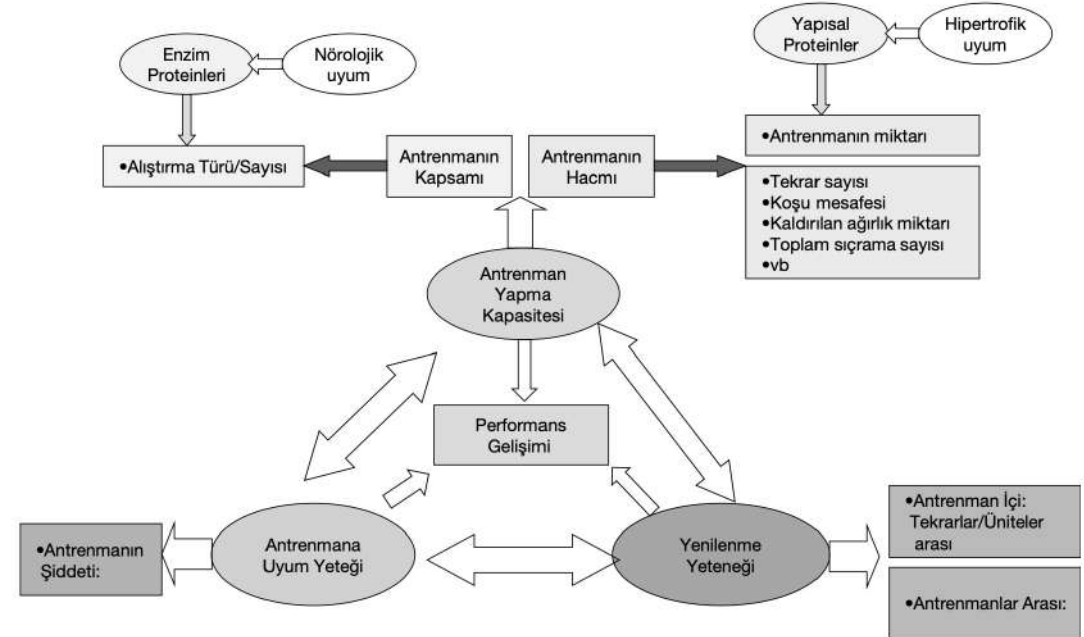
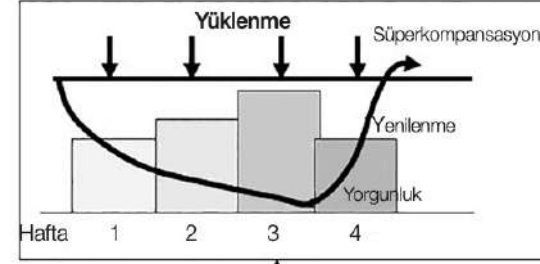
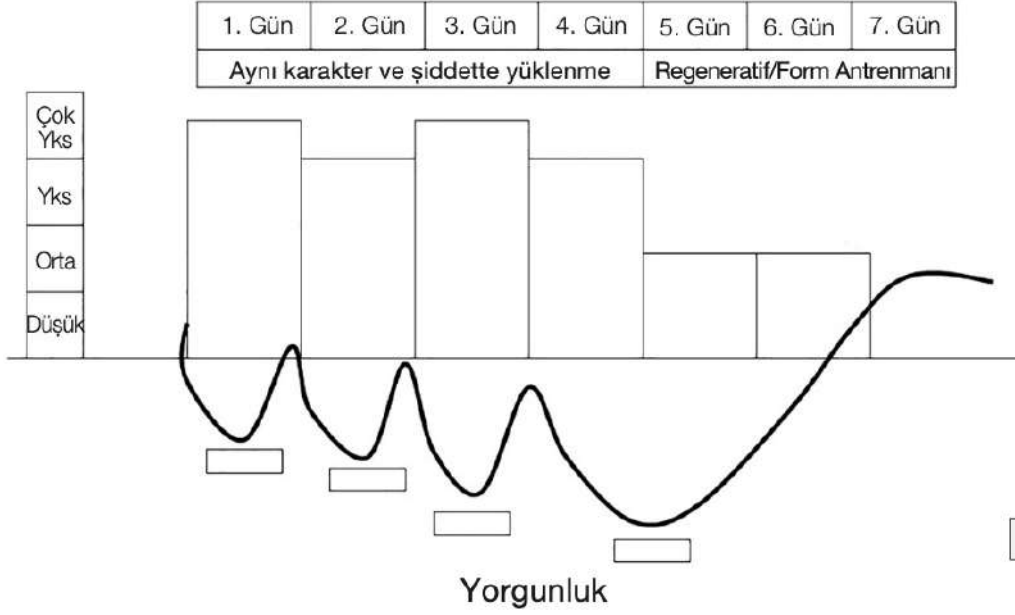
## 5. Kademe Antrenör Eğitimi

### **Antrenman Yüğü Takibi ve Antrenmanın Planlaması**

**Doç.Dr. Alper Aşçı**

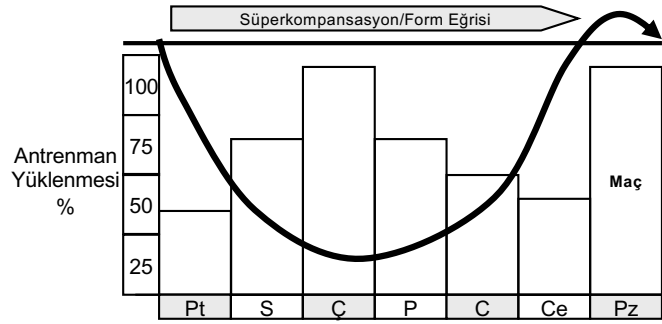
Haliç Üniversitesi Beden Eğitimi ve Spor Yüksekokulu

## Yüklenme

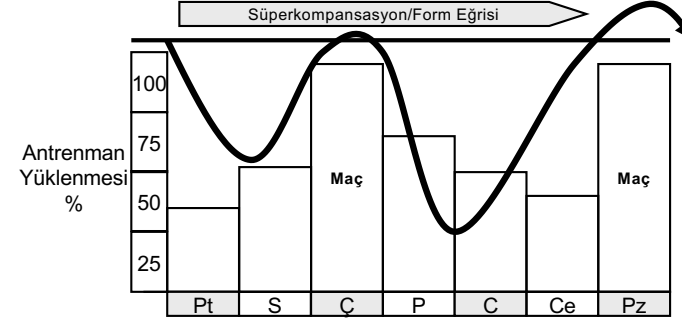


Şekil 2.4.14: : Performans gelişimini etkileyen antrenman bileşenleri. Performans gelişimi ve performans kapasitesi, antrenmana ilişkin diğer özelliklerle çok yakından ilgilidir.

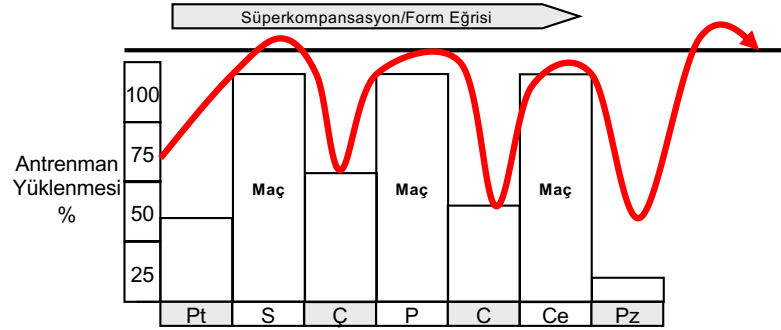
## Haftalık (Mikrosiklüs) Planlama: Yarışma Periyodu Yarışma Mikrosiklüs Yapıları



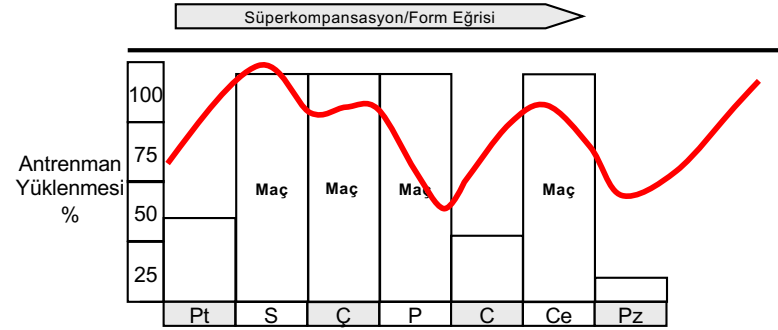
A: Tek Yarışma özellikli mikrosiklüs



B: Çift Yarışma özellikli mikrosiklüs



C: Turnuva Yarışma özellikli mikrosiklüs



C: Turnuva Yarışma özellikli mikrosiklüs

## Antrenman Yükünün Takibi

### Objektif Yaklaşım: Teknoloji

- External
  - ❖ Lokomotor (Hız, Mesafe)
  - ❖ Mekanik (İvmelenme)
- Internal (Kalp atım hızı)
  - ❖ Banister TRIMP
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  - ❖ iTRIMP



### Subjektif Yaklaşım:

- Algılanan Zorluk Derecesi (RPE)
  - ❖ sRPE hesabı

### 1- ACWR:

- a-  $ACWR_{Rolling}$  Model
- b-  $ACWR_{EWMA}$  Model

### 2- Training Monotony & Strain

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# Season Impact on the Technical and Physical Training Load in Professional Volleyball



Thiago A.G. Horta<sup>\*</sup>, Maurício G. Bara Filho, Bernardo Miloski, Daniel G.S. de Freitas and Jeferson M. Vianna

Faculty of Physical Education and Sports, Federal University of Juiz de Fora, Brazil

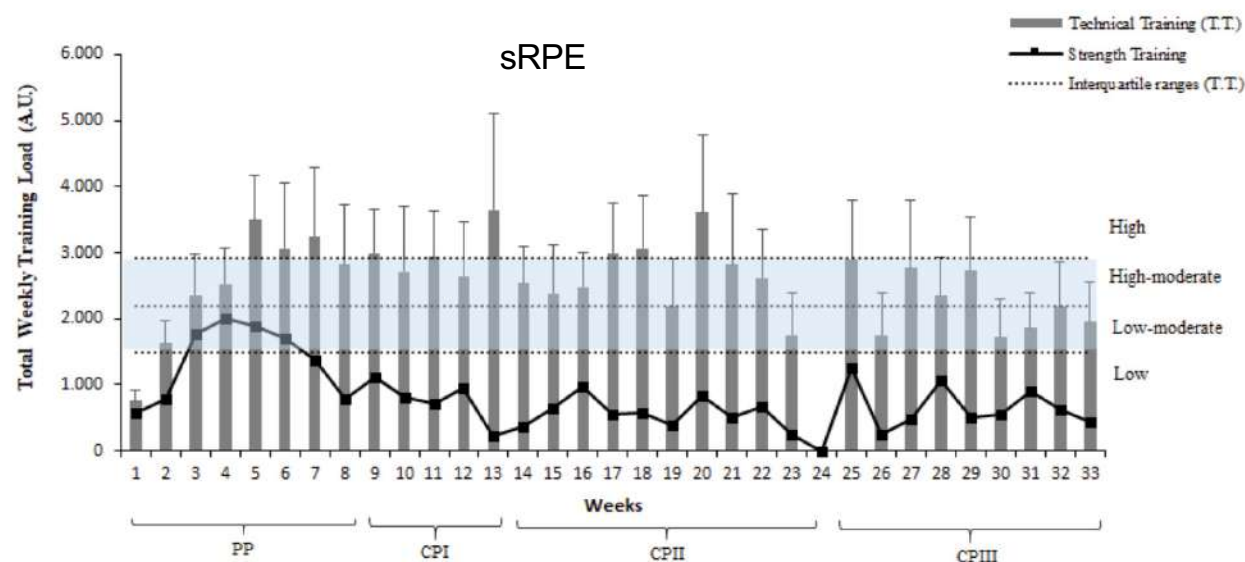


International Journal of Sports and Exercise Medicine

Horta et al. Int J Sports Exerc Med 2021, 7:183

The participants were players from a professional volleyball team. In total, 14 male athletes (four hitter spikers, two opposites spikers, two setters, two liberos, and four middle-blockers), with physical characteristics (mean  $\pm$  standard deviation) (age:  $26.7 \pm 5.5$  years, body mass:  $95.8 \pm 8.2$  kg, height:  $197.0 \pm 7.9$  cm, body fat:  $14.8 \pm 5.8\%$ ) were analyzed. No athlete was < 18-years-

TL was measured daily using the RPE session method [11], which had already been used with similar samples from professional volleyball players [4,18,20]. Approximately 30 minutes after the end of each training session, the athletes answered the question “How was your training?” The intensity was measured using the 10-point Borg scale (CR-10) [22] which ranged from 0 (rest) to 10 (maximum effort).



**Figure 3:** Description of technical and strength training Total Weekly Training Load (TWTL) during 33 weeks of a season in volleyball.

AU: Arbitrary Units. Values presented in mean  $\pm$  SD.

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**Table 1:** Training load and vertical jump variables in the four periods of the season.

Variables	Preparatory	Competitive I	Competitive II	Competitive III	TOTAL
N° of weeks	8	5	10	9	32
N° of games	2	11	15	13	41
ATL (AU)	3789 ± 1638	3676 ± 1083 <sup>#</sup>	3180 ± 1105 <sup>*</sup>	2893 ± 1074 <sup>*</sup>	3332 ± 1297
TECTL (AU)	2413 ± 1131	2868 ± 1062 <sup>#</sup>	2613 ± 952 <sup>#</sup>	2154 ± 878	2468 ± 1023
STL (AU)	1338 ± 672	771 ± 341 <sup>§</sup>	581 ± 243 <sup>*</sup>	680 ± 342 <sup>*</sup>	820 ± 516
RPE - TECT	4.0 ± 0.3	3.9 ± 0.2	3.8 ± 0.5	3.4 ± 0.3 <sup>*</sup>	3.7 ± 0.4
RPE - ST	4.3 ± 0.6	3.5 ± 0.6	3.4 ± 0.5 <sup>*</sup>	3.7 ± 0.3	3.7 ± 0.6
V. (min) - TECT	76 ± 8 <sup>#</sup>	95 ± 9 <sup>*#§</sup>	75 ± 11 <sup>#</sup>	61 ± 10 <sup>§</sup>	74 ± 14
V. (min) - ST	57 ± 6	56 ± 7	55 ± 6	59 ± 2	57 ± 5
VTST (repetition)	2010 ± 1061	832 ± 343 <sup>*</sup>	1039 ± 358 <sup>*</sup>	1025 ± 452 <sup>*</sup>	1246 ± 752
%TECTL of ATL	64%	78%	82%	74%	75%
% STL of ATL	36%	22%	18%	26%	25%
CMJ (cm)	43.2 ± 7.0	43.1 ± 6.2	44.2 ± 6.3	-----	43.5 ± 0.6

Average values ± standard deviation.

ATL: Accumulated Training Load; AU: Arbitrary Units; TECTL: Technical training load; RPE: Perceived exertion; TECT: Technical training; V (Min): Volume in minutes; STL: Strength Training Load; ST: Strength Training; VTST: Strength training total volume by repetitions; CMJ: Vertical countermovement jump.

<sup>\*</sup>Significant difference (ANOVA repeated measures) for the preparatory period; <sup>#</sup>Significant difference (ANOVA repeated measures) for competitive period III; <sup>§</sup>Significant difference (ANOVA repeated measures) for competitive period II.

## MONITORING TRAINING LOAD AND RECOVERY IN VOLLEYBALL PLAYERS DURING A SEASON

MONITORAMENTO DA CARGA DE TREINAMENTO E RECUPERAÇÃO EM JOGADORES DE VOLEIBOL DURANTE UMA TEMPORADA

MONITOREO DE LA CARGA DE ENTRENAMIENTO Y RECUPERACIÓN EN JUGADORES DE VOLEIBOL DURANTE UNA TEMPORADA

Thiago Seixas Duarte<sup>1</sup> Renato Miranda<sup>1</sup> Heglison Custódio Toledo<sup>3</sup>  
Francisco Zacaron Werneck<sup>4</sup> Daniel Gustavo Schimitz de Freitas<sup>5</sup>  
Maurício Gáttas Bara Filho<sup>1</sup>

Rev Bras Med Esporte – Vol. 25, Nº 3 – Mai/Jun, 2019



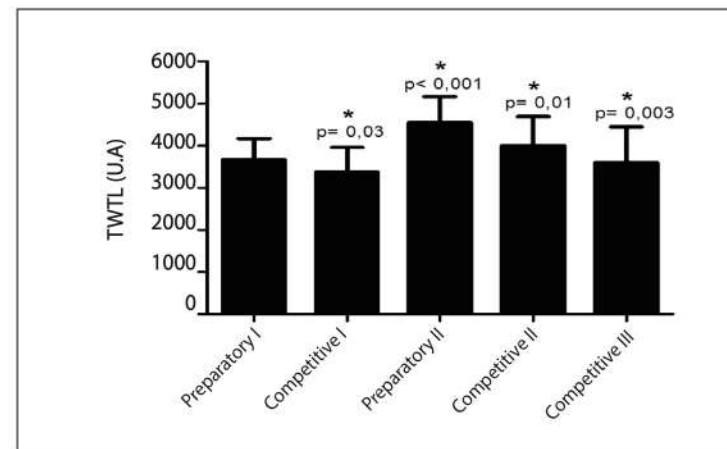
The study included 14 male athletes from an adult volleyball team competing in the National Superliga championship, with mean age of  $24.0 \pm 3.59$  years, body mass of  $96.87 \pm 9.85$  kg, height of  $194.36 \pm 6.9$  cm, fat percentage of  $7.58 \pm 1.91\%$ .

To monitor the recovery state, the Total Recovery Quality Scale (TQR) was used.

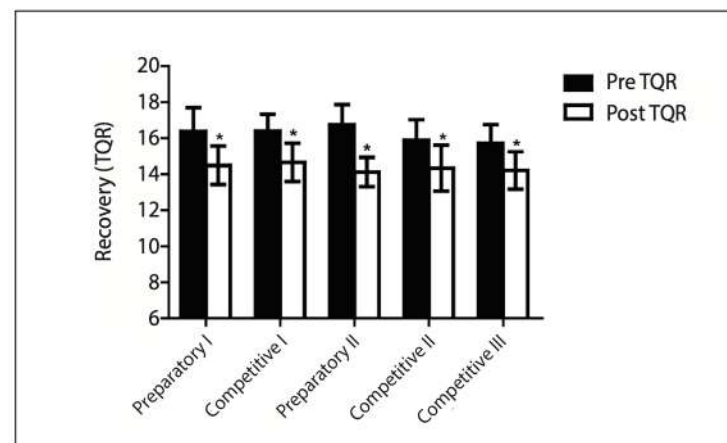
This scale was proposed in order to evaluate general recovery. Athletes answered the question "How do you feel about your recovery?", based on the scale proposed by Kentta and Hassmen,<sup>2</sup> in which 6 corresponds to "Not recovered" and 20, "Completely recovered." The athletes responded to the scale on the first and last day of training or game in the week.

This study was carried out during a competitive season lasting 35 weeks, divided into five mesocycles named as follows:

- Seven weeks of preparatory period I,
- Five weeks of competitive period I,
- Eight weeks of preparatory period II,
- Eight weeks of competitive period II,
- Seven weeks of competitive period III.



**Figure 1.** Mean±standard deviation of the training load (TL) of a volleyball team (n=14) measured over five mesocycles of the season (\*Significant differences found compared to the previous mesocycle,  $p < 0.05$ ).



**Figure 2.** Mean±standard deviation of the total quality recovery (TQR) at the beginning and at the end of the week for a volleyball team (n=14) measured over five mesocycles of the 2012/2013 season. (\*Significant differences between Pre TQR and Post TQR;  $p < 0.05$ ).



## Analyzing the seasonal changes and relationships in training load and wellness in elite volleyball players

Filipe Manuel Clemente<sup>1,2\*</sup>, Ana Filipa Silva<sup>1,3</sup>, Cain Craig Truman Clark<sup>4</sup>, Daniele Conte<sup>5</sup>, João Ribeiro<sup>6,7</sup>, Bruno Mendes<sup>7</sup>, Ricardo Lima<sup>1,7</sup>

### Participants

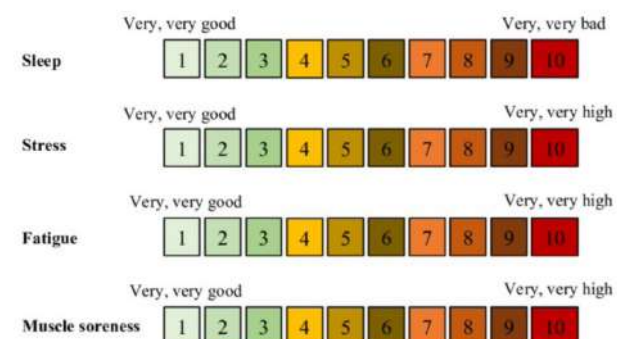
This study included thirteen professional volleyball players in a team competing in the 1<sup>st</sup> Portuguese volleyball division (age:  $31.0 \pm 5.0$  years old; height:  $1.94 \pm 0.07$  m; body mass:  $88.9 \pm 7.6$  kg). The team reached the finals of the first league in the season.

### Well-being monitoring

The Hooper questionnaire, consisting of four items (stress, fatigue, sleep and DOMS) (17), was administered every morning before training sessions. The scale ranged from 1 (very, very low) to 7 (very, very high) for stress, fatigue and DOMS categories, concordant to previous studies (19). In the specific case of sleep quality, the 1 represented very, very good and 7 very, very bad. The Hooper index was calculated for each day, representing the sum of the four rates (i.e. the rate for each item) of the day (11).

**Table 1.** Characterization of the number of weeks, training sessions and matches during the season.

	October	November	December	January	February	March	April	May
Weeks (n)	4	5	4	4	4	5	4	3
Sessions (n)	31	31	20	29	21	31	27	13
Matches (n)	2	5	5	5	6	6	6	2



**Subjektif Yaklaşım:  
Algılanan Zorluk Derecesi (RPE) üzerinden Antrenman Yüğü (sRPE)**



Borg CR10 Scale

	Tanım
0	Dinlenik
1	Çok kolay
2	Kolay
3	Ortalama
4	Biraz Zor
5	Zor
6	
7	Çok Zor
8	
9	
10	Maksimal

Drill	Süre	RPE Cevabı	sRPE
Isınma	10		
Pas Çalışması	10		
7x5 oyun	10		
Şut çalışması	20		
4x4 oyun	20		
<b>Antrenman</b>	<b>70</b>	<b>6</b>	<b>420</b>

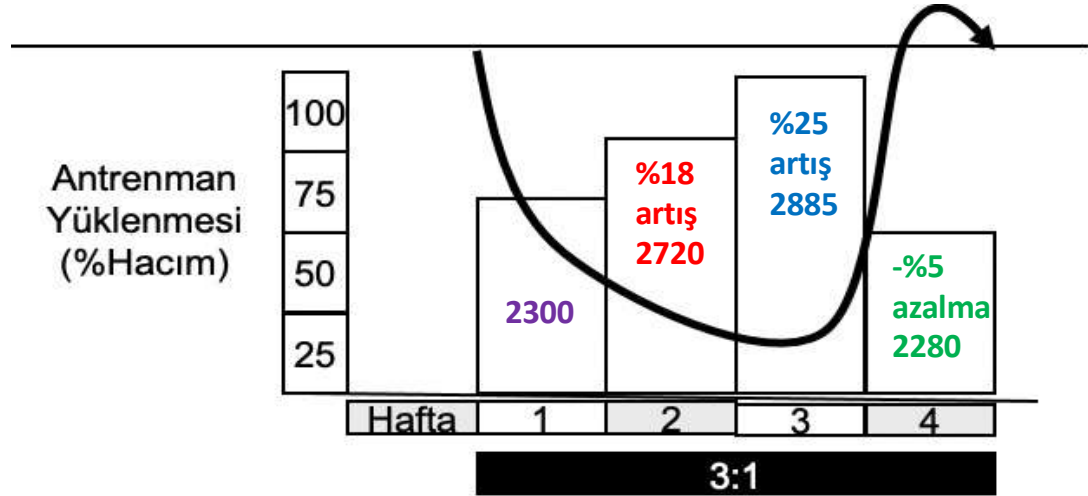
$$\text{sRPE} = \text{Süre} \times \text{RPE cevabı}$$

$$\text{sRPE} = 70 \text{ dk} \times 6 = 420$$

## Algılanan Zorluk Derecesi (RPE) üzerinden Antrenman Yüğü (sRPE)



HAFTA	GÜN	RPE	Süre (dk)	sRPE (AU)	Haftalık Yük (AU)
1	Pazartesi	5	70	350	2300
	Salı	7	70	490	
	Çarşamba	6	75	450	
	Perşembe	4	65	260	
	Cuma	2	50	100	
	Cumartesi	10	90	650	
	Pazar	0	0	0	
2	Pazartesi	5	70	350	2720
	Salı	7	75	525	
	Çarşamba	6	65	390	
	Perşembe	9	75	675	
	Cuma	4	70	280	
	Cumartesi	5	70	350	
	Pazar	3	50	150	
3	Pazartesi	4	70	280	2885
	Salı	9	75	675	
	Çarşamba	6	70	420	
	Perşembe	5	65	325	
	Cuma	8	75	600	
	Cumartesi	9	65	585	
	Pazar	0	0	0	
4	Pazartesi	4	70	280	2280
	Salı	7	75	525	
	Çarşamba	6	70	420	
	Perşembe	5	65	325	
	Cuma	6	75	450	
	Cumartesi	4	70	280	
	Pazar	0	0	0	



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**Measuring the training external jump load of elite male volleyball players: an exploratory study in Portuguese League**

**Medición de la carga externa de entrenamiento de los jugadores de voleibol masculino de élite: un estudio exploratorio en la Liga Portuguesa**

\*Ricardo Franco Lima, \*\*Jose Palao, \*\*\*Henrique Castro, \*\*\*\*Filipe Clemente

\*Instituto Politécnico de Viana do Castelo – Escola Superior de Desporto e Lazer (Portugal); Research Center in Sports Sciences, Health Sciences and Human Development (CIDESD) (Portugal), \*\*University of Wisconsin Parkside (Estados Unidos),

\*\*\*Universidade Federal de Minas Gerais (Brasil), \*\*\*\* Instituto Politécnico de Viana do Castelo – Escola Superior de Desporto e Lazer (Portugal); Instituto de Telecomunicações, Delegação da Covilhã (Portugal)

2019, *Retos*, 36, 454-458



Table 1.

Characteristics of the male elite volleyball players that participated in the study.

Subject	Age (yr)	Height (m)	Weight (kg)	Years of experience (yr)
Middle blocker #1	20	2.07	91	5
Middle blocker #2	36	1.93	90	20
Setter #1	29	1.87	74	16
Outside hitter #1	19	1.98	89	4
Outside hitter #2	34	1.94	82	22



***Design and Procedures***

To determinate the jump number and heights, each participant wore an inertial measurement unit device with three gyroscopes and three accelerometers (VERT Classic, Florida, United States).

The average standard error of the device for assessing the jump height is 4 cm (Charlton et al., 2016). The participants each wore a belt with the device on the hip.

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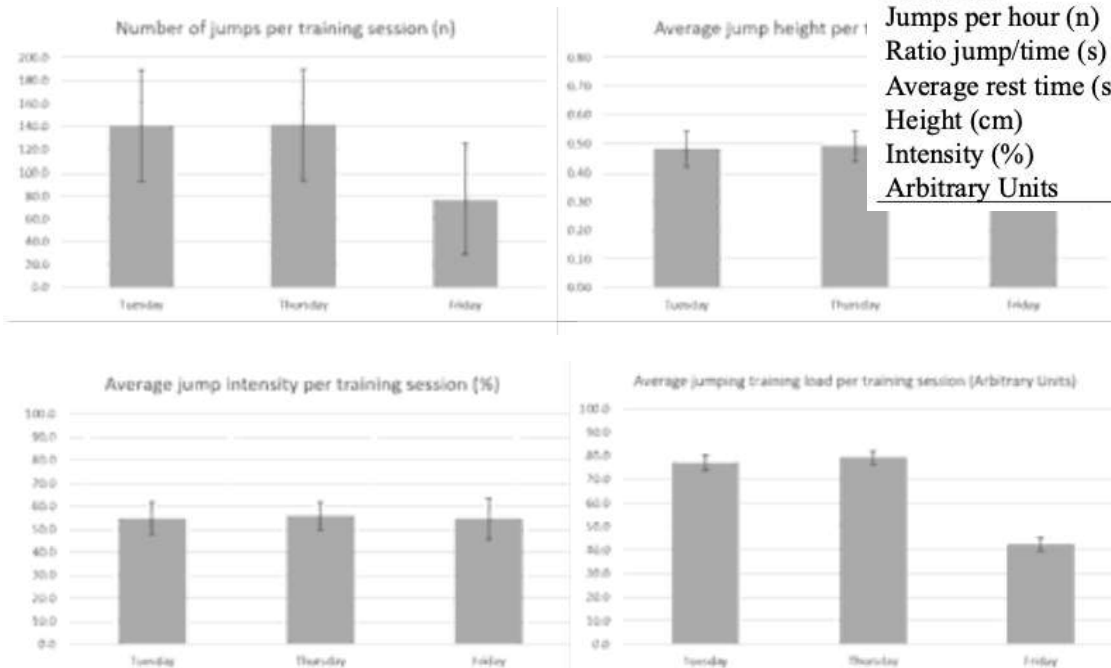


Figure 1. Average jumps frequency, jump heights, jump intensity, and arbitrary units of jump load per practice for male volleyball players studied.



## Conclusions

**Table 2.** Average amount of jumps, jump frequency, jump heights, jump intensity and arbitrary units in practice for male volleyball players of different positions.

Variable	Middle blocker		Setter		Outside hitter	
	Average	SD	Average	SD	Average	SD
Jumps (n)	123.3	54.3	179.9 <sup>a,b</sup>	64.0	141.7	63.1
Jumps per hour (n)	77.5	22.0	118.0	10.8	90.7	23.4
Ratio jump/time (s)	1 : 53.0	27.8	1 : 30.7	2.8	1 : 42.3	11.8
Average rest time (s)	23.4	7.8	27.9	2.6	20.7	5.3
Height (cm)	48.0 <sup>b,c</sup>	4.4	41.1 <sup>a,b</sup>	2.5	51.0 <sup>a,c</sup>	4.0
Intensity (%)	51.6	4.8	57.8	3.5	54.6	4.0
Arbitrary Units	62.2	26.2	105.6 <sup>a,b</sup>	40.4	78.8	37.5

with similar intensity and distribute uniformly through the training practice. However, middle blockers and outside hitters accumulated their jumps in specific moments (frontcourt). These results show that monitoring the jump-training load of volleyball players should consider their role and specific characteristics (jump capacity). This research showed how the coach reduced the jump volume the previous day to the match with respect to previous training sessions as a way to prepare the competition. Players did not change the intensity of their jumps the previous session to the match. More studies are needed to provide information about jump training load in volleyball players.

# Within-week differences in external training load demands in elite volleyball players

**BMC**  
(2022) 14:188



Zeki Akyildiz<sup>1</sup>, Henrique de Oliveira Castro<sup>2</sup>, Erhan Çene<sup>3</sup>, Lorenzo Laporta<sup>4</sup>, Coskun Parim<sup>3</sup>, Emre Altundag<sup>1</sup>, Cengiz Akarçesme<sup>1</sup>, Giovanni Guidetti<sup>5</sup>, Giovanni Miale<sup>6</sup>, Ana Filipa Silva<sup>6,7</sup>, Hadi Nobari<sup>8,9,10\*</sup> and Filipe Manuel Clemente<sup>7,11</sup>

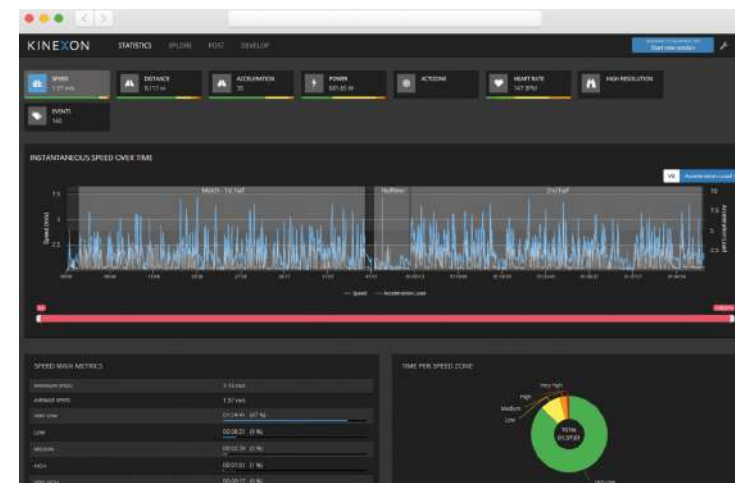
## Methods

### Participants

This study included 14 top elite female club world champion volleyball league players (mean±standard deviation (SD); age, 22±0.9 years; height, 195.1±7.6 cm; body mass, 71.4±6.3 kg). Volleyball players in this team participated in the competitions organized by the Turkish Volleyball Federation (TVF) and the Fédération Internationale de Volleyball (FIVB).

External loads in training sessions and competitions were recorded with LPS [KINEXON, GMBH, Precision Technologies, KINEXON ONE Munich, Germany] technology. In all training sessions and competitions, the players wore the LPS units in a specially positioned vest between the shoulder blades.

five days before the match day (MD-5) (n=107, number of sessions=7), four days before the match day (MD-4) (n=225, number of sessions=14), three days before the match day (MD-3) (n=436, number of sessions=18), two days before the match day (MD-2) (n=517, number of sessions=28), one day before the match day (MD-1) (n=940, number of sessions=56), the match day (MD) (n=811, number of sessions=63), a match day with training on the same day (MD-T) (n=391, number of sessions=39) and the day after the match (MD+1) (n=391, number of sessions=22).

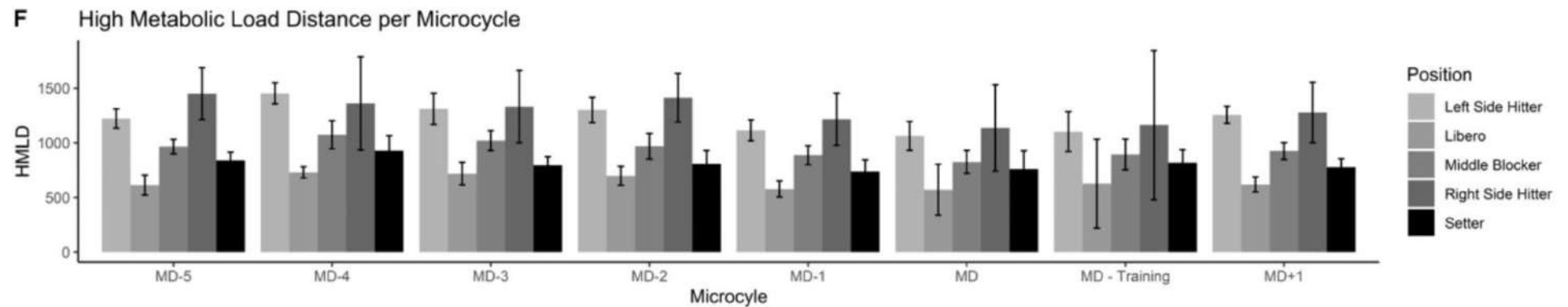
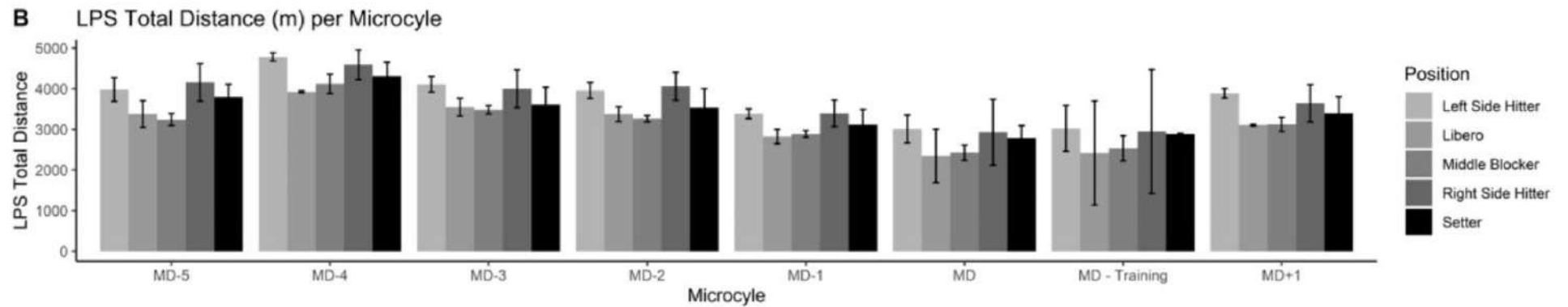


# Within-week differences in external training load demands in elite volleyball players



Zeki Akyıldız<sup>1</sup>, Henrique de Oliveira Castro<sup>2</sup>, Erhan Çene<sup>3</sup>, Lorenzo Laporta<sup>4</sup>, Coskun Parim<sup>3</sup>, Emre Altundag<sup>1</sup>, Cengiz Akarçesme<sup>1</sup>, Giovanni Guidetti<sup>5</sup>, Giovanni Miale<sup>6</sup>, Ana Filipa Silva<sup>6,7</sup>, Hadi Nobari<sup>8,9,10</sup> and Filipe Manuel Clemente<sup>7,11</sup>

## Lokomotor Yük





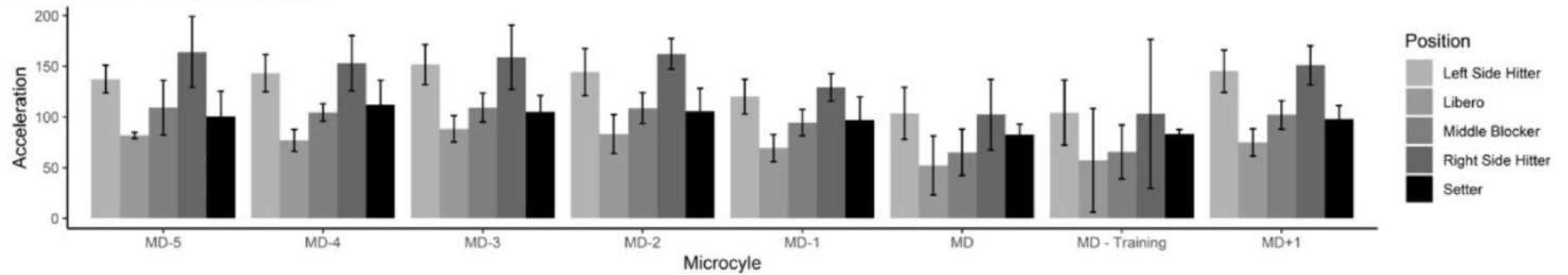
# Within-week differences in external training load demands in elite volleyball players



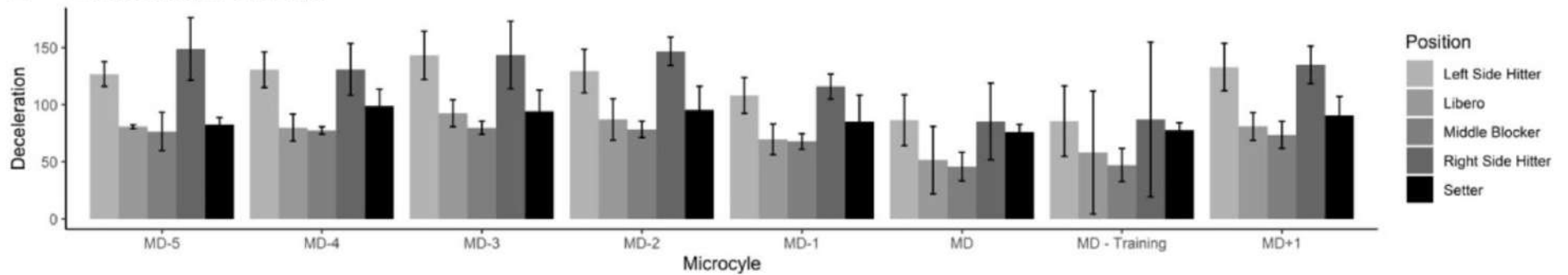
Zeki Akyildiz<sup>1</sup>, Henrique de Oliveira Castro<sup>2</sup>, Erhan Çene<sup>3</sup>, Lorenzo Laporta<sup>4</sup>, Coskun Parim<sup>3</sup>, Emre Altundag<sup>1</sup>, Cengiz Akarçesme<sup>1</sup>, Giovanni Guidetti<sup>5</sup>, Giovanni Miale<sup>6</sup>, Ana Filipa Silva<sup>6,7</sup>, Hadi Nobari<sup>8,9,10\*</sup> and Filipe Manuel Clemente<sup>7,11</sup>

## Mekanik Yük

**D** Acceleration per Microcycle



**E** Deceleration per Microcycle



## Within-week differences in external training load demands in elite volleyball players

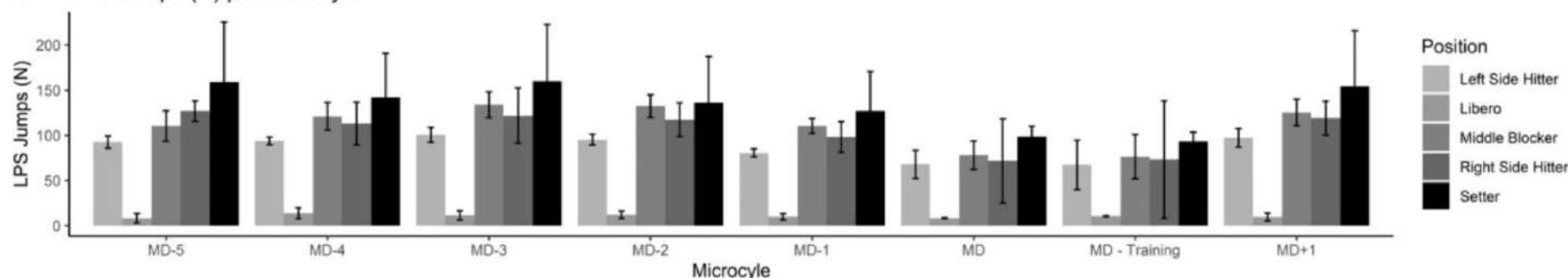
**BMC**  
(2022) 14:188



Zeki Akylidiz<sup>1</sup>, Henrique de Oliveira Castro<sup>2</sup>, Erhan Çene<sup>3</sup>, Lorenzo Laporta<sup>4</sup>, Coskun Parim<sup>3</sup>, Emre Altundag<sup>1</sup>, Cengiz Akarçesme<sup>1</sup>, Giovanni Guidetti<sup>5</sup>, Giovanni Miale<sup>6</sup>, Ana Filipa Silva<sup>6,7</sup>, Hadi Nobari<sup>8,9,10</sup> and Filipe Manuel Clemente<sup>7,11</sup>

### Mekanik Yük

**C** LPS Jumps (N) per Microcycle



## Patellar tendon structure responds to load over a 7-week preseason in elite male volleyball players

Lucas Maciel Rabello<sup>1</sup> | Johannes Zwerver<sup>1</sup> | Roy E. Stewart<sup>2</sup> | Inge van den Akker-Scheek<sup>1,3</sup> | Michel S. Brink<sup>4</sup>

Received: 16 May 2018 | Revised: 28 February 2019 | Accepted: 27 March 2019

DOI: 10.1111/sms.13428

	Weekly volume (min)	Mean RPE score (6-20)	Weekly load (AU)	Weekly jump frequency (jumps)
Week 1	638 (193)	14.1 (1.0)	8976 (2741)	262 (84)
Week 2	599 (211) <sup>b</sup>	13.8 (1.1)	8398 (3211) <sup>b</sup>	265 (93)
Week 3	687 (207) <sup>a</sup>	13.8 (1.1)	9587 (3010) <sup>a</sup>	293 (131)
Week 4	717 (208)	14.2 (1.0)	10 437 (3257) <sup>a</sup>	320 (132)
Week 5	559 (199)	13.6 (1.1)	7897 (3066)	229 (132)
Week 6	590 (207)	13.7 (1.4)	8419 (3180)	252 (125)
Week 7	522 (162)	14.0 (1.1)	7433 (2467)	266 (138)
SUM	4312 (940)	13.9 (0.7)	61 148 (13 945)	18 086 (634)

Note. Abbreviations: AU, arbitrary units; RPE, rate of perceived exertion.

<sup>a</sup>Significant difference compared to week 7.

<sup>b</sup>Significant difference compared to week 4.

the potential to revert to normal if sufficient recovery time is given and further training load is balanced.<sup>32</sup>

It is notable that the players were exposed to only subtle changes in load during preseason, and they performed a low amount of load over those 7 weeks. The athletes jumped much less (weekly jump frequency range 228-319 jumps) compared to a previous study observing that athletes jumped up to 300 times in one single match.<sup>33</sup> The first explanation for the low load performed would be the fact that this study was conducted during the preseason, when athletes are returning from a low level of activities (holiday). Another explanation could be that because of this study, coaches and medical staff were more aware of the risks of injuries such as patellar tendinopathy. As we demonstrated, no spikes in load were observed during preseason.

# Jump Performance During Official Matches in Elite Volleyball Players: A Pilot Study

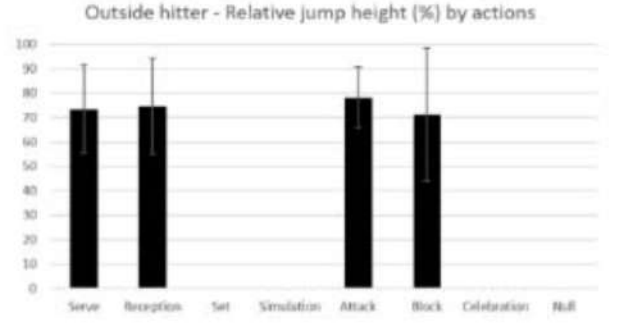
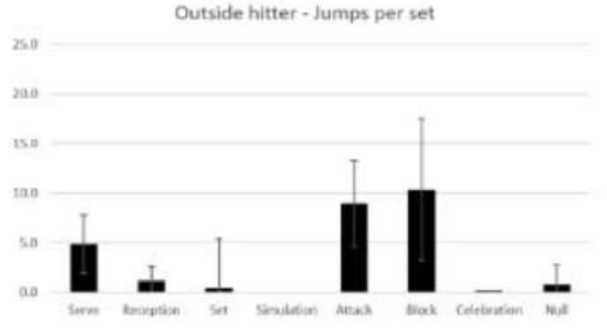
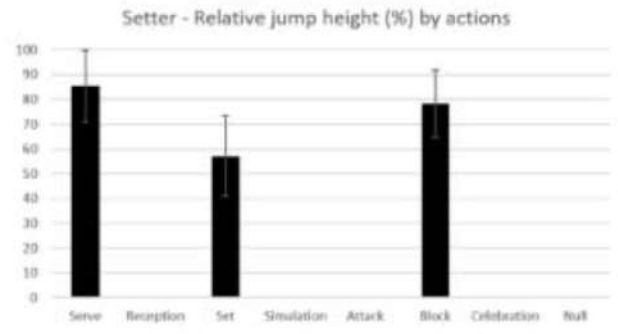
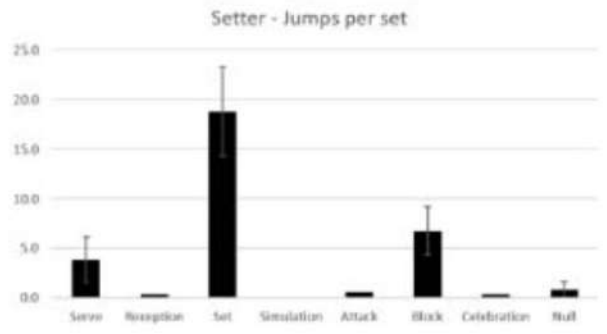
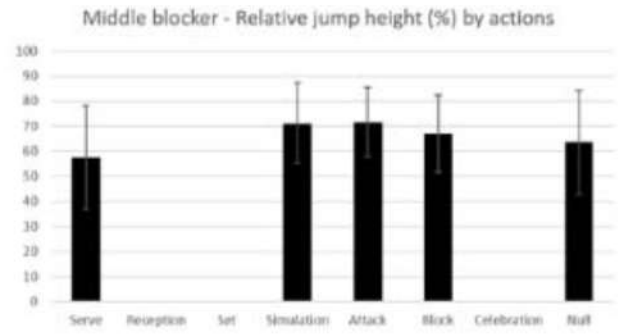
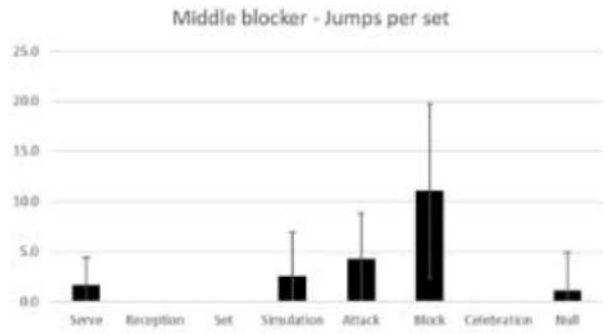
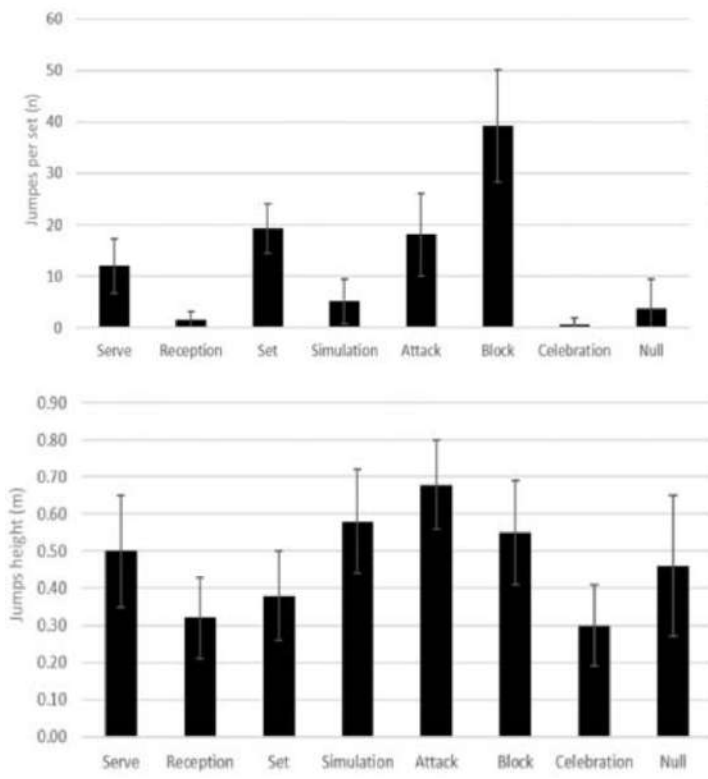
Article 11 | Journal of Human Kinetics | September 2018  
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## Antrenman Yükünün Takibi

### Objektif Yaklaşım: Teknoloji

- External
  - ❖ Lokomotor (Hız, Mesafe)
  - ❖ Mekanik (İvmelenme)
- Internal (Kalp atım hızı)
  - ❖ Banister TRIMP
  - ❖ Edward's TRIMP
  - ❖ Lucia's TRIMP
  - ❖ iTRIMP



### Subjektif Yaklaşım:

- Algılanan Zorluk Derecesi (RPE)
  - ❖ sRPE hesabı

### 1- ACWR:

- a-  $ACWR_{Rolling}$  Model
- b-  $ACWR_{EWMA}$  Model

### 2- Training Monotony & Strain

## Antrenmanın Yüğü: Futbol



Lokomotor Yük	Mekanik Yük	İnternal Yük
<ul style="list-style-type: none"><li>➤ Toplam kat edilen mesafe</li><li>➤ Yüksek hız mesafesi</li><li>➤ Sprint mesafesi</li></ul>	<ul style="list-style-type: none"><li>➤ Toplam Pozitif ve Negatif İvme Sayısı</li><li>➤ Yüksek Şiddetli İvme Sayısı (&gt;3m/s<sup>2</sup>)</li></ul>	<ul style="list-style-type: none"><li>➤ Heart rate Exertion (HRE)</li></ul>



## Lokomotor Yükün Hesaplanması



Ant No	Hafta	Gün	Drill No	Oyuncu	Antrenman	Ant Süresi	Maç Süresi	Toplam Mesafe	YŞ Mesafesi	Sprint Mesafesi	Ort Hız	Max Hız	Acc sayısı	Decc sayısı	Toplam Acc-Decc sayısı
1	1	1	1	P23	WarmUp+Dynamic Streching	14		928	18	4	3.8	22.2	5	7	12
1	1	1	2	P23	10x10 Game	28		2686	193	56	5.7	26.5	40	40	80
1	1	1	3	P23	Multidirectional Speed	27		937	103		2.1	21.0	35	31	66
1	1	1	4	P23	5x4 Attack Game	29		1889	178	77	3.9	25.9	44	41	85
2	1	2	1	P23	WarmUp	8		440			3.1	12.7			
2	1	2	2	P23	Strength Training-1	26		332			0.7	8.7			
2	1	2	3	P23	8x3 game	22		1284			3.4	17.7	20	17	37
3	1	3	2	P23	Friendly Game 2.Half		22	3009	309	73	8.2	24.0	39	49	88
4	1	4	1	P23	Dripling With Ball	12		365	114	14	1.8	22.1	10	11	21
4	1	4	2	P23	7x3 game	33		448			0.8	16.4	6	5	11
4	1	4	3	P23	6x6 Small Side Game	23		2307	90		6.0	20.0	60	63	123
4	1	4	4	P23	30 mt sprint	7		541	54	10	4.6	23.2	8	8	16
5	1	5	1	P23	WarmUp+Dynamic Streching	20		1110	54	44	3.2	26.7	2	2	4
5	1	5	2	P23	Pas Drill	19		1221	8		3.8	18.1	12	3	15
5	1	5	3	P23	7x7x6 Small Side Game	15		1474	63	5	5.7	22.1	16	26	42
5	1	5	4	P23	4x35 mt Sprint	33		1519	795	634	2.7	29.4	26	29	55
6	1	6	1	P23	Friendly Game 1. Half		45	5378	433	126	7.1	26.9	78	72	150
7	1	7	1	P23	5x2 Game	20		405			1.2	11.2	2	2	4
7	1	7	2	P23	80 mt.Actv.Rejenaration	19		1840	780	201	5.8	23.1	18	6	24
7	1	7	3	P23	9x9 Game	18		1629	22	9	5.4	24.1	17	18	35

Oyuncu: P23 Midfielder

HAFTA	Gün No	GÜN	Süre (dk)	Toplam Mesafe (m)	Yüksek Şiddet Mesafesi (m)	Sprint Mesafesi (m)	İvme Sayısı (adet)
1	1	Pazartesi	98	6440	493	136	243
	2	Salı	56	2056	0	0	37
	3	Çarşamba	22	3009	309	73	88
	4	Perşembe	75	3662	257	24	171
	5	Cuma	87	5325	919	684	116
	6	Cumartesi	45	5378	433	126	150
	7	Pazar	57	3874	802	210	63

Hacim: ?  
Şiddet: ?

HAFTA	Gün No	GÜN	Süre (dk)	Toplam Mesafe (m)	Yüksek Şiddet Mesafesi (m)	Sprint Mesafesi (m)	İvme Sayısı (adet)
1	1	Pazartesi	98	6440	493	136	243
	2	Salı	56	2056	0	0	37
	3	Çarşamba	22	3009	309	73	88
	4	Perşembe	75	3662	257	24	171
	5	Cuma	87	5325	919	684	116
	6	Cumartesi	45	5378	433	126	150
	7	Pazar	57	3874	802	210	63
2	1	Pazartesi	73	7643	872	177	153
	2	Salı	72	2161	124	89	32
	3	Çarşamba	83	4933	370	171	177
	4	Perşembe	102	5350	69	17	166
	5	Cuma	85	7467	750	312	196
	6	Cumartesi	87	3906	273	78	74
	7	Pazar	0	0	0	0	0
3	1	Pazartesi	75	7697	135	0	141
	2	Salı	27	2732	736	536	56
	3	Çarşamba	45	5666	397	124	147
	4	Perşembe	79	5920	593	186	173
	5	Cuma	40	3086	54	0	64
	6	Cumartesi	0	0	0	0	0
	7	Pazar	0	0	0	0	0
4	1	Pazartesi	70	5727	629	181	155
	2	Salı	61	4104	861	146	156
	3	Çarşamba	88	6686	961	557	171
	4	Perşembe	52	5922	580	161	175
	5	Cuma	83	4297	213	138	100
	6	Cumartesi	0	0	0	0	0
	7	Pazar	52	3807	226	49	83
5	1	Pazartesi	65	6328	514	259	166
	2	Salı	65	6731	1029	680	171
	3	Çarşamba	49	4160	332	116	73
	4	Perşembe	77	5263	267	97	150
	5	Cuma	0	0	0	0	0
	6	Cumartesi	0	0	0	0	0
	7	Pazar	0	0	0	0	0
6	1	Pazartesi	66	5468	689	422	184
	2	Salı	37	4587	195	22	168
	3	Çarşamba	56	5732	598	0	193
	4	Perşembe	74	4063	235	118	107
	5	Cuma	46	5618	511	122	162
	6	Cumartesi	0	0	0	0	0
	7	Pazar	0	0	0	0	0

## Lokomotor Yükün Hesaplanması



Oyuncu: **P23** Midfielder

$$\text{Hacim} = (\text{Günlük Antrenman verisi} / \text{Maç verisi}) * 100$$

$$\text{Şiddet} = ((\text{Günlük Antrenman verisi} / \text{Maç verisi}) / (\text{Günlük Antrenman Süresi} / \text{Maç Süresi})) * 100$$

## Lokomotor Yükün Hesaplanması



$$\text{Hacim} = (\text{Günlük Antrenman verisi} / \text{Maç verisi}) * 100$$

$$\text{Şiddet} = ((\text{Günlük Antrenman verisi} / \text{Maç verisi}) / (\text{Günlük Antrenman Süresi} / \text{Maç Süresi})) * 100$$

Toplam Mesafe Oyuncu: P23 Midfielder

Maksimum Maç Performansı: 10757 m 90 dk

HAFTA	Gün No	GÜN	Süre (dk)	Toplam Mesafe (m)	TM Hacim (%)	TM Şiddet (%)	Uygulanan Haftalık Yük (AU)	Uygulanan Haftalık Yük Oranı (%)	%5 Artırım Planlı Haftalık Yük	Planlanan Haftalık Yük Oranı (%)
1	1	Pazartesi	98	6440						
	2	Salı	56	2056						
	3	Çarşamba	22	3009						
	4	Perşembe	75	3662						
	5	Cuma	87	5325						
	6	Cumartesi	45	5378						
	7	Pazar	57	3874						

Yüksek Şiddet Mesafesi Oyuncu: P23 Midfielder

Maksimum Maç Performansı: 593 m 90 dk

HAFTA	Gün No	GÜN	Süre (dk)	Yüksek Şiddet Mesafesi (m)	YŞM Hacim (%)	YŞM Şiddet (%)	Uygulanan Haftalık Yük (AU)	Uygulanan Haftalık Yük Oranı (%)	%5 Artırım Planlı Haftalık Yük	Planlanan Haftalık Yük Oranı (%)
1	1	Pazartesi	98	493						
	2	Salı	56	0						
	3	Çarşamba	22	309						
	4	Perşembe	75	257						
	5	Cuma	87	919						
	6	Cumartesi	45	433						
	7	Pazar	57	802						

Sprint Mesafesi Oyuncu: P23 Midfielder

Maksimum Maç Performansı: 203 m 90 dk

HAFTA	Gün No	GÜN	Süre (dk)	Sprint Mesafesi (m)	SPM Hacim (%)	SPM Şiddet (%)	Uygulanan Haftalık Yük (AU)	Uygulanan Haftalık Yük Oranı (%)	%5 Artırım Planlı Haftalık Yük	Planlanan Haftalık Yük Oranı (%)
1	1	Pazartesi	98	136						
	2	Salı	56	0						
	3	Çarşamba	22	73						
	4	Perşembe	75	24						
	5	Cuma	87	684						
	6	Cumartesi	45	126						
	7	Pazar	57	210						

İvme Sayısı Oyuncu: P23 Midfielder

Maksimum Maç Performansı: 356 adet 90 dk

HAFTA	Gün No	GÜN	Süre (dk)	Toplam İvme Sayısı	İvme Hacim (%)	İvme Şiddet (%)	Uygulanan Haftalık Yük (AU)	Uygulanan Haftalık Yük Oranı (%)	%5 Artırım Planlı Haftalık Yük	Planlanan Haftalık Yük Oranı (%)
1	1	Pazartesi	98	243						
	2	Salı	56	37						
	3	Çarşamba	22	88						
	4	Perşembe	75	171						
	5	Cuma	87	116						
	6	Cumartesi	45	150						
	7	Pazar	57	63						

Yüksek Metabolik Güç Mesafesi Oyuncu: P23 Midfielder

Maksimum Maç Performansı: 3332 m 90 dk

HAFTA	Gün No	GÜN	Süre (dk)	Yüksek Metabolik Güç Mesafesi (m)	YMG Hacim (%)	YMG Şiddet (%)	Uygulanan Haftalık Yük (AU)	Uygulanan Haftalık Yük Oranı (%)	%5 Artırım Planlı Haftalık Yük	Planlanan Haftalık Yük Oranı (%)
1	1	Pazartesi	98	1415						
	2	Salı	56	208						
	3	Çarşamba	22	898						
	4	Perşembe	75	951						
	5	Cuma	87	1433						
	6	Cumartesi	45	1347						
	7	Pazar	57	1091						



## Lokomotor Yükün Hesaplanması



$$\text{Hacim} = (\text{Günlük Antrenman verisi} / \text{Maç verisi}) * 100$$

$$\text{Şiddet} = ((\text{Günlük Antrenman verisi} / \text{Maç verisi}) / (\text{Günlük Antrenman Süresi} / \text{Maç Süresi})) * 100$$

$$\begin{aligned} \text{1.Gün Hacim} &= (6440 / 10757) * 100 \\ &= \%60 \end{aligned}$$

$$\begin{aligned} \text{1.Gün Şiddet} &= ((6440 / 10757) / (98 / 90)) * 100 \\ &= \%55 \end{aligned}$$

Toplam Mesafe

Oyuncu: **P23** Midfielder

Maksimum Maç Performansı: **10757** m **90** dk

HAFTA	Gün No	GÜN	Süre (dk)	Toplam Mesafe (m)	TM Hacim (%)	TM Şiddet (%)	Uygulanan Haftalık Yük (AU)	Uygulanan Haftalık Yük Oranı (%)	%5 Artırım Planlı Haftalık Yük	Planlanan Haftalık Yük Oranı (%)
1	1	Pazartesi	98	6440	60%	55%	29743		29743	
	2	Salı	56	2056	19%	31%				
	3	Çarşamba	22	3009	28%	114%				
	4	Perşembe	75	3662	34%	41%				
	5	Cuma	87	5325	50%	51%				
	6	Cumartesi	45	5378	50%	100%				
	7	Pazar	57	3874	36%	57%				

## Lokomotor Yükün Hesaplanması



Hacim = (Günlük Antrenman verisi / Maç verisi) \*100

Şiddet = ((Günlük Antrenman verisi / Maç verisi) / (Günlük Antrenman Süresi / Maç Süresi)) \*100

Yüksek Şiddet Mesafesi

Oyuncu: P23 Midfielder

Maksimum Maç Performansı: 593 m 90 dk

HAFTA	Gün No	GÜN	Süre (dk)	Yüksek Şiddet Mesafesi (m)	YŞM Hacim (%)	YŞM Şiddet (%)	Uygulanan Haftalık Yük (AU)	Uygulanan Haftalık Yük Oranı (%)	%5 Artırım Planlı Haftalık Yük	Planlanan Haftalık Yük Oranı (%)
1	1	Pazartesi	98	493	83%	76%	3213		3213	
	2	Salı	56	0	0%	0%				
	3	Çarşamba	22	309	52%	213%				
	4	Perşembe	75	257	43%	52%				
	5	Cuma	87	919	155%	160%				
	6	Cumartesi	45	433	73%	146%				
	7	Pazar	57	802	135%	214%				

1.Gün Hacim = (493 / 593) \*100  
= %83

1.Gün Şiddet = ((493 / 593) / (98 / 90)) \*100  
= %76

## Lokomotor Yükün Hesaplanması



$$\text{Hacim} = (\text{Günlük Antrenman verisi} / \text{Maç verisi}) * 100$$

$$\text{Şiddet} = ((\text{Günlük Antrenman verisi} / \text{Maç verisi}) / (\text{Günlük Antrenman Süresi} / \text{Maç Süresi})) * 100$$

Sprint Mesafesi

Oyuncu: P23 Midfielder

Maksimum Maç Performansı: 203 m 90 dk

HAFTA	Gün No	GÜN	Süre (dk)	Sprint Mesafesi (m)	SPM Hacim (%)	SPM Şiddet (%)	Uygulanan Haftalık Yük (AU)	Uygulanan Haftalık Yük Oranı (%)	%5 Artırım Planlı Haftalık Yük	Planlanan Haftalık Yük Oranı (%)
1	1	Pazartesi	98	136	67%	61%	1251		1251	
	2	Salı	56	0	0%	0%				
	3	Çarşamba	22	73	36%	146%				
	4	Perşembe	75	24	12%	14%				
	5	Cuma	87	684	336%	348%				
	6	Cumartesi	45	126	62%	123%				
	7	Pazar	57	210	103%	163%				

$$\begin{aligned} 1.\text{Gün Hacim} &= (136 / 203) * 100 \\ &= \%67 \end{aligned}$$

$$\begin{aligned} 1.\text{Gün Şiddet} &= ((136 / 203) / (98 / 90)) * 100 \\ &= \%61 \end{aligned}$$

## Mekanik Yükün Hesaplanması



$$\text{Hacim} = (\text{Günlük Antrenman verisi} / \text{Maç verisi}) * 100$$

$$\text{Şiddet} = ((\text{Günlük Antrenman verisi} / \text{Maç verisi}) / (\text{Günlük Antrenman Süresi} / \text{Maç Süresi})) * 100$$

İvme Sayısı

Oyuncu: P23 Midfielder

Maksimum Maç Performansı: 356 adet 90 dk

HAFTA	Gün No	GÜN	Süre (dk)	Toplam İvme Sayısı	İvme Hacim (%)	İvme Şiddet (%)	Uygulanan Haftalık Yük (AU)	Uygulanan Haftalık Yük Oranı (%)	%5 Artırım Planlı Haftalık Yük	Planlanan Haftalık Yük Oranı (%)
1	1	Pazartesi	98	243	68%	63%	868		868	
	2	Salı	56	37	10%	17%				
	3	Çarşamba	22	88	25%	101%				
	4	Perşembe	75	171	48%	58%				
	5	Cuma	87	116	33%	34%				
	6	Cumartesi	45	150	42%	84%				
	7	Pazar	57	63	18%	28%				

$$\begin{aligned} 1.\text{Gün Hacim} &= (243 / 356) * 100 \\ &= \%68 \end{aligned}$$

$$\begin{aligned} 1.\text{Gün Şiddet} &= ((243 / 356) / (98 / 90)) * 100 \\ &= \%63 \end{aligned}$$

## Mekanik Yükün Hesaplanması



$$\text{Hacim} = (\text{Günlük Antrenman verisi} / \text{Maç verisi}) * 100$$

$$\text{Şiddet} = ((\text{Günlük Antrenman verisi} / \text{Maç verisi}) / (\text{Günlük Antrenman Süresi} / \text{Maç Süresi})) * 100$$

Yüksek Metabolik Güç Mesafesi

Oyuncu: P23 Midfielder

Maksimum Maç Performansı: 3332 m 90 dk

HAFTA	Gün No	GÜN	Süre (dk)	Yüksek Metabolik Güç Mesafesi (m)	YMG Hacim (%)	YMG Şiddet (%)	Uygulanan Haftalık Yük (AU)	Uygulanan Haftalık Yük Oranı (%)	%5 Artırım Planlı Haftalık Yük	Planlanan Haftalık Yük Oranı (%)
1	1	Pazartesi	98	1415	42%	39%	7344		7344	
	2	Salı	56	208	6%	10%				
	3	Çarşamba	22	898	27%	110%				
	4	Perşembe	75	951	29%	34%				
	5	Cuma	87	1433	43%	44%				
	6	Cumartesi	45	1347	40%	81%				
	7	Pazar	57	1091	33%	52%				

$$\begin{aligned} \text{1.Gün Hacim} &= (1415 / 3332) * 100 \\ &= \%42 \end{aligned}$$

$$\begin{aligned} \text{1.Gün Şiddet} &= ((1415 / 3332) / (98 / 90)) * 100 \\ &= \%39 \end{aligned}$$

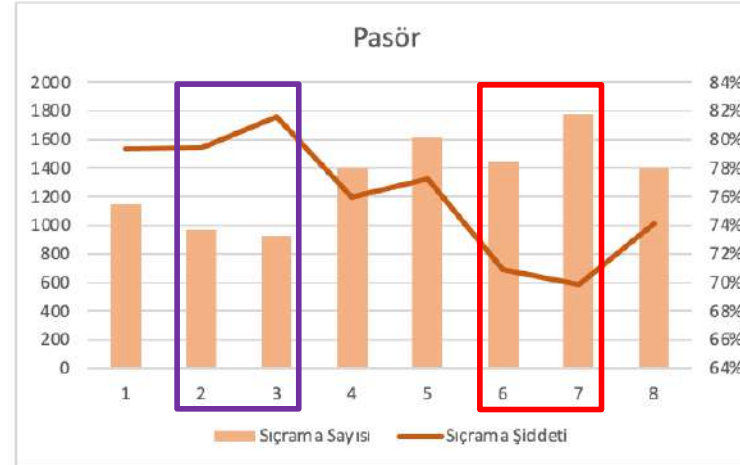
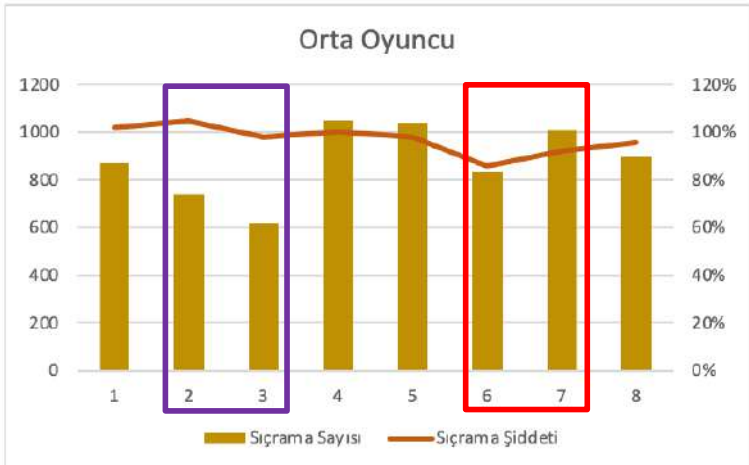
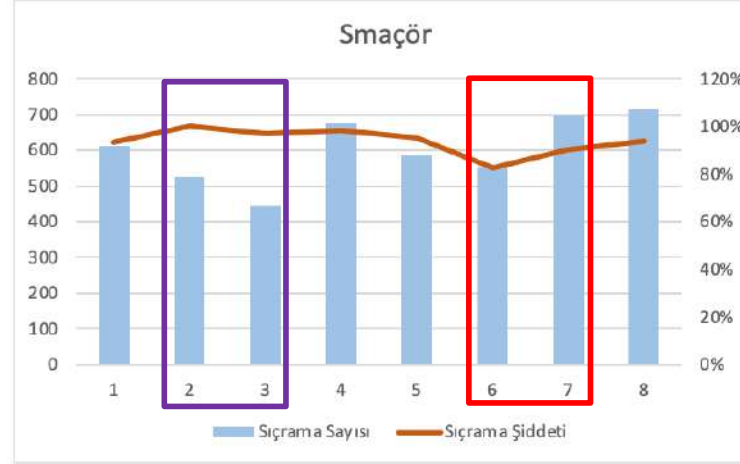
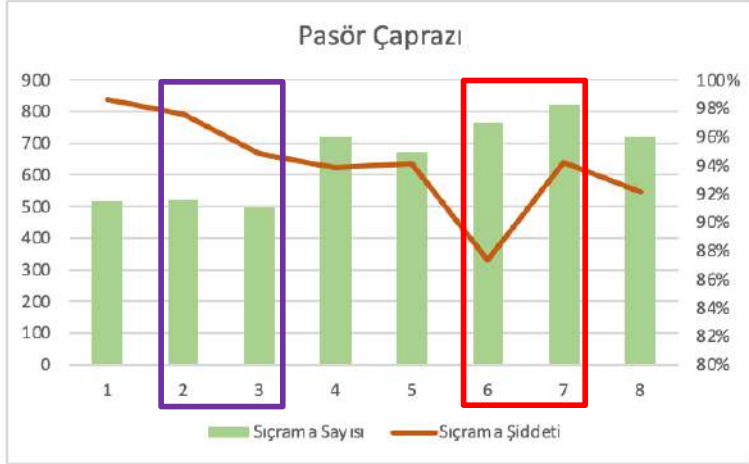
## Antrenmanın Yüğü: Futbol



Lokomotor Yük	Mekanik Yük	İnternal Yük
<ul style="list-style-type: none"><li>➤ Toplam kat edilen mesafe</li><li>➤ Yüksek hız mesafesi</li><li>➤ Sprint mesafesi</li></ul>	<ul style="list-style-type: none"><li>➤ Toplam Pozitif ve Negatif İvme Sayısı</li><li>➤ Yüksek Şiddetli İvme Sayısı (&gt;3m/s<sup>2</sup>)</li></ul>	<ul style="list-style-type: none"><li>➤ Heart rate Exertion (HRE)</li></ul>



## Voleybolda Antrenman Yükü: Kulüp; 62 gün / 8 hft



Sıçrama Şiddeti=

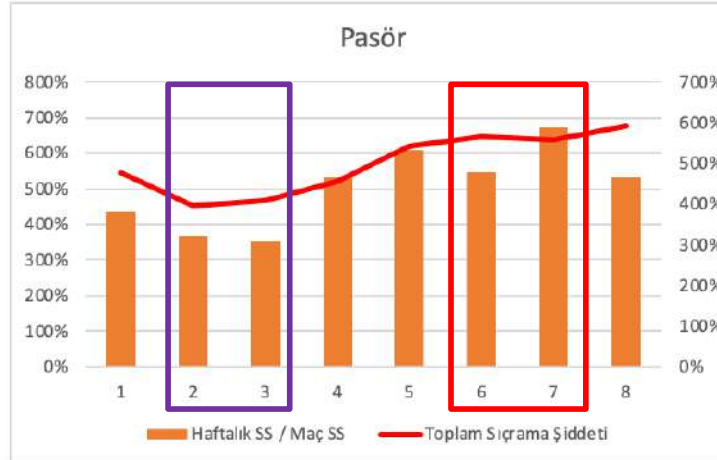
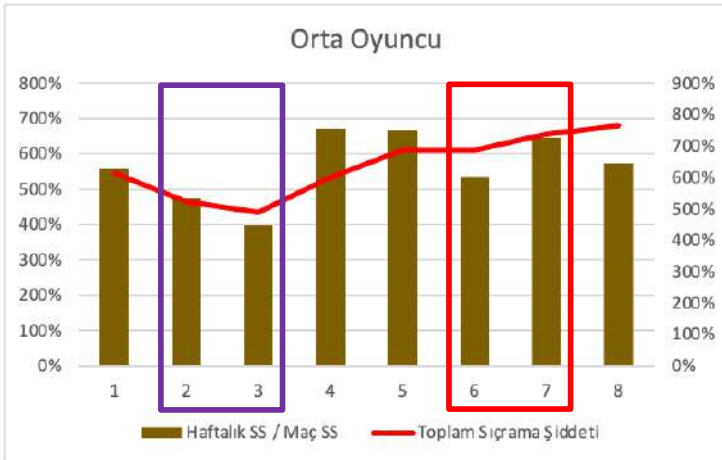
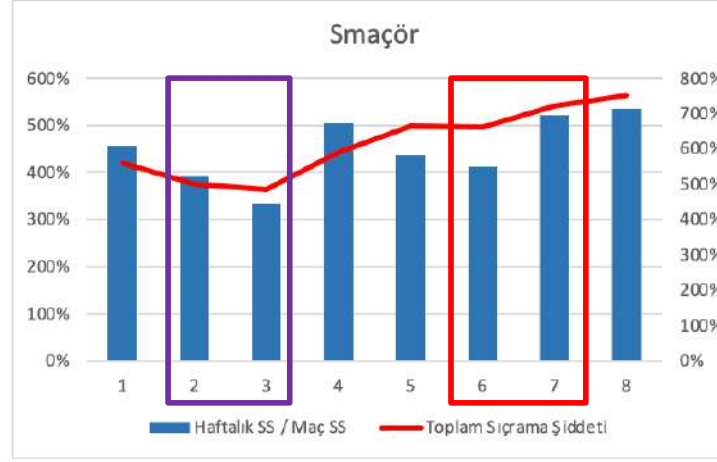
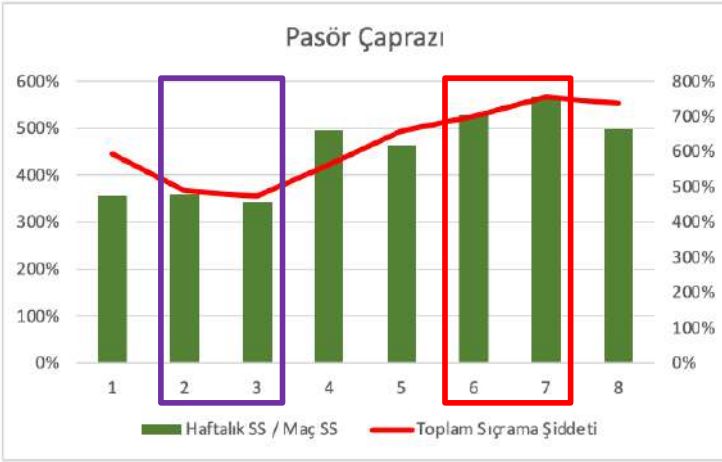
(Ortalama sıçrama yüksekliği / maksimum sıçrama yüksekliği) \* 100

Sıçrama Sayısı=

Σ sıçrama sayısı

Hafta	Antrenman	Maç
1	5	1
2	3	2
3	3	2
4	5	1
5	6	1
6	8	0
7	7	1
8	7	1

## Voleybolda Antrenman Yükü: Kulüp; 62 gün / 8 hft



Hafta	Antrenman	Maç
1	5	1
2	3	2
3	3	2
4	5	1
5	6	1
6	8	0
7	7	1
8	7	1

Haftalık SS / Maç SS=

$(\sum \text{haftalık sıçrama sayısı} / \text{Maç max sıçrama sayısı}) * 100$

Toplam Sıçrama Şiddeti=

$\sum \text{haftalık sıçrama şiddeti}$



**Voleybolda Antrenman Yüğü: Kulüp; 62 gün / 8 hft**



- 1- Toplam antrenman ve maç sayısı artarsa, antrenman yükü de bu sayıya bağılı olarak artıyor**
- 2- Antrenman içeriğı, haftalık antrenman yükünün ana belirleyicisi**
- 3- Optimal antrenman yükü ne kadar olmalı? Maksimum maç performansının kaç katı?**
- 4- Bu parametreler yeterli görünmüyor**

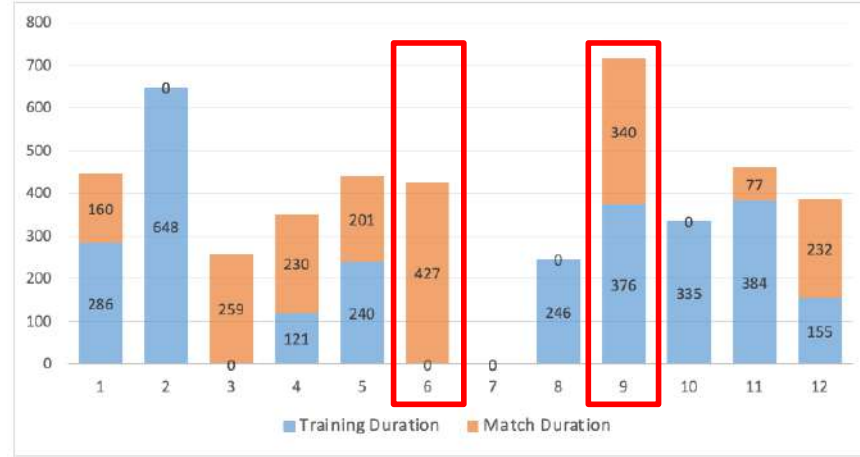
# Voleybolda Antrenman Yükü: Milli Takım; 81 gün / 12 hft



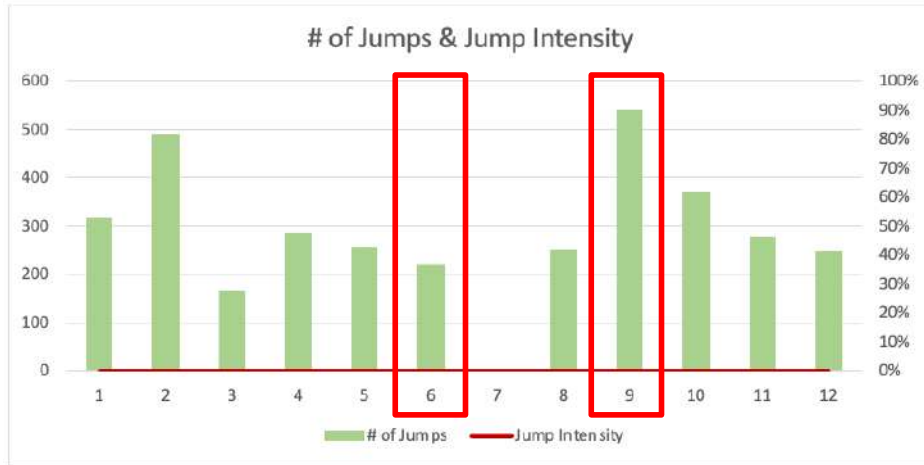
Smaçör\_1

Week	Training	Match	Training Duration	Match Duration	# of Jumps	Jump Intensity	Energy	Relative Energy
1	2	1	286	160	318	0%	36487	247
2	6	0	648	0	490	0%	53393	491
3	0	2	0	259	167	0%	17584	135
4	1	2	121	230	287	0%	25677	215
5	2	2	240	201	255	0%	24831	219
6	0	4	0	427	221	0%	24707	231
7	0	0	0	0	0	0%	0	0
8	2	0	246	0	250	0%	20753	168
9	4	3	376	340	540	0%	60464	507
10	3	0	335	0	372	0%	34076	308
11	4	1	384	77	277	0%	30010	324
12	2	3	155	232	249	0%	29535	375

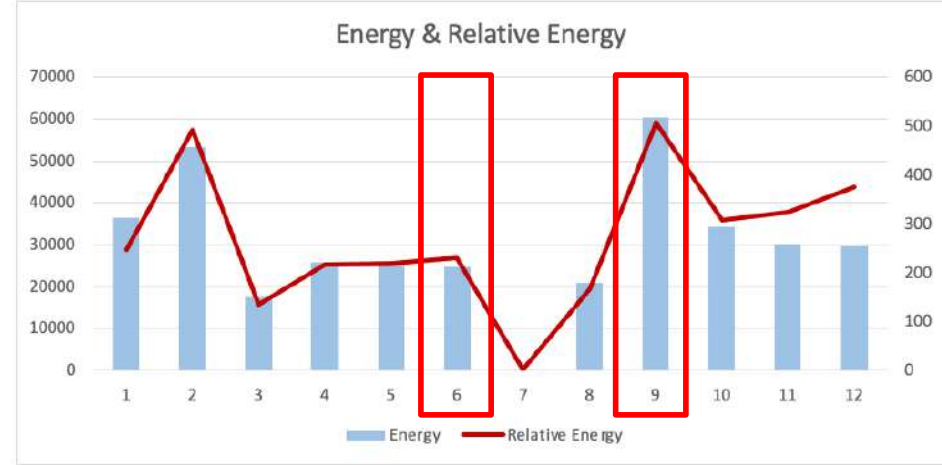
Smaçör\_1



Smaçör\_1



Smaçör\_1



# Voleybolda Antrenman Yükü: Milli Takım; 81 gün / 12 hft



Orta\_3

Week	Training	Match	Training Duration	Match Duration	# of Jumps	Jump Intensity	Energy	Relative Energy
1	2	1	250	130	454	0%	17682	140
2	6	0	674	0	805	0%	33421	282
3	0	2	0	231	209	0%	9309	80
4	1	3	117	336	606	0%	24821	220
5	2	2	235	207	482	0%	21406	193
6	0	4	0	414	433	0%	21895	213
7	0	0	0	0	0	0%	0	0
8	2	0	235	0	239	0%	9979	84
9	4	3	306	293	647	0%	26048	262
10	3	0	311	0	438	0%	11518	114
11	4	1	314	75	438	0%	15998	198
12	2	3	157	235	426	0%	17339	223

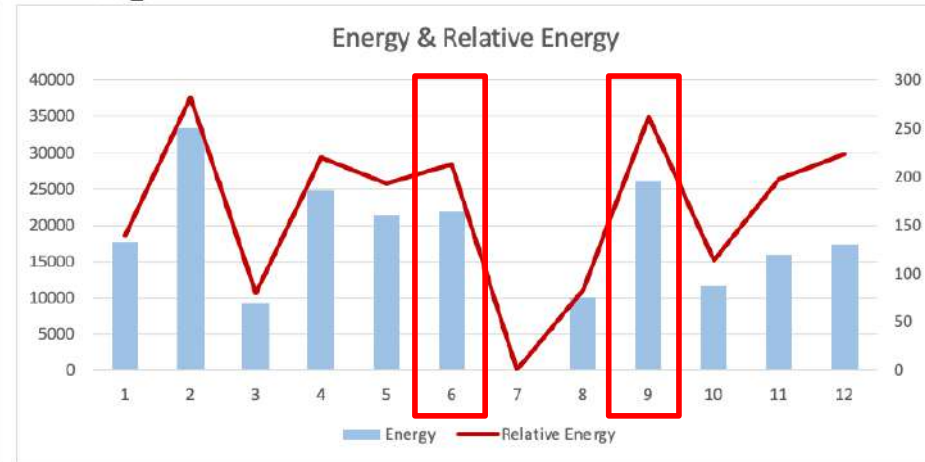
Orta\_3



Orta\_3



Orta\_3



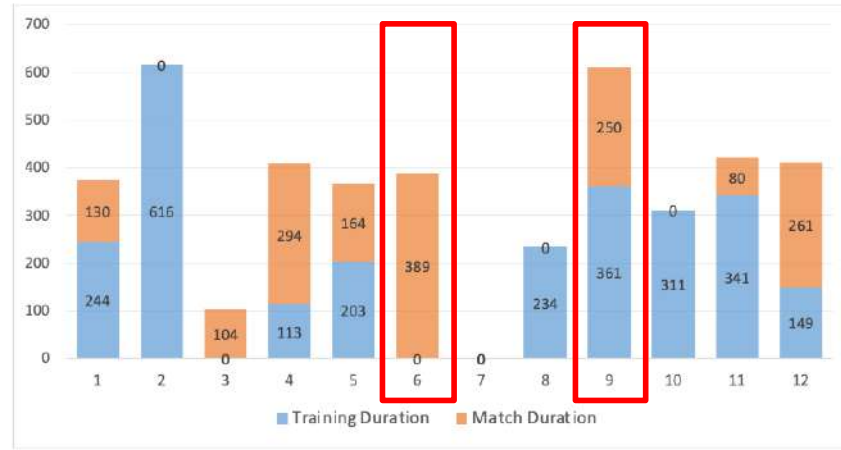
# Voleybolda Antrenman Yükü: Milli Takım; 81 gün / 12 hft



Orta\_1

Week	Training	Match	Training Duration	Match Duration	# of Jumps	Jump Intensity	Energy	Relative Energy
1	2	1	244	130	438	519%	18246	144
2	6	0	616	0	742	1021%	30302	287
3	0	2	0	104	76	184%	4310	41
4	1	3	113	294	478	711%	20293	202
5	2	2	203	164	304	746%	17357	185
6	0	4	0	389	196	809%	19602	189
7	0	0	0	0	0	0%	0	0
8	2	0	234	0	197	335%	8969	75
9	4	3	361	250	611	1058%	30454	304
10	3	0	311	0	430	514%	16911	167
11	4	1	341	80	450	916%	22038	254
12	2	3	149	261	292	947%	29659	355

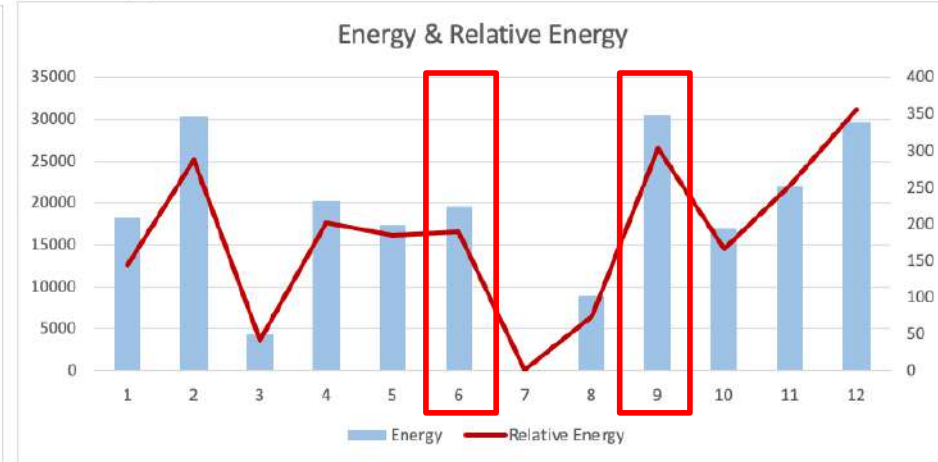
Orta\_1



Orta\_1



Orta\_1



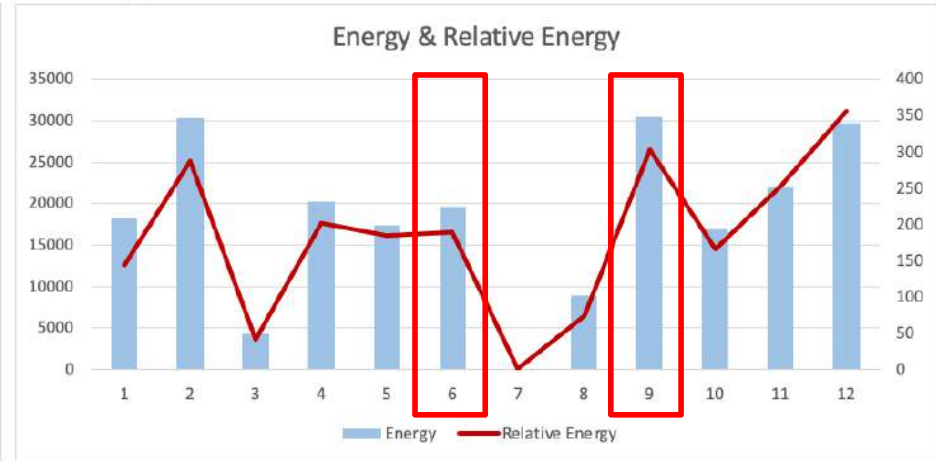
# Voleybolda Antrenman Yükü: Milli Takım; 81 gün / 12 hft



Orta\_1



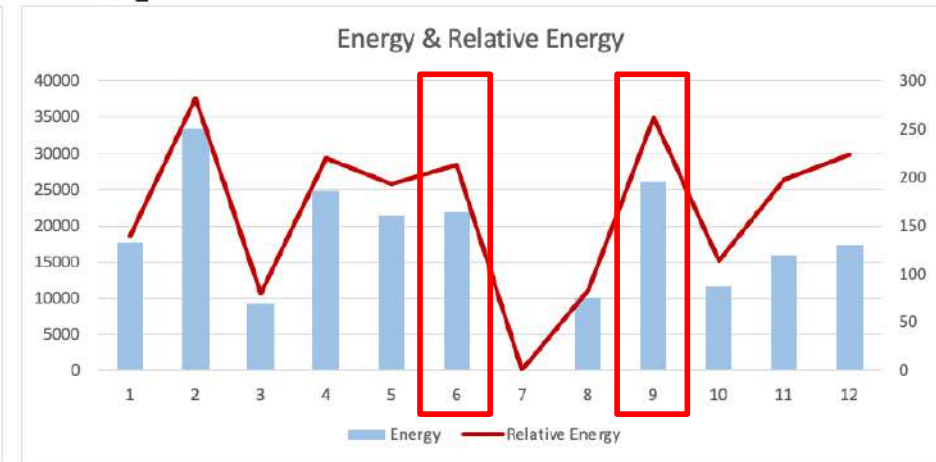
Orta\_1



Orta\_3



Orta\_3



**Voleybolda Antrenman Yüğü: Milli Takım; 81 gün / 12 hft**



**1- Antrenman sayısı arttıđında antrenman yüğü daha fazla artıyor**

**2- Maç sayısı artsa da antrenman yüğü düşük kalıyor**

**3- Antrenman ve maç sayısı arttıđında, antrenman yüğü antrenman içeriđine bađlı olarak artıyor**

**4- Bireysel farklılıkların analizi için incelenen parametre sayısı artırılmalı**

## Antrenman Yükünün Takibi: ACWR



### Yüklenmenin Takibi

#### Amaç:

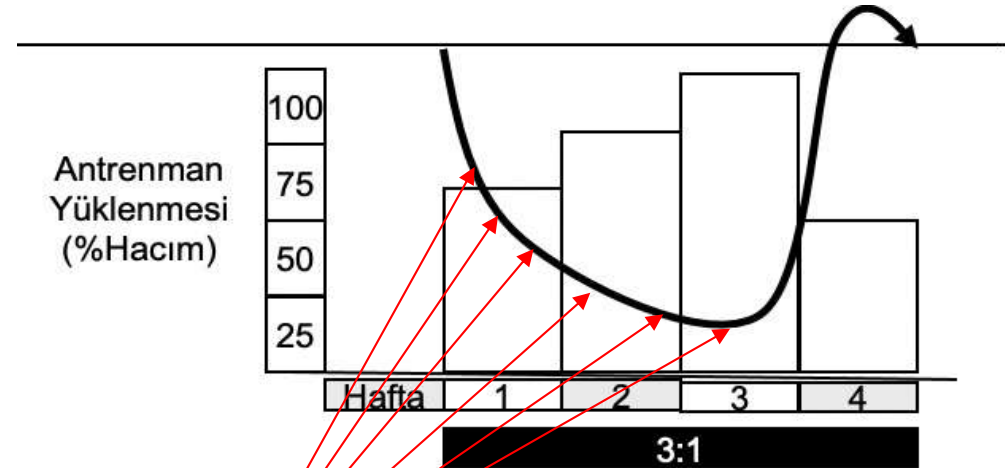
- Performansı geliştirmek
- **Yaralanma riskini düşürmek**

ATL: Akut antrenman yükü  
CTL: Kronik antrenman yükü

ACWR: ATL / CTL

1- ACWR<sub>Rolling</sub> Model

2- ACWR<sub>EWMA</sub> Model



Birikmiş Yorgunluk

Yaralanma risk artışı

Maç ve Antrenman Yükünün Takibi

Yüklenmenin Amacı:

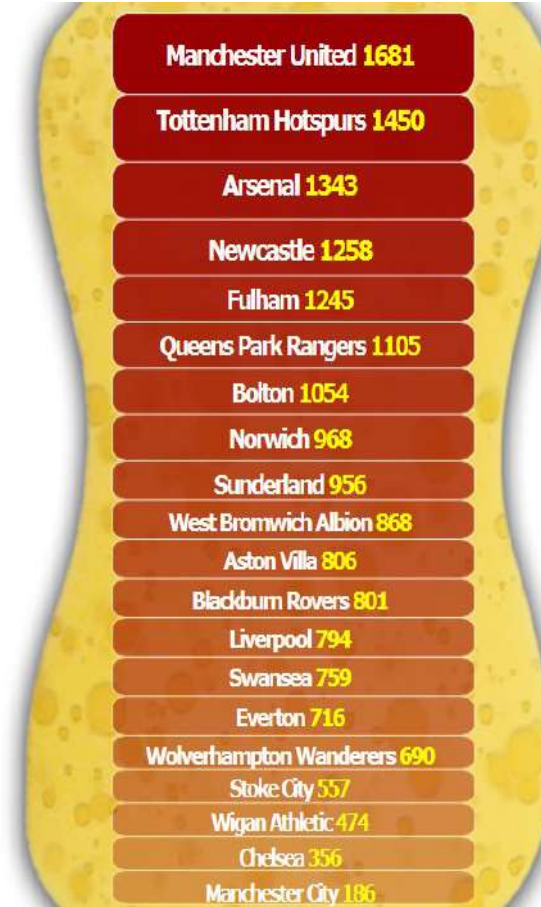
- Performansı geliştirmek
- Yaralanma riskini düşürmek

# Total days lost to injury

İngiltere Premier Lig

Sezon : 2011/2012

Puan Durumu	İstatistik	Fikstür	Haber	Takım Değerleri	Tar				
Puan Durumu	Form Durumu	Seriler	Alt / Üst	Karşılıklı Gol					
TAKIM		O	G	B	M	A	Y	Puan	AV
1 Manchester City		38	28	5	5	93	29	89	+64
2 Manchester United		38	28	5	5	89	33	89	+56
3 Arsenal		38	21	7	10	74	49	70	+25
4 Tottenham		38	20	9	9	66	41	69	+25
5 Newcastle United		38	19	8	11	56	51	65	+5
6 Chelsea		38	18	10	10	65	46	64	+19
7 Everton		38	15	11	12	50	40	56	+10
8 Liverpool		38	14	10	14	47	40	52	+7
9 Fulham		38	14	10	14	48	51	52	-3
10 West Bromwich		38	13	8	17	45	52	47	-7
11 Swansea City		38	12	11	15	44	51	47	-7
12 Norwich City		38	12	11	15	52	66	47	-14
13 Sunderland		38	11	12	15	45	46	45	-1
14 Stoke City		38	11	12	15	36	53	45	-17
15 Wigan Athletic		38	11	10	17	42	62	43	-20
16 Aston Villa		38	7	17	14	37	53	38	-16
17 Queens P.R.		38	10	7	21	43	66	37	-23
18 Bolton Wanderers		38	10	6	22	46	77	36	-31
19 Blackburn Rovers		38	8	7	23	48	78	31	-30
20 Wolverhampton		38	5	10	23	40	82	25	-42





### INJURY LEAGUE .com

#### 2011/2012

MAN UNITED	305
ARSENAL	272
BOLTON	256
TOTTENHAM	249
NEWCASTLE	218
SUNDERLAND	198
QPR	176
FULHAM	170
NORWICH	157
ASTON VILLA	155
BLACKBURN	143
WOLVES	139
WEST BROM	136
EVERTON	126
SWANSEA	117
CHELSEA	106
STOKE	97
LIVERPOOL	95
WIGAN	78
MAN CITY	50

BASED ON FIGURES TAKEN WEEKLY DETAILING NUMBER OF PLAYERS OUT FOR EACH CLUB ON PHYSIOROOM.COM  
ONE PLAYER INJURED FOR ONE WEEK = ONE POINT

### INJURY LEAGUE .com

#### 2012/2013

NEWCASTLE	274
ASTON VILLA	262
ARSENAL	206
WIGAN	188
MAN UNITED	184
WEST HAM	171
TOTTENHAM	168
FULHAM	165
QPR	161
MAN CITY	158
SUNDERLAND	155
NORWICH	146
WEST BROM	138
LIVERPOOL	133
READING	127
CHELSEA	109
EVERTON	108
SOUTHAMPTON	105
SWANSEA	102
STOKE	80

BASED ON FIGURES TAKEN WEEKLY DETAILING NUMBER OF PLAYERS OUT FOR EACH CLUB ON PHYSIOROOM.COM  
ONE PLAYER INJURED FOR ONE WEEK = ONE POINT

### INJURY LEAGUE .com

#### 2013/2014

ARSENAL	289
ASTON VILLA	212
TOTTENHAM	207
EVERTON	194
MAN UNITED	194
NEWCASTLE	194
WEST BROM	181
CRYSTAL PALACE	160
WEST HAM	158
LIVERPOOL	157
FULHAM	156
SWANSEA	153
NORWICH	149
HULL	146
MAN CITY	142
SUNDERLAND	120
SOUTHAMPTON	119
CHELSEA	109
STOKE	108
CARDIFF	86

BASED ON FIGURES TAKEN WEEKLY DETAILING NUMBER OF PLAYERS OUT FOR EACH CLUB ON PHYSIOROOM.COM  
ONE PLAYER INJURED FOR ONE WEEK = ONE POINT

### INJURY LEAGUE .com

#### 2014/2015

NEWCASTLE	347
MAN UNITED	250
EVERTON	244
ASTON VILLA	228
ARSENAL	227
LIVERPOOL	216
SOUTHAMPTON	191
STOKE	186
QPR	182
HULL	174
WEST HAM	169
BURNLEY	150
SWANSEA	150
SUNDERLAND	149
CRYSTAL PALACE	142
WEST BROM	115
MAN CITY	109
TOTTENHAM	109
LEICESTER	104
CHELSEA	92

BASED ON FIGURES TAKEN WEEKLY DETAILING NUMBER OF PLAYERS OUT FOR EACH CLUB ON PHYSIOROOM.COM  
ONE PLAYER INJURED FOR ONE WEEK = ONE POINT

### INJURY LEAGUE .com

#### 2015/2016

NEWCASTLE	397
LIVERPOOL	284
EVERTON	248
MAN UNITED	243
ARSENAL	239
BOURNEMOUTH	224
MAN CITY	211
ASTON VILLA	204
CRYSTAL PALACE	204
STOKE	190
WEST HAM	185
SOUTHAMPTON	165
TOTTENHAM	149
CHELSEA	134
SUNDERLAND	132
WATFORD	130
WEST BROM	127
NORWICH	109
LEICESTER	77
SWANSEA	49

BASED ON FIGURES TAKEN WEEKLY DETAILING NUMBER OF PLAYERS OUT FOR EACH CLUB ON PHYSIOROOM.COM  
ONE PLAYER INJURED FOR ONE WEEK = ONE POINT

### DAILY CANNON INJURY LEAGUE

#### 2016/17

SUNDERLAND	306
HULL CITY	290
WEST HAM UNITED	274
CRYSTAL PALACE	258
ARSENAL	233
WATFORD	231
SOUTHAMPTON	223
LIVERPOOL	222
EVERTON	218
STOKE CITY	205
BOURNEMOUTH	151
MANCHESTER UNITED	150
MANCHESTER CITY	143
TOTTENHAM HOTSPUR	136
SWANSEA CITY	122
MIDDLESBROUGH	121
BURNLEY	107
LEICESTER CITY	107
CHELSEA	81
WEST BROMWICH ALBION	60

BASED ON FIGURES TAKEN WEEKLY DETAILING NUMBER OF PLAYERS OUT FOR EACH CLUB ON PREMIERLEAGUE.COM  
ONE PLAYER INJURED FOR ONE WEEK = ONE POINT



# Patellar tendon structure responds to load over a 7-week preseason in elite male volleyball players

Lucas Maciel Rabello<sup>1</sup>  | Johannes Zwerver<sup>1</sup> | Roy E. Stewart<sup>2</sup> | Inge van den Akker-Scheek<sup>1,3</sup> | Michel S. Brink<sup>4</sup>

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DOI: 10.1111/sms.13428



	Weekly volume (min)	Mean RPE score (6-20)	Weekly load (AU)	Weekly jump frequency (jumps)
Week 1	638 (193)	14.1 (1.0)	8976 (2741)	262 (84)
Week 2	599 (211) <sup>b</sup>	13.8 (1.1)	8398 (3211) <sup>b</sup>	265 (93)
Week 3	687 (207) <sup>a</sup>	13.8 (1.1)	9587 (3010) <sup>a</sup>	293 (131)
Week 4	717 (208)	14.2 (1.0)	10 437 (3257) <sup>a</sup>	320 (132)
Week 5	559 (199)	13.6 (1.1)	7897 (3066)	229 (132)
Week 6	590 (207)	13.7 (1.4)	8419 (3180)	252 (125)
Week 7	522 (162)	14.0 (1.1)	7433 (2467)	266 (138)
SUM	4312 (940)	13.9 (0.7)	61 148 (13 945)	18 086 (634)

Note. Abbreviations: AU, arbitrary units; RPE, rate of perceived exertion.

<sup>a</sup>Significant difference compared to week 7.

<sup>b</sup>Significant difference compared to week 4.

the potential to revert to normal if sufficient recovery time is given and further training load is balanced.<sup>32</sup>

It is notable that the players were exposed to only subtle changes in load during preseason, and they performed a low amount of load over those 7 weeks. The athletes jumped much less (weekly jump frequency range 228-319 jumps) compared to a previous study observing that athletes jumped up to 300 times in one single match.<sup>33</sup> The first explanation for the low load performed would be the fact that this study was conducted during the preseason, when athletes are returning from a low level of activities (holiday). Another explanation could be that because of this study, coaches and medical staff were more aware of the risks of injuries such as patellar tendinopathy. As we demonstrated, no spikes in load were observed during preseason.

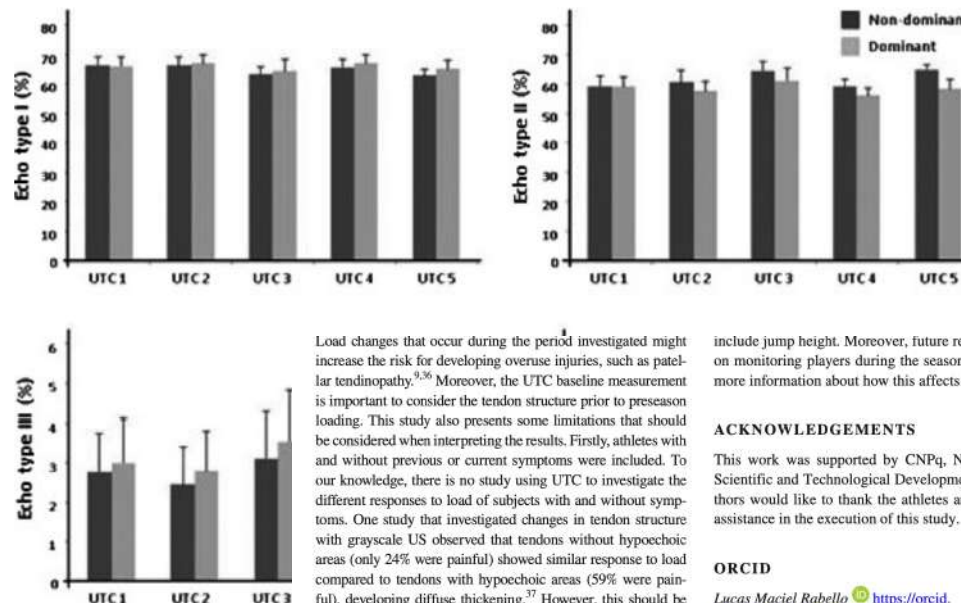


FIGURE 4 Echo type percentages of

Load changes that occur during the period investigated might increase the risk for developing overuse injuries, such as patellar tendinopathy.<sup>9,30</sup> Moreover, the UTC baseline measurement is important to consider the tendon structure prior to preseason loading. This study also presents some limitations that should be considered when interpreting the results. Firstly, athletes with and without previous or current symptoms were included. To our knowledge, there is no study using UTC to investigate the different responses to load of subjects with and without symptoms. One study that investigated changes in tendon structure with grayscale US observed that tendons without hypoechoic areas (only 24% were painful) showed similar response to load compared to tendons with hypoechoic areas (59% were painful), developing diffuse thickening.<sup>37</sup> However, this should be interpreted with caution since the US might be not sensitive to subtle changes in tendon structure as UTC. Secondly, the load performed on the day previous to the UTC measurement could have influenced the results.<sup>38</sup> In Australian football players, the Achilles tendon structure changed significantly 2 days post-game (reduction in echo type I) and returned to baseline 4 days post-game.<sup>38</sup> However, other studies involving novice runners and much lower running volumes did not observe this Achilles tendon response at 2 and 7 days post-activity.<sup>39</sup> The acute tendon response to load might depend on different factors, including the amount of load players are exposed to and the tendon load capacity. To minimize this effect, the UTC measurements were performed at the beginning of the week and players refrained from physical activity on the day of measurement. Thirdly, no distinction between jump height or between single- and double-leg jumps was made in this study. It is known that players who jump higher expose their tendons to a higher load.<sup>40</sup> Further research could explore the link between jump height and changes in tendon structure.<sup>41</sup>

include jump height. Moreover, future research should focus on monitoring players during the season using UTC to gain more information about how this affects tendon structure.

## ACKNOWLEDGEMENTS

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5. van Rijn D, van den Akker-Scheek I, Steunebrink M, Diercks RL, Zwerver J, van der Worp H. Comparison of the effect of 5 different treatment options for managing patellar tendinopathy. *Clin J Sport Med*. 2017. [Epub Ahead of print].
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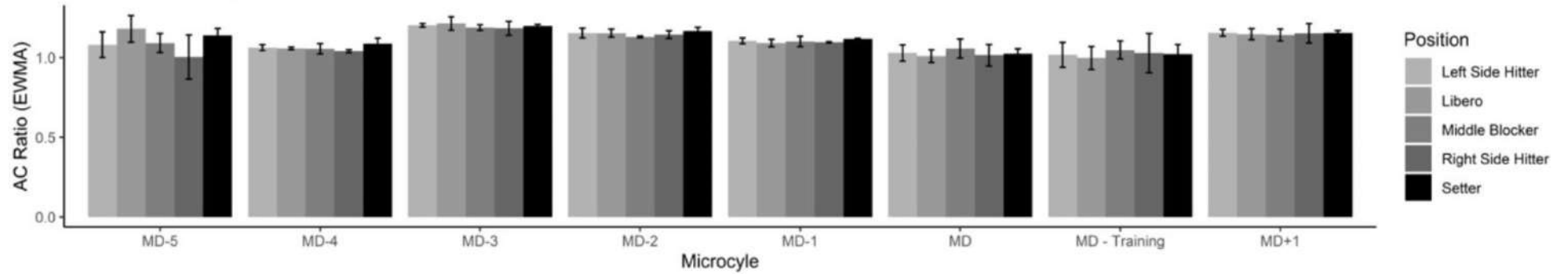
# Within-week differences in external training load demands in elite volleyball players



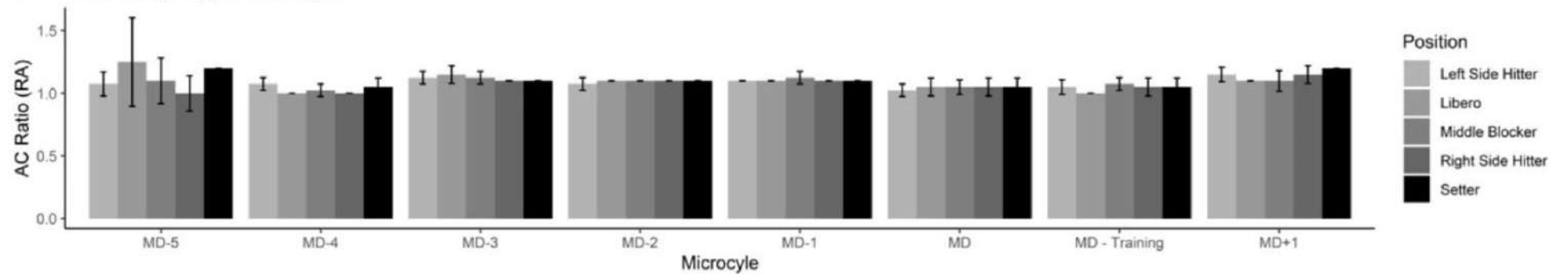
Zeki Akyıldız<sup>1</sup>, Henrique de Oliveira Castro<sup>2</sup>, Erhan Çene<sup>3</sup>, Lorenzo Laporta<sup>4</sup>, Coskun Parim<sup>3</sup>, Emre Altundag<sup>1</sup>, Cengiz Akarçesme<sup>1</sup>, Giovanni Guidetti<sup>5</sup>, Giovanni Miale<sup>6</sup>, Ana Filipa Silva<sup>6,7</sup>, Hadi Nobari<sup>8,9,10\*</sup> and Filipe Manuel Clemente<sup>7,11</sup>

## ACWR: Yaralanma Riski

I AC Ratio (EWMA) per Microcycle



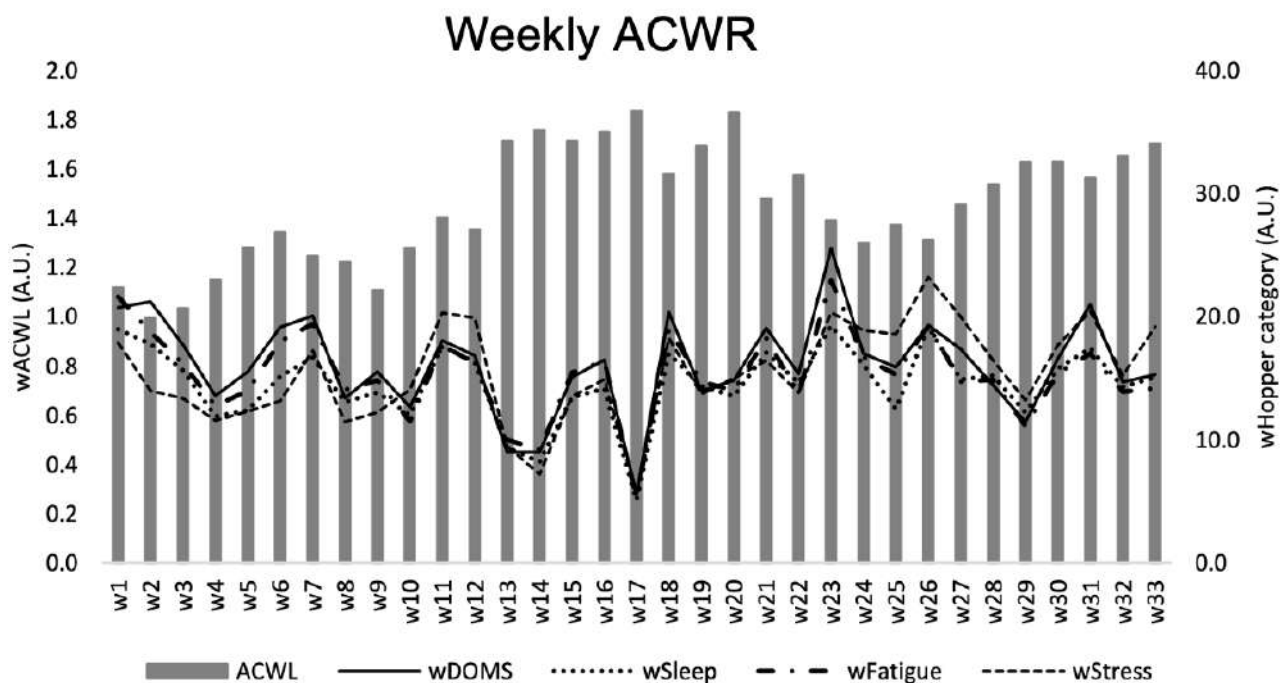
Y AC Ratio (RA) per Microcycle



**Analyzing the seasonal changes and relationships in training load and wellness in elite volleyball players**



Filipe Manuel Clemente<sup>1,2\*</sup>, Ana Filipa Silva<sup>1,3</sup>, Cain Craig Truman Clark<sup>4</sup>, Daniele Conte<sup>5</sup>, João Ribeiro<sup>6,7</sup>, Bruno Mendes<sup>7</sup>, Ricardo Lima<sup>1,7</sup>

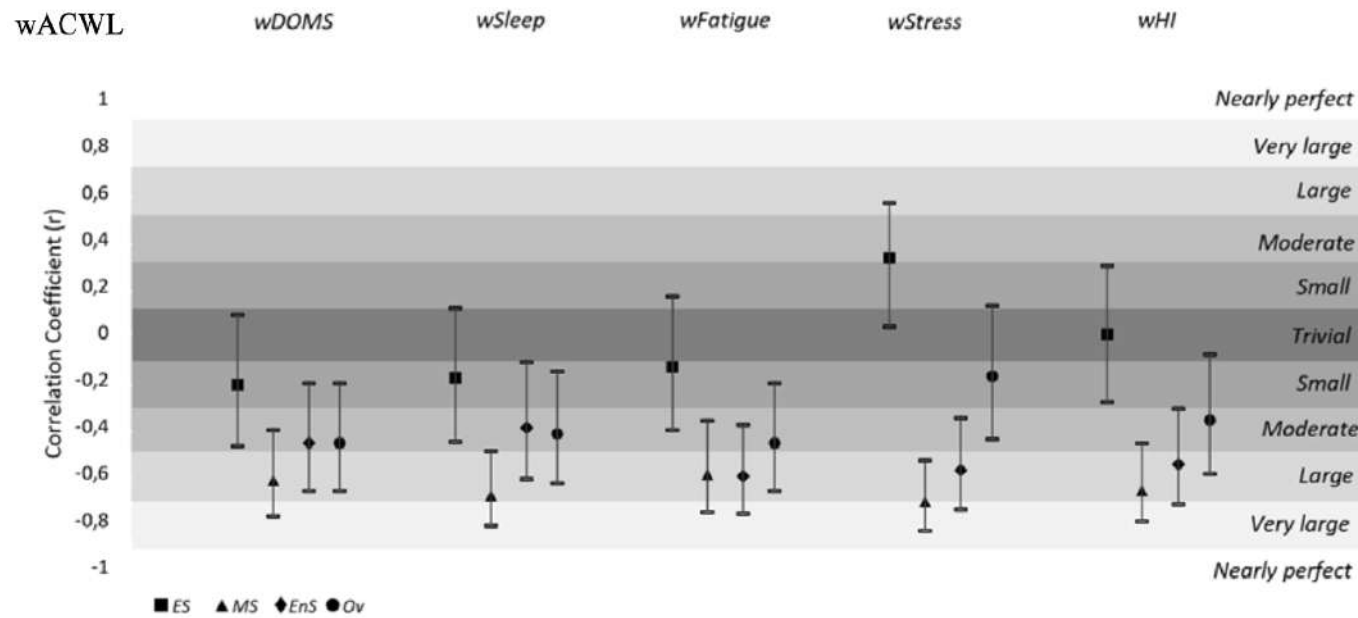


wACWL: weekly acute:chroni work load;  
wDOMS: weekly muscle soreness;  
wSleep: weekly sleep;  
wFatigue: weekly fatigue;  
wStress: weekly stress;  
wTM: weekly training monotony;

**Analyzing the seasonal changes and relationships in training load and wellness in elite volleyball players**



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wACWL: weekly acute:chronic work load;  
wDOMS: weekly muscle soreness;  
wSleep: weekly sleep;  
wFatigue: weekly fatigue;  
wStress: weekly stress;  
wTM: weekly training monotony;  
wHI: weekly hooper index

**Figure 4.** Correlations between (a) wACWL and (b) wTM and the well-being categories during the early season (ES), mid-season (MS), ending season (EnS) and overall (Ov).

## Antrenman Yükünün Takibi

### Objektif Yaklaşım: Teknoloji

- External
  - ❖ Lokomotor (Hız, Mesafe)
  - ❖ Mekanik (İvmelenme)
- Internal (Kalp atım hızı)
  - ❖ Banister TRIMP
  - ❖ Edward's TRIMP
  - ❖ Lucia's TRIMP
  - ❖ iTRIMP



### Subjektif Yaklaşım:

- Algılanan Zorluk Derecesi (RPE)
  - ❖ sRPE hesabı

### 1- ACWR:

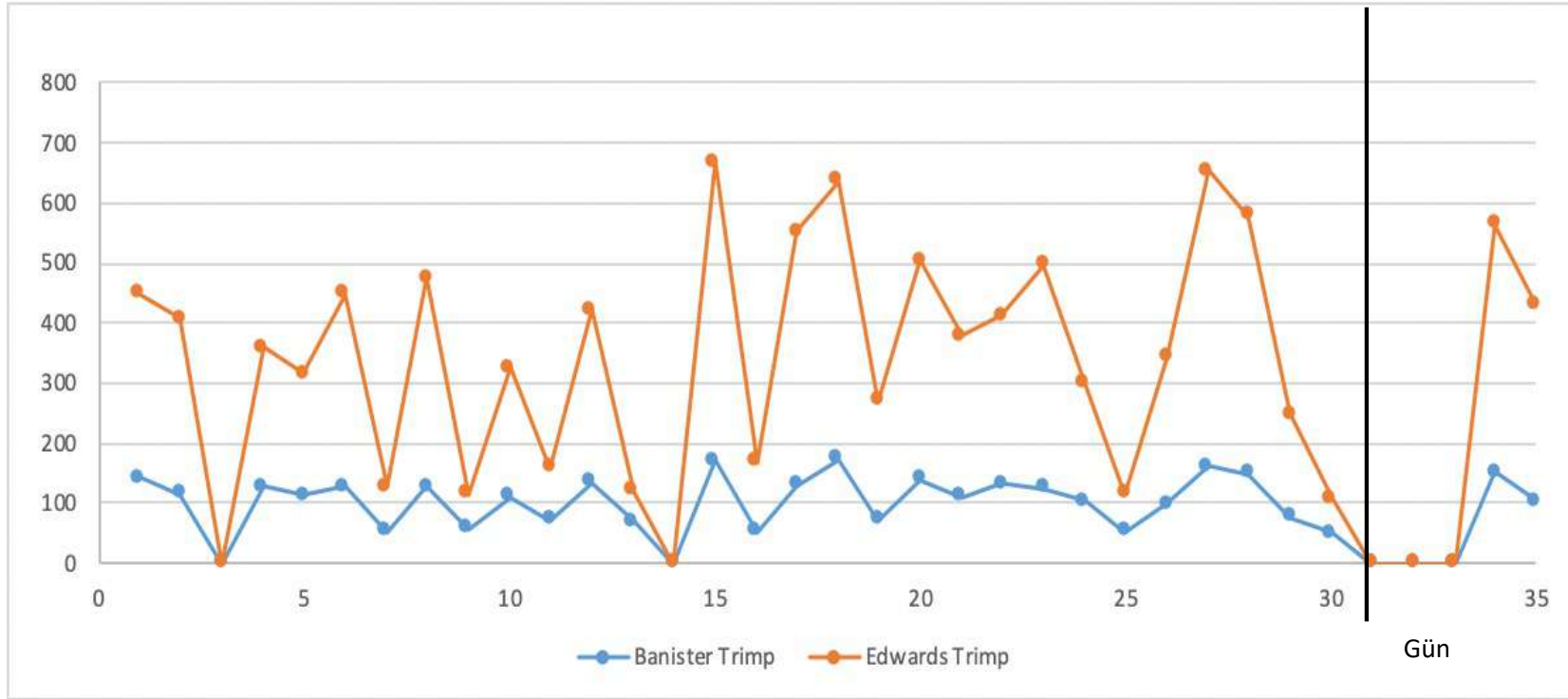
- a-  $ACWR_{Rolling}$  Model
- b-  $ACWR_{EWMA}$  Model

### 2- Training Monotony & Strain

# Antrenman Yüğü



Hazırlık Periyodu: 35 Gün



# Antrenman Yükünün Takibi: Rolling Average ACWR (ACWR<sub>Rolling</sub>) Model



$$ACWR = ATL / CTL$$

ATL (Akut Yük): Son 7 günün ortalama yükü

CTL (Kronik Yük): Son 28 günün ortalama yükü

Daily Internal Load			
Banister Trimp	RA-Acute BT	RA-Chronic BT	Banister Trimp RA-ACWR
142	142	142	1.00
115	128	128	1.00
0	85	85	1.00
127	96	96	1.00
113	99	99	1.00
128	104	104	1.00
52	97	97	1.00
127	95	100	0.94
59	87	96	0.90
111	102	97	1.05
71	94	95	0.99
134	97	98	0.99
69	89	96	0.93
0	82	89	0.92
171	88	95	0.93
52	87	92	0.94
129	89	94	0.95
173	104	98	1.06
73	95	97	0.98
140	105	99	1.06
111	121	100	1.21
131	116	101	1.14
125	126	102	1.23
104	122	102	1.20
53	105	100	1.05
97	109	100	1.08
162	112	103	1.09
149	118	104	1.13
77	110	102	1.08
50	99	100	0.99
0	84	100	0.85
0	77	95	0.81
0	63	91	0.69
151	61	92	0.67
102	54	94	0.58

Banister Trimp için ACWR<sub>Rolling</sub> = ATL/CTL

8.Güne ait RA-Acute BT=

$$((115+0+127+113+128+52+127)/7) = 95$$

8 günlük RA-Chronic BT=

$$((142+115+0+127+113+128+52+95)/8)=100$$

$$\text{Banister Trimp ACWR}_{\text{Rolling}} = 95 / 100 = 0.94$$



## Antrenman Yükünün Takibi: $ACWR_{EWMA}$ Model



### Yüklenme Takibinin Amacı:

- Performansı geliştirmek
- Yaralanma riskini düşürmek

ATL: 7 günlük üssel ağırlıklı Akut antrenman yükü

CTL: 28 günlük üssel ağırlıklı Kronik antrenman yükü

$ACWR_{EWMA}$  : ATL ve CTL arası oran

$$ATL_{today} = TRIMP * \lambda_a + ((1 - \lambda_a) * ATL_{yesterday})$$
$$CTL_{today} = TRIMP * \lambda_f + ((1 - \lambda_f) * CTL_{yesterday})$$

$$\lambda(N) = \frac{2}{N + 1}$$

$$7 \text{ günlük } \lambda = 2 / 7+1 = 0.25$$

$$28 \text{ günlük } \lambda = 2 / 28+1 = 0.07$$

## Antrenman Yükünün Takibi: ACWR<sub>EWMA</sub> Model



$$ACWR = ATL/CTL$$

ATL (Akut Yük): 8. günün Akut etkisi

CTL (Kronik Yük): 8. günün Kronik etkisi

$$7 \text{ günlük } \lambda = 2 / 7+1 = 0.25$$

$$28 \text{ günlük } \lambda = 2 / 28+1 = 0.07$$

	7-day $\lambda$ 0.25	28 day $\lambda$ 0.07	
Banister Trimp	Ewma- Acute BT	Ewma- Chronic BT	Banister Trimp EWMA- ACWR
142	142	142	1.00
115	135	140	0.96
0	101	130	0.78
127	108	130	0.83
113	109	129	0.85
128	114	129	0.88
52	98	124	0.80
127	106	124	0.85
59	94	119	0.79
111	98	119	0.83
71	91	115	0.79
134	102	117	0.87
69	94	113	0.83
0	70	106	0.67
171	95	110	0.87
52	85	106	0.80
129	96	108	0.89
173	115	112	1.03
73	105	110	0.95
140	113	112	1.02
111	113	112	1.01
131	117	113	1.04
125	119	114	1.05
104	115	113	1.02
53	100	109	0.92
97	99	108	0.92
162	115	112	1.03
149	124	114	1.08
77	112	112	1.00
50	97	108	0.90
0	72	100	0.72
0	54	93	0.58
0	41	87	0.47
151	68	91	0.75
102	77	92	0.83

Banister Trimp için ACWR<sub>EWMA</sub> = ATL/CTL

2.Güne ait yükün Akut etkisi  
EWMA-Acute BT=

$$(115 \times 0.25) + ((1-0.25) \times 142) = 135$$

2.Güne ait yükün Kronik etkisi  
EWMA-Chronic BT=

$$(115 \times 0.07) + ((1-0.07) \times 142) = 140$$

$$\text{Banister Trimp ACWR}_{EWMA} = 135 / 140 = 0.96$$

## Antrenman Yükünün Takibi: ACWR<sub>EWMA</sub> Model



$$ACWR = ATL/CTL$$

ATL (Akut Yük): 8. günün Akut etkisi

CTL (Kronik Yük): 8. günün Kronik etkisi

$$7 \text{ günlük } \lambda = 2 / 7 + 1 = 0.25$$

$$28 \text{ günlük } \lambda = 2 / 28 + 1 = 0.07$$

Banister Trimp	7-day $\lambda$ 0.25		Banister Trimp EWMA-ACWR
	Ewma-Acute BT	Ewma-Chronic BT	
142	142	142	1.00
115	135	140	0.96
0	101	130	0.78
127	108	130	0.83
113	109	129	0.85
128	114	129	0.88
52	98	124	0.80
127	106	124	0.85
59	94	119	0.79
111	98	119	0.83
71	91	115	0.79
134	102	117	0.87
69	94	113	0.83
0	70	106	0.67
171	95	110	0.87
52	85	106	0.80
129	96	108	0.89
173	115	112	1.03
73	105	110	0.95
140	113	112	1.02
111	113	112	1.01
131	117	113	1.04
125	119	114	1.05
104	115	113	1.02
53	100	109	0.92
97	99	108	0.92
162	115	112	1.03
149	124	114	1.08
77	112	112	1.00
50	97	108	0.90
0	72	100	0.72
0	54	93	0.58
0	41	87	0.47
151	68	91	0.75
102	77	92	0.83

Banister Trimp için ACWR<sub>EWMA</sub> = ATL/CTL

8.Güne ait EWMA-Acute BT=

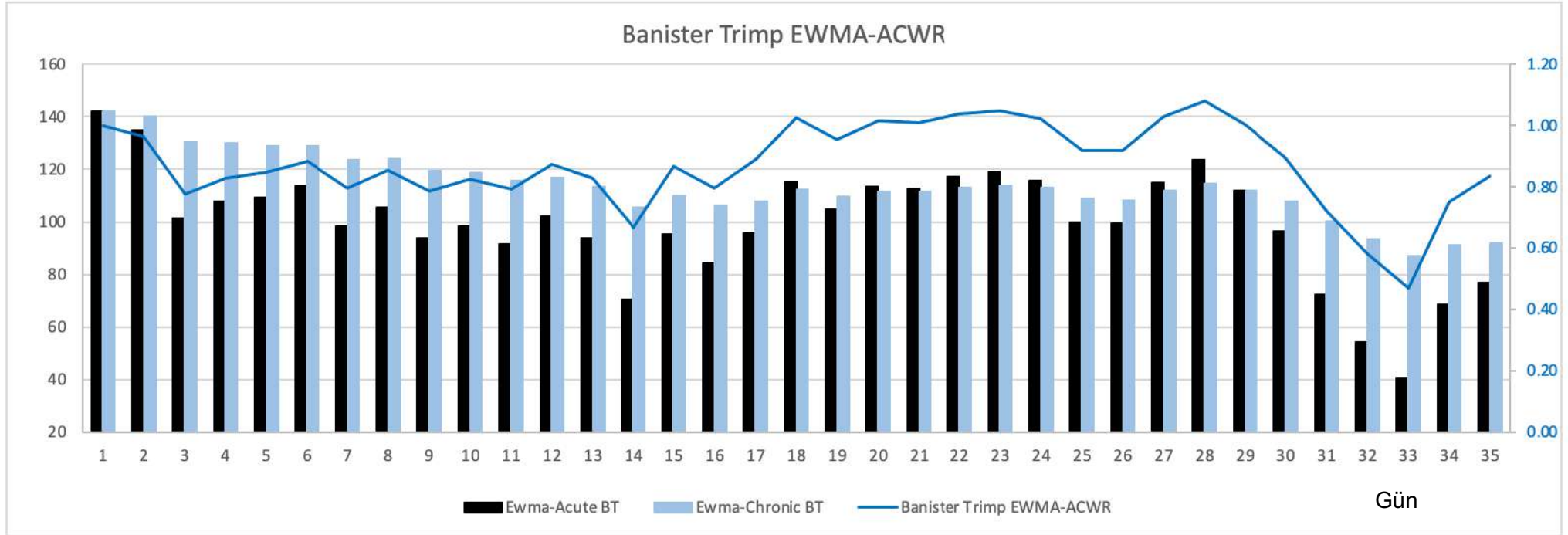
$$(127 \times 0.25) + ((1-0.25) \times 98) = 106$$

8 günlük EWMA-Chronic BT=

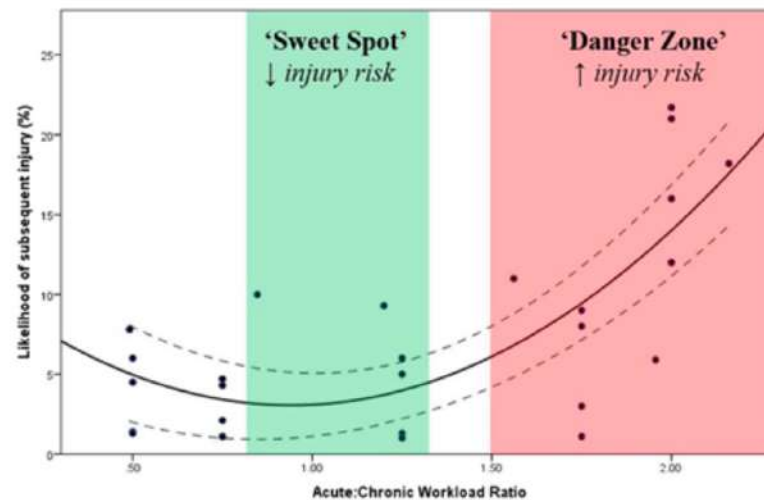
$$(127 \times 0.07) + ((1-0.07) \times 124) = 124$$

$$\text{Banister Trimp ACWR}_{EWMA} = 106 / 124 = 0.85$$

# Internal Yük: Günlük Banister Trimp $ACWR_{EWMA}$



## ACWR: Optimal ATL / CTL Oranı

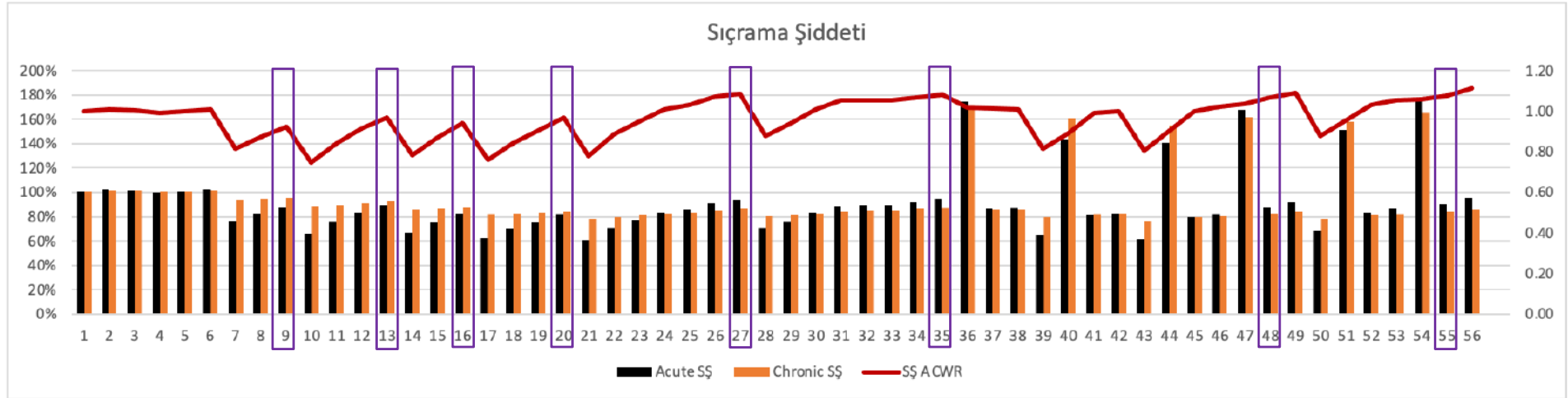
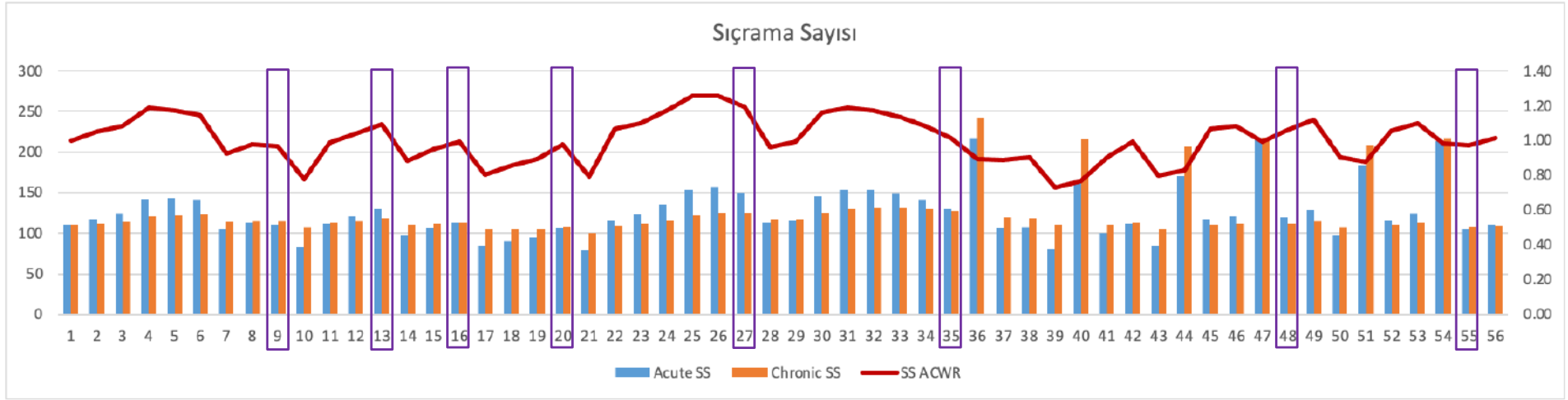


**Fig.1** Established relationship between the acute:chronic workload ratio and injury risk based on studies from 3 different sports. The green-shaded area covers acute:chronic workload ratios within a range of approximately 0.8–1.3, and represents a ‘sweet spot’ where injury risk is low. The red-shaded area covers acute:chronic workload ratios of 1.5 and above, and represents a ‘danger zone’ where injury risk is high [reproduced from [6]]

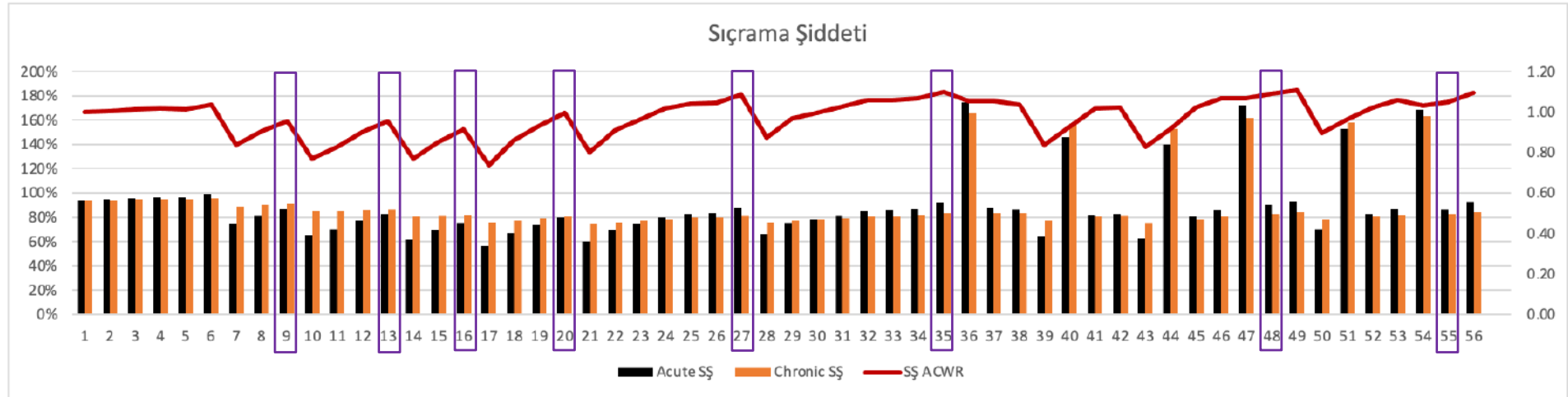
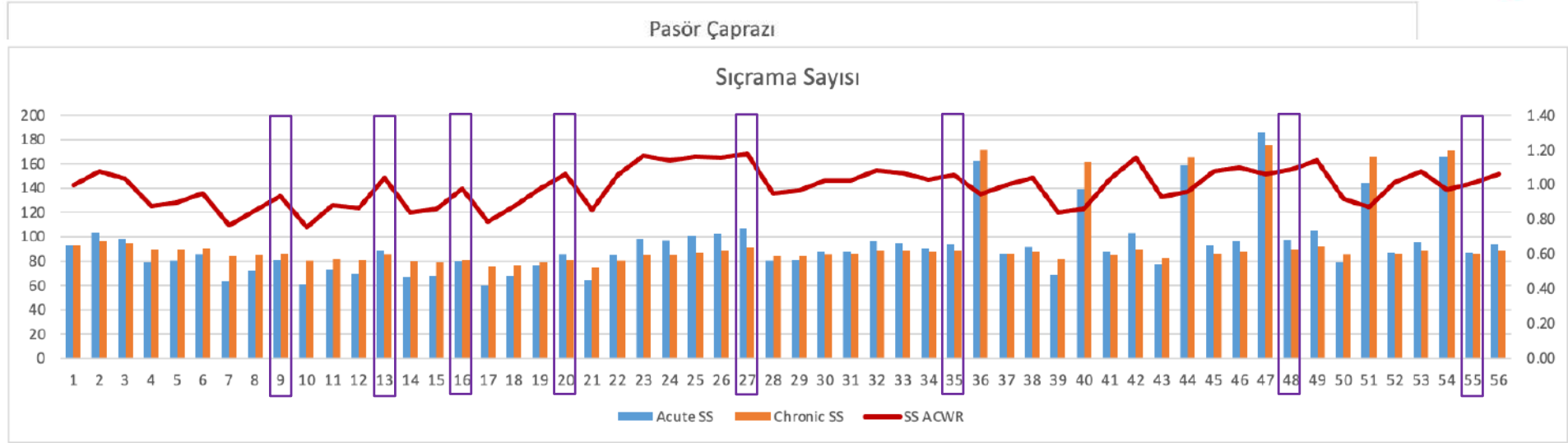
## Voleybol External Yük: Kulüp Antrenmanı Günlük Yüklenme



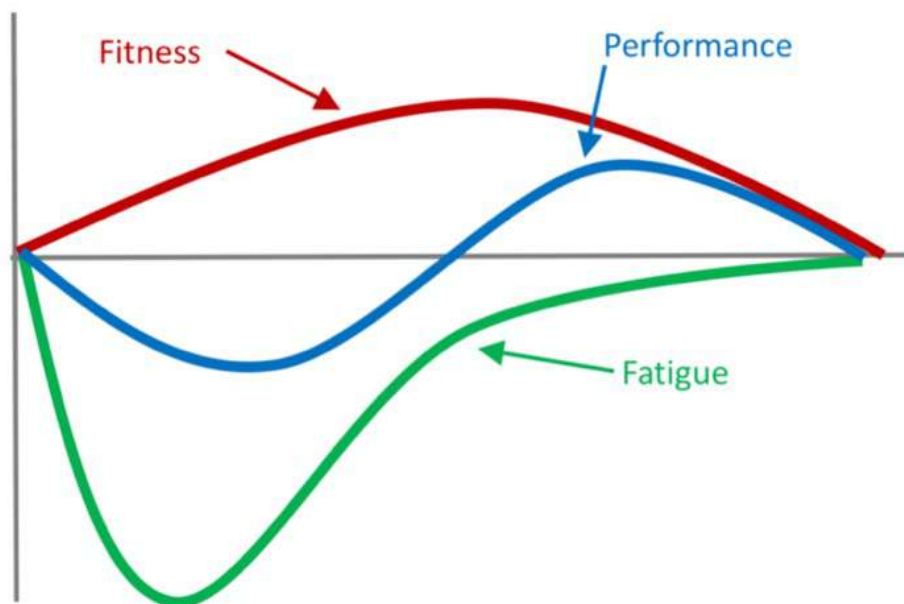
### Orta Oyuncu



## Voleybol External Yük: Kulüp Antrenmanı Günlük Yüklenme



## Fitness – Fatigue Model: ATL, CTL & TSB (Training Stress Balance)



**ATL: Acute TL= Fatigue**    **Antrenmanın negatif etkisi**

**CTL: Chronic TL= Fitness**    **Antrenmanın pozitif etkisi**

**Performans (TSB: Form)= CTL-ATL**    **TSB: Training Stress Balance**

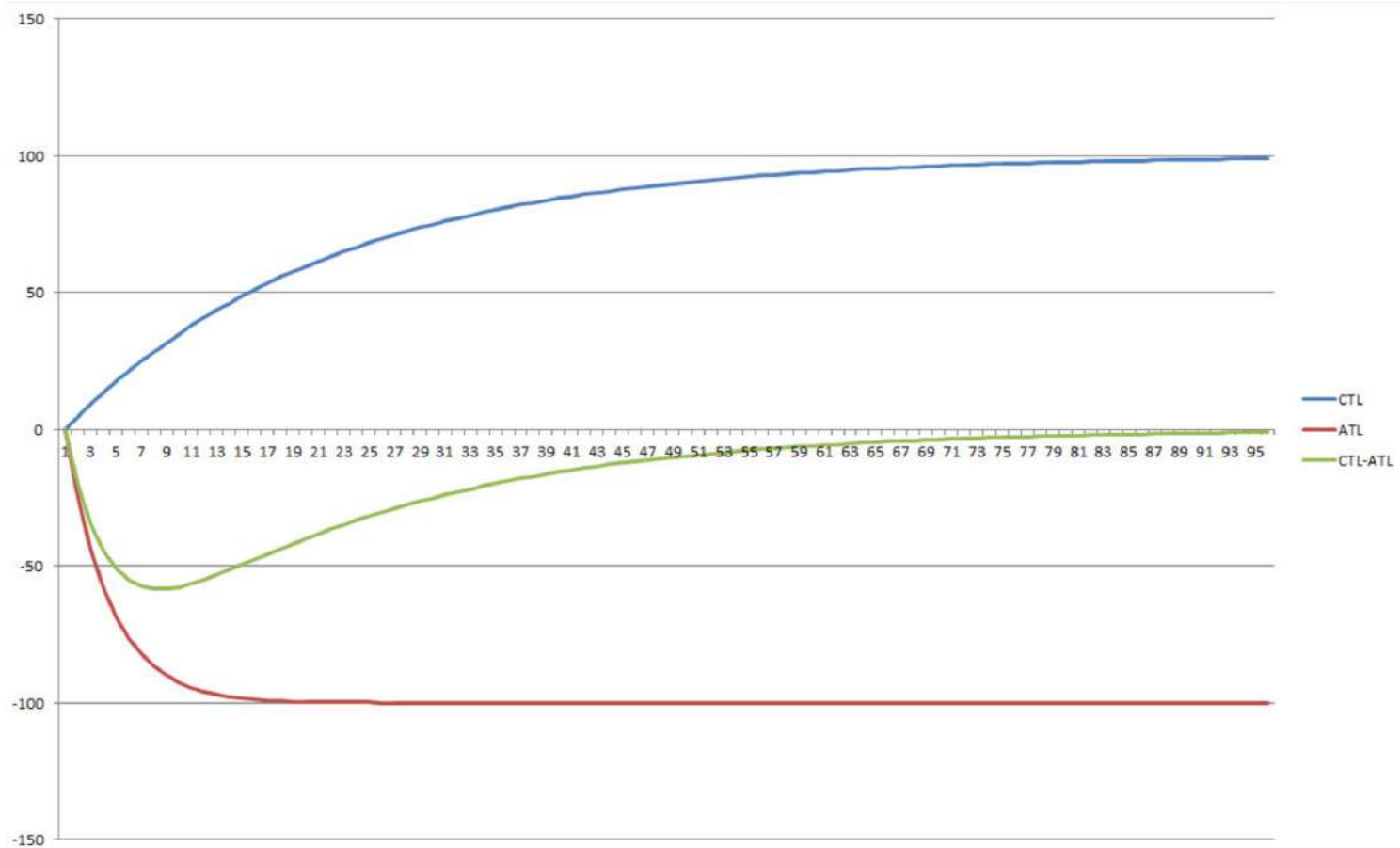
The fitness-fatigue model explains this curve by proposing that it is the sum of two curves, one representing the fatigue effect, and the other representing the fitness improvement. Only once the fatigue effect has dissipated is it possible to see the fitness effect, even though fitness has actually been improving from immediately after the end of the workout.



# Fitness – Fatigue Model (TSB): ATL, CTL & CTL-ATL (TSB)



Training Stress Balance (TSB) uses the terms Chronic Training Load (CTL) for "fitness", Acute Training Load (ATL) for "fatigue" and Training Stress Balance (TSB) for "performance". As with all the models, both CTL and ATL are based on TRIMP, with the effect of a given workout reducing over time, but the effect lasts longer on CTL than on ATL. In addition the TSB method assumes the effect is greater on CTL than on ATL.

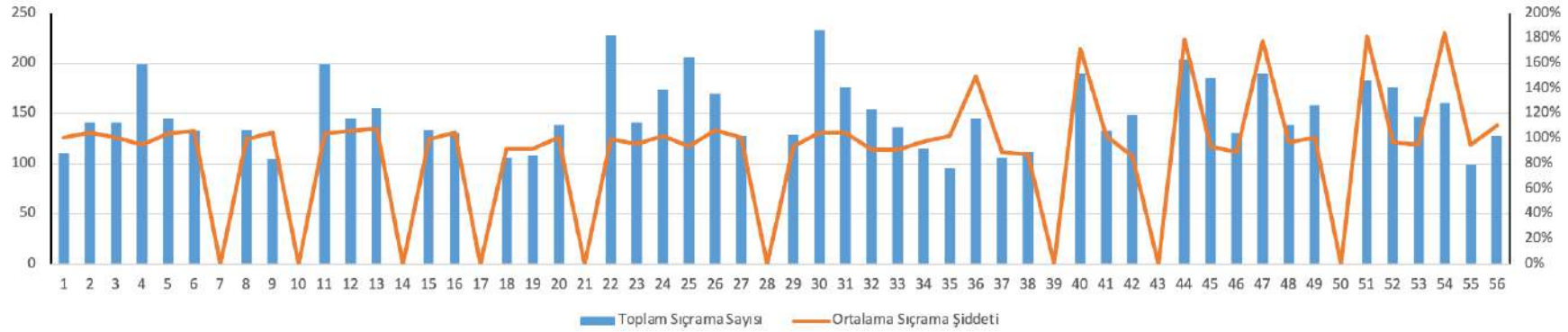


## Voleybol External Yük: 56 Günlük Kulüp Antrenmanı; Günlük Yüklenme, ACWR & TSB



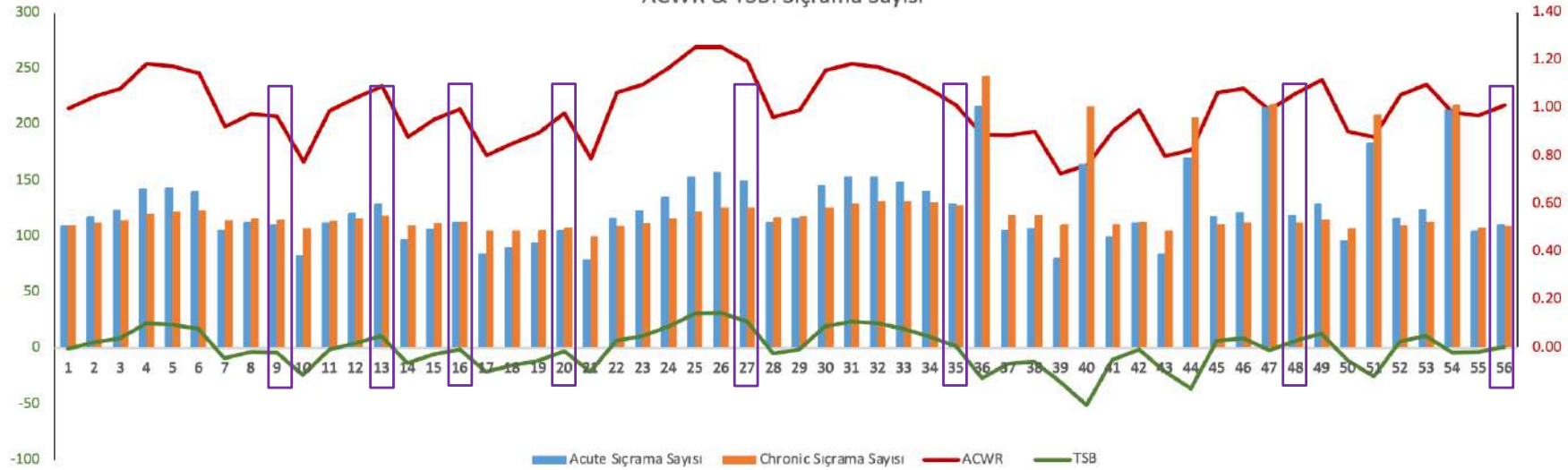
Orta

### Günlük Sıçrama Sayısı ve Şiddeti



Orta

### ACWR & TSB: Sıçrama Sayısı

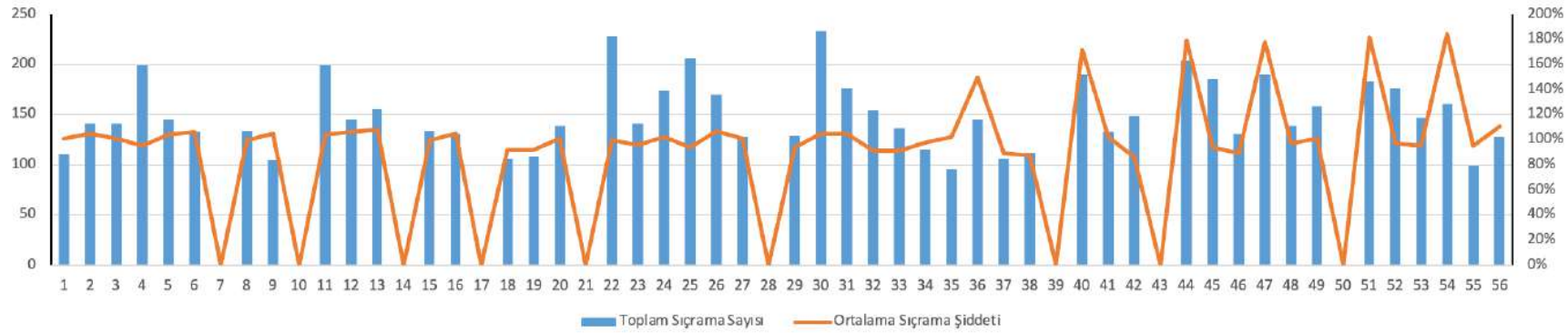


## Voleybol External Yük: 56 Günlük Kulüp Antrenmanı; Günlük Yüklenme, ACWR & TSB



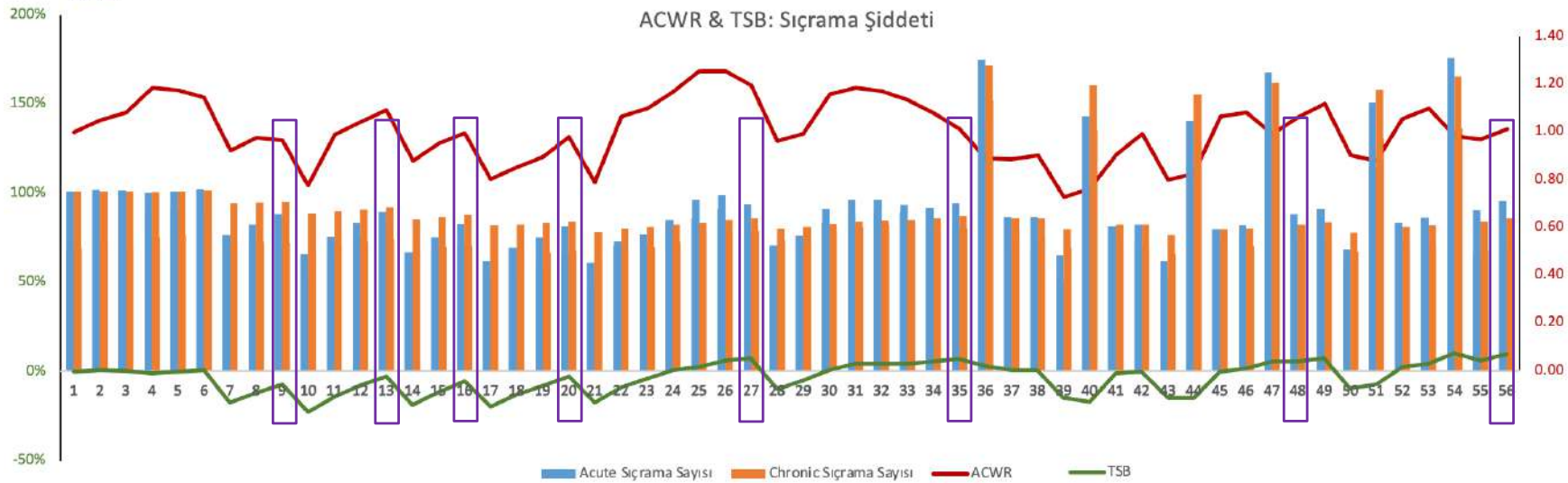
Orta

### Günlük Sıçrama Sayısı ve Şiddeti



Orta

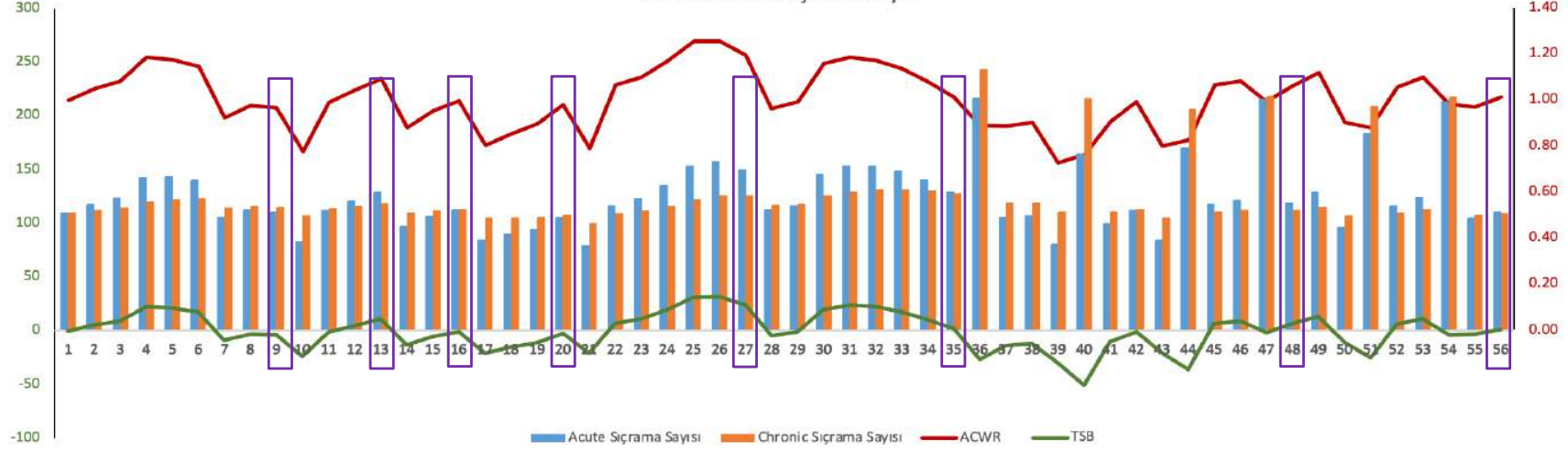
### ACWR & TSB: Sıçrama Şiddeti



# Voleybol

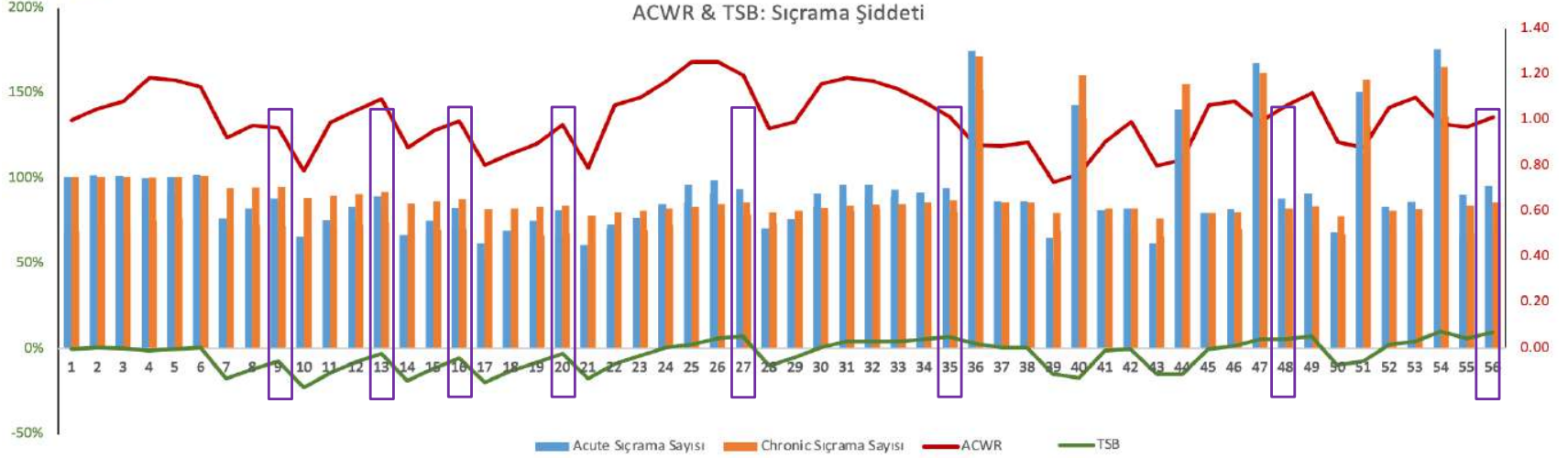
Orta

### ACWR & TSB: Sıçrama Sayısı



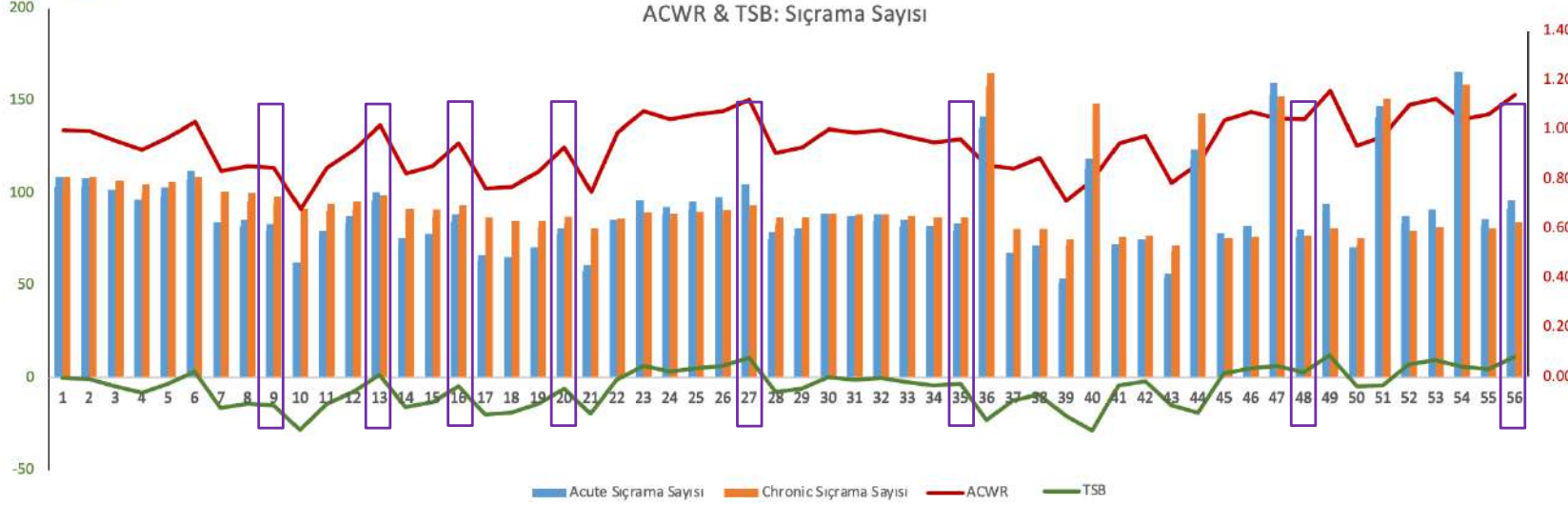
Orta

### ACWR & TSB: Sıçrama Şiddeti

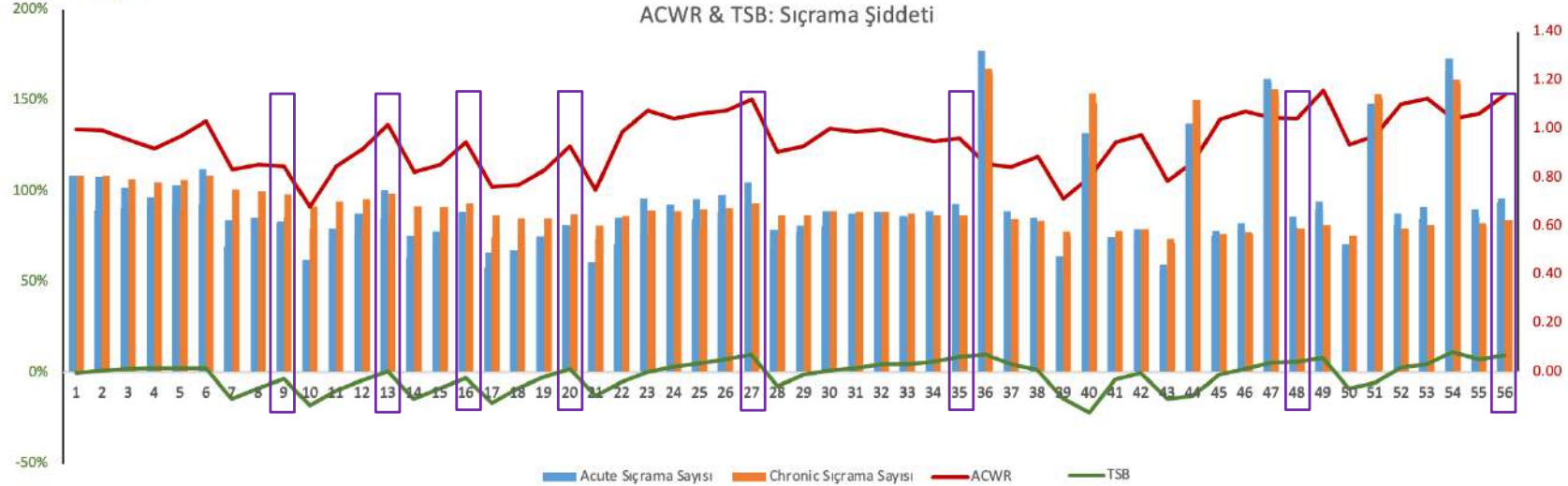


# Voleybol

Smaçör



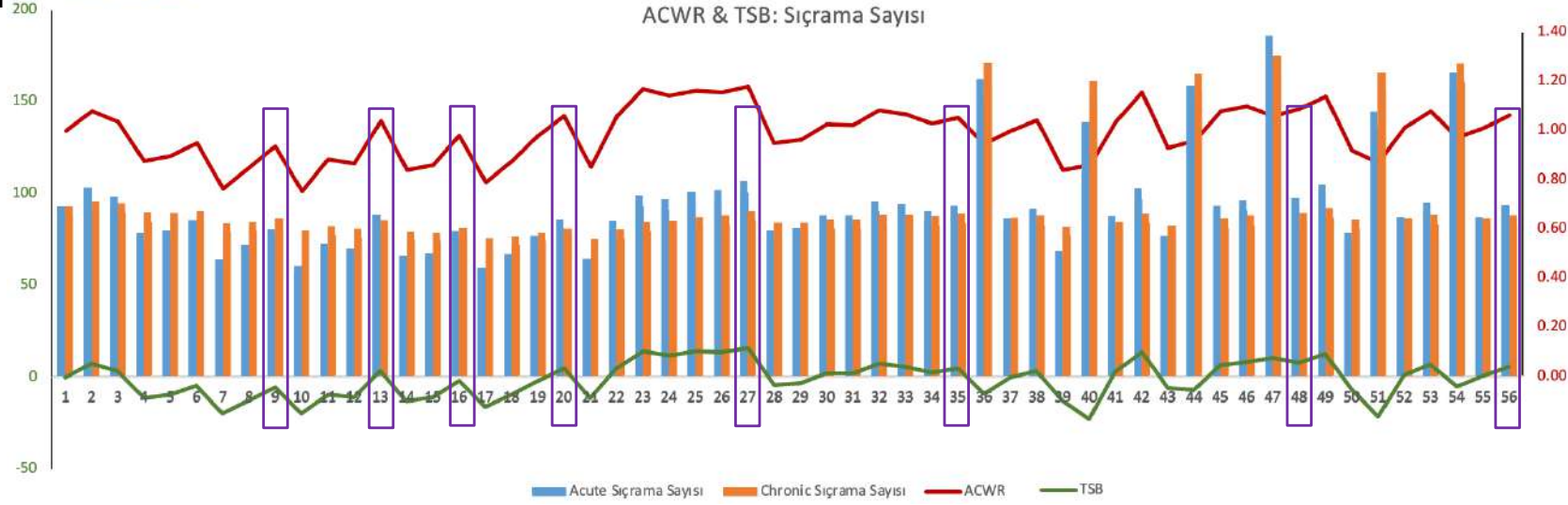
Smaçör



# Voleybol

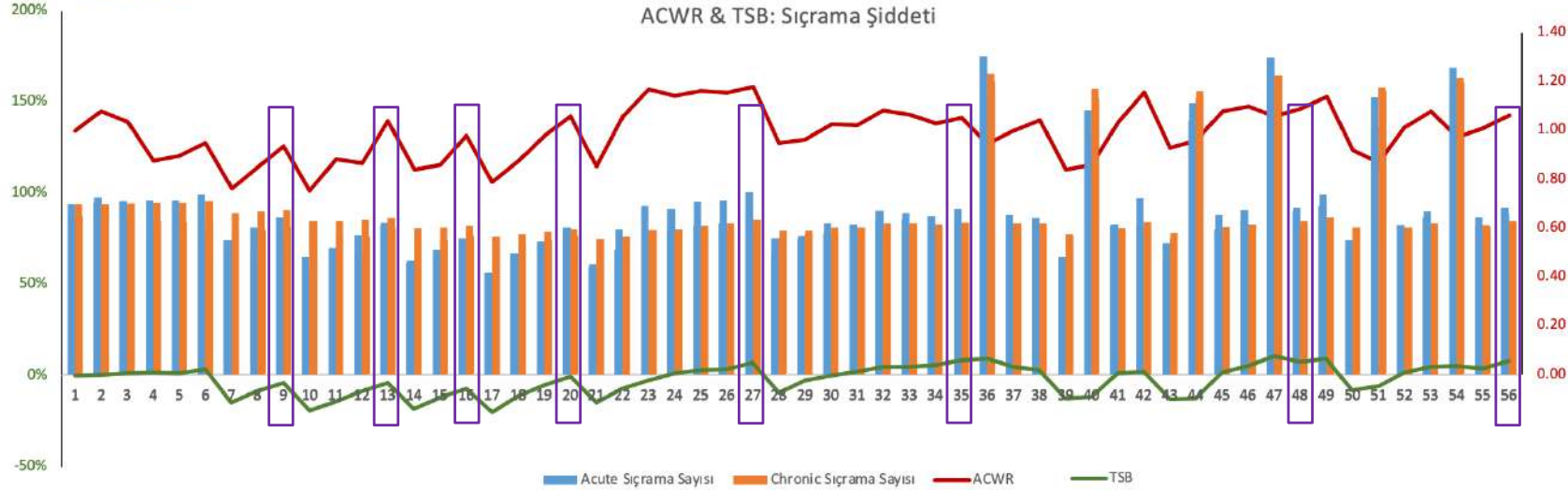
Pasör Çaprazı

## ACWR & TSB: Sıçrama Sayısı



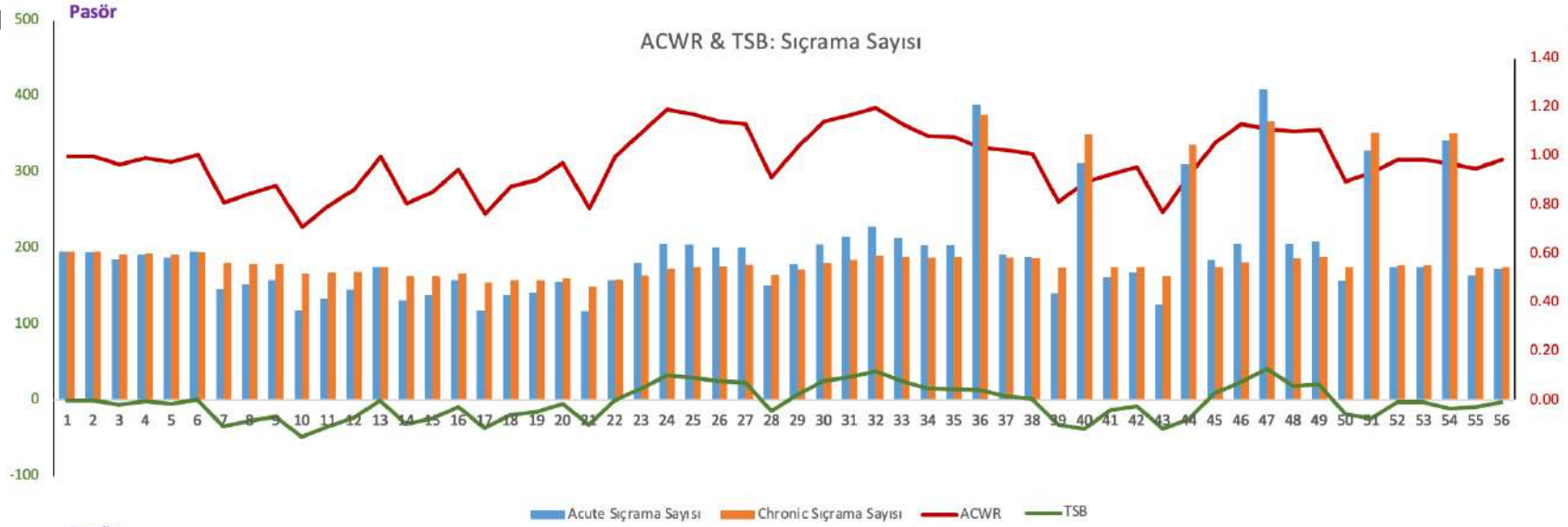
Pasör Çaprazı

## ACWR & TSB: Sıçrama Şiddeti

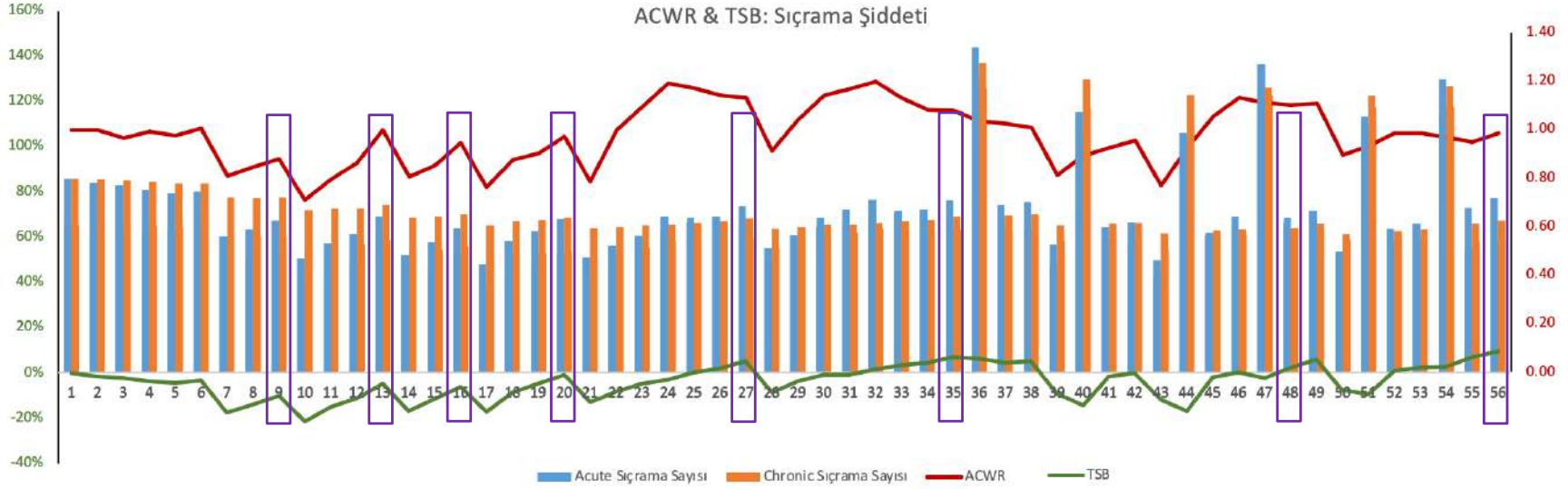


# Voleybol

Pasör



Pasör

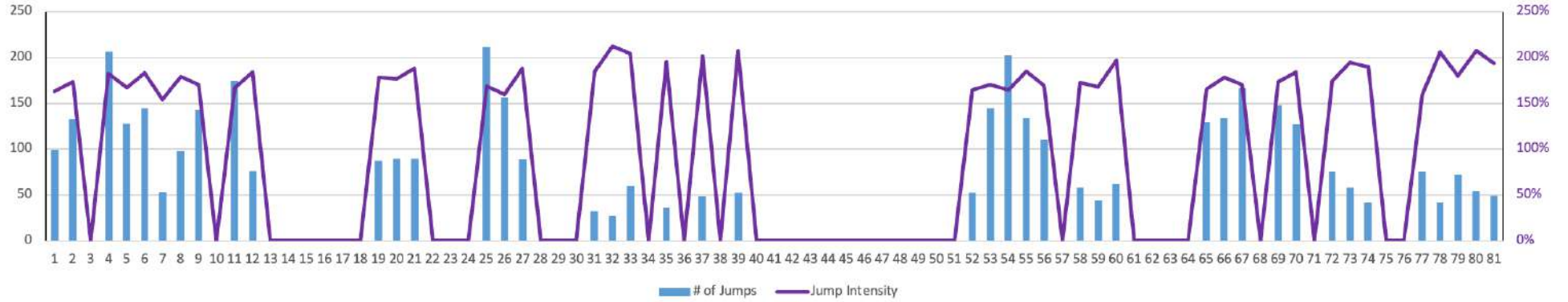


Voleybol External Yük: Milli Takım 81 günlük yüklenme, ACWR & TSB



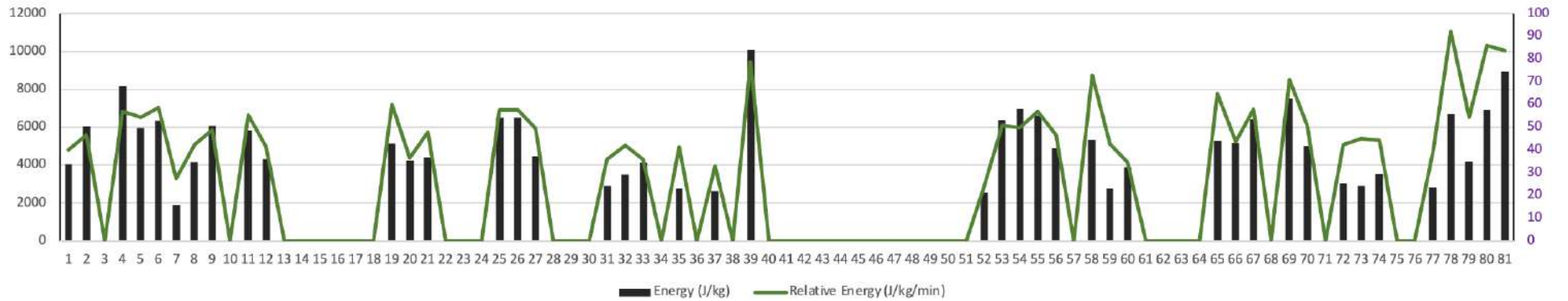
Orta\_1

# of Daily Jumps & Jump Intensity



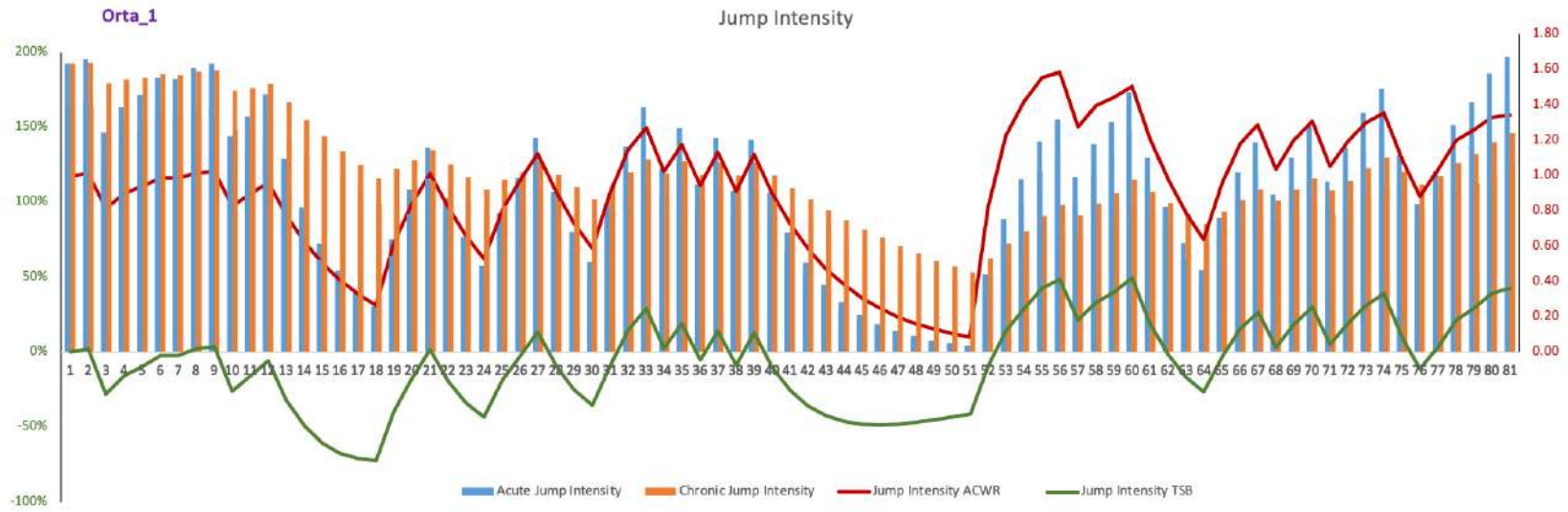
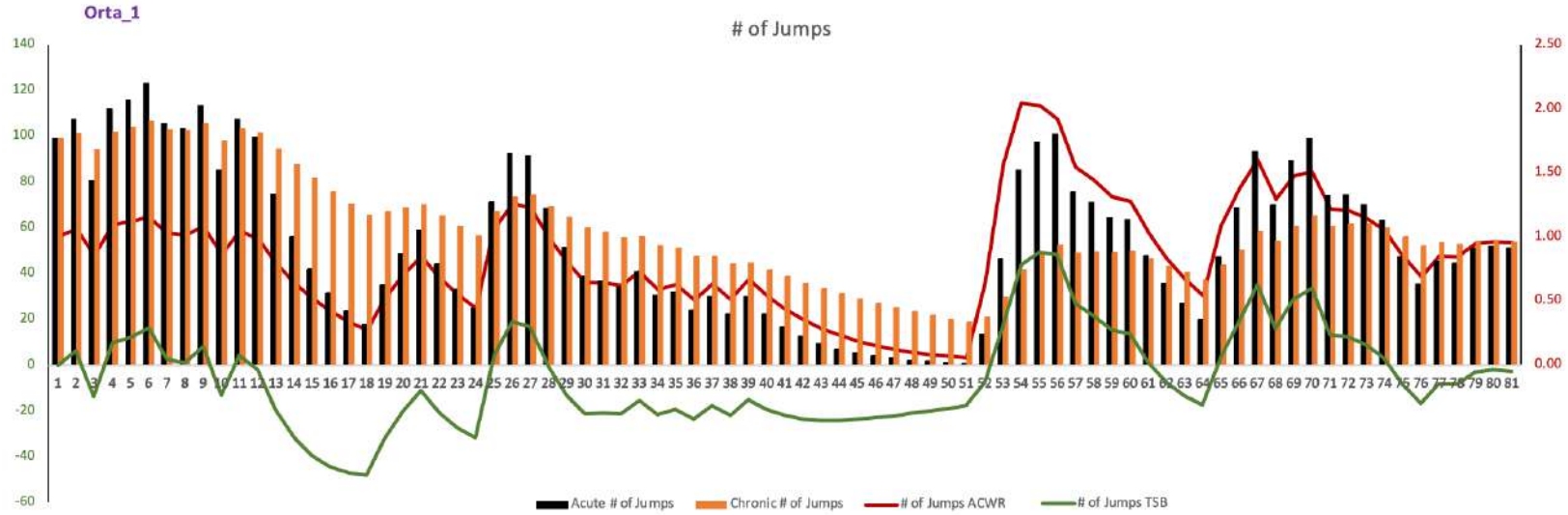
Orta\_1

Daily Energy & Relative Energy

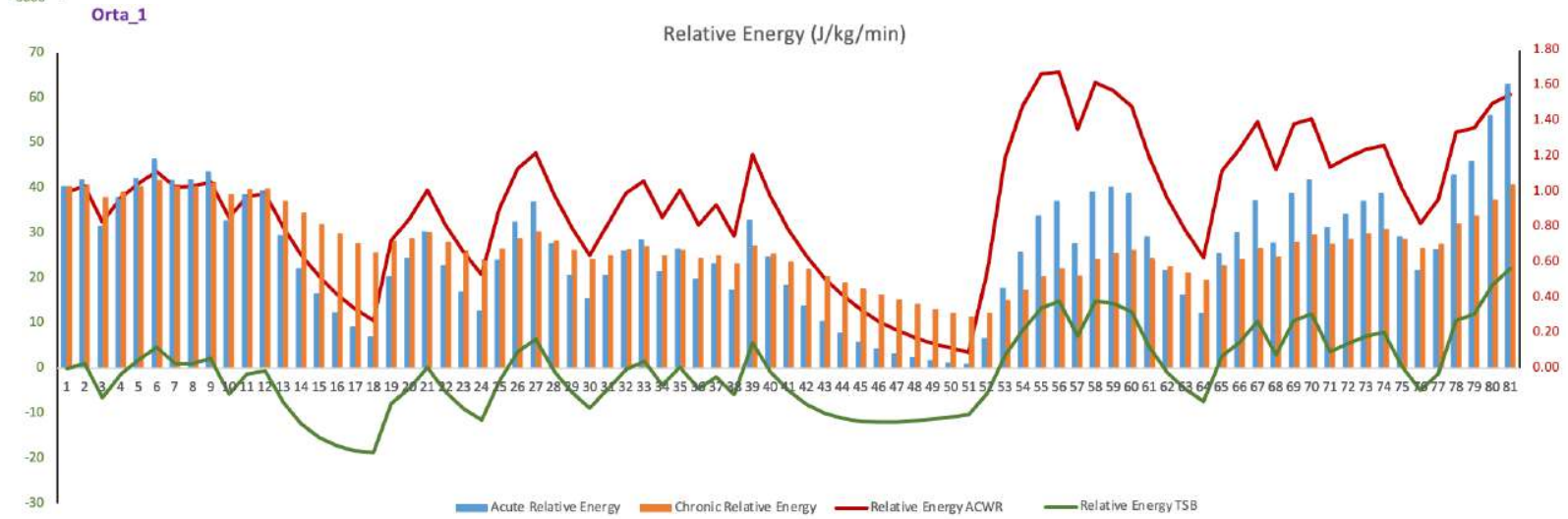
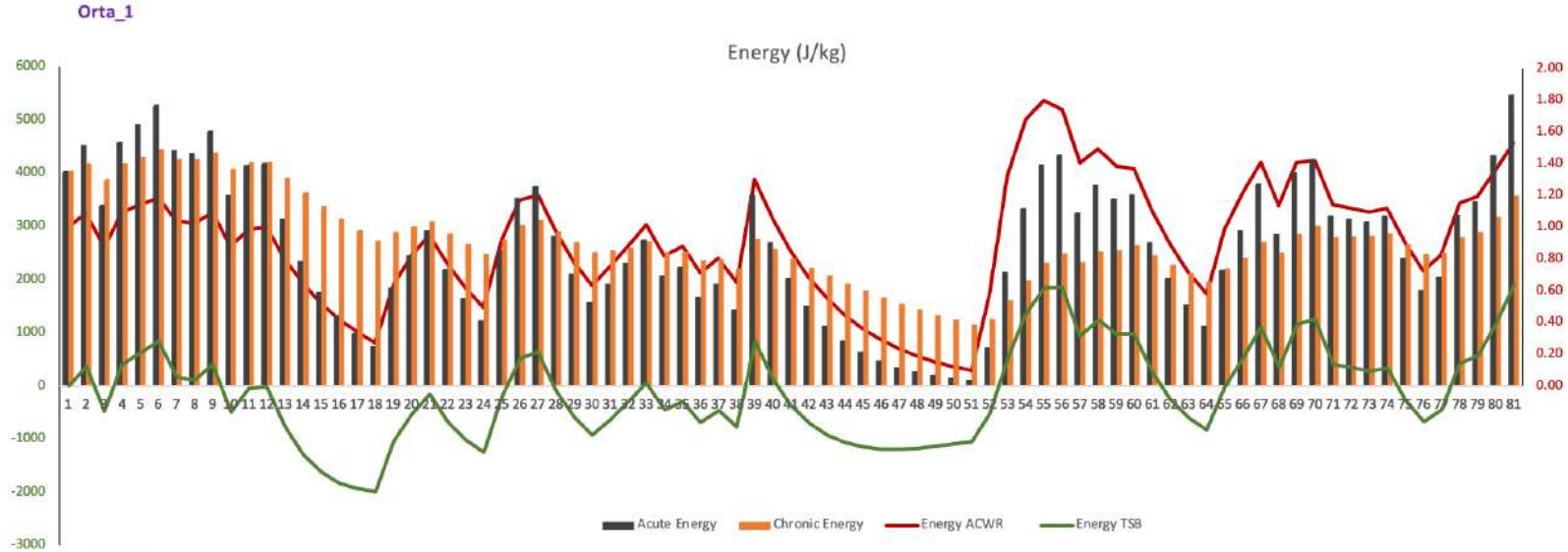




## Voleybol External Yük: Milli Takım 81 günlük yüklenme, ACWR & TSB



## Voleybol External Yük: Milli Takım 81 günlük yüklenme, ACWR & TSB

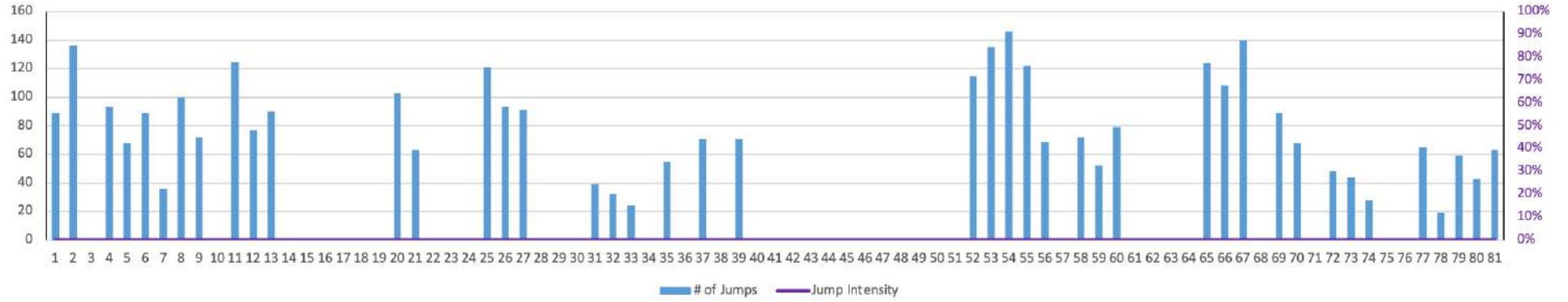


## Voleybol External Yük: Milli Takım 81 günlük yüklenme, ACWR & TSB



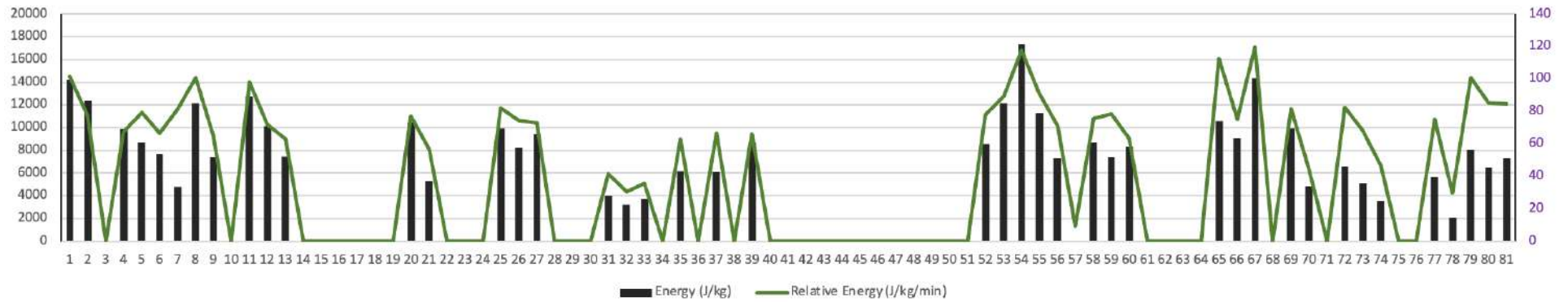
Smaçör\_1

### # of Daily Jumps & Jump Intensity



Smaçör\_1

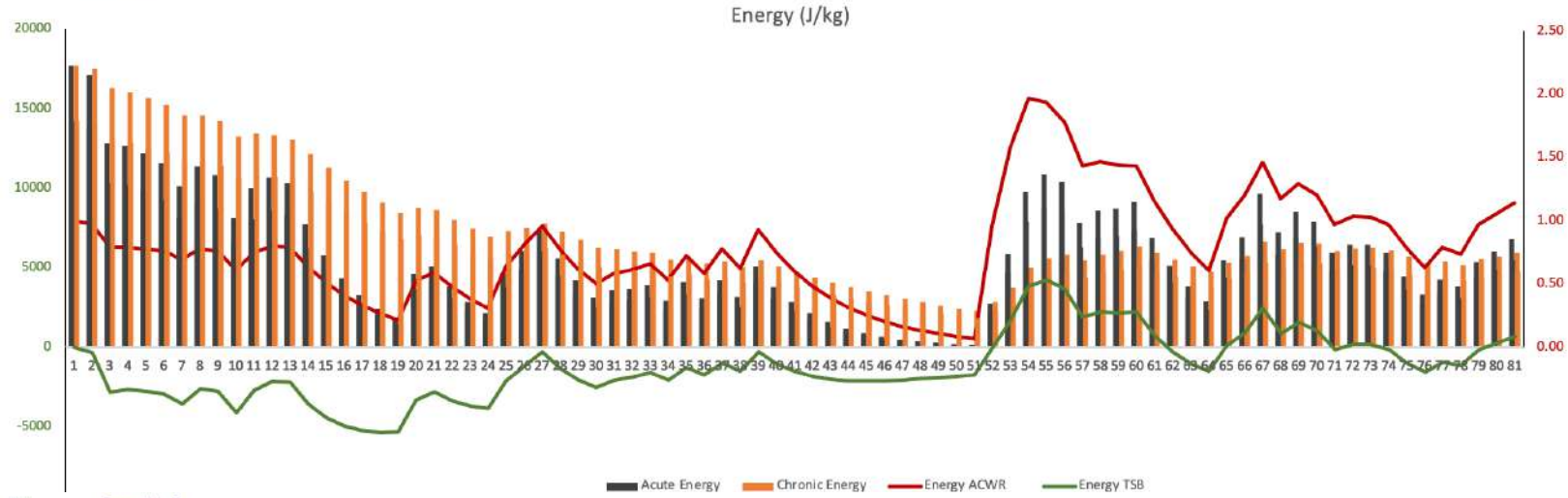
### Daily Energy & Relative Energy



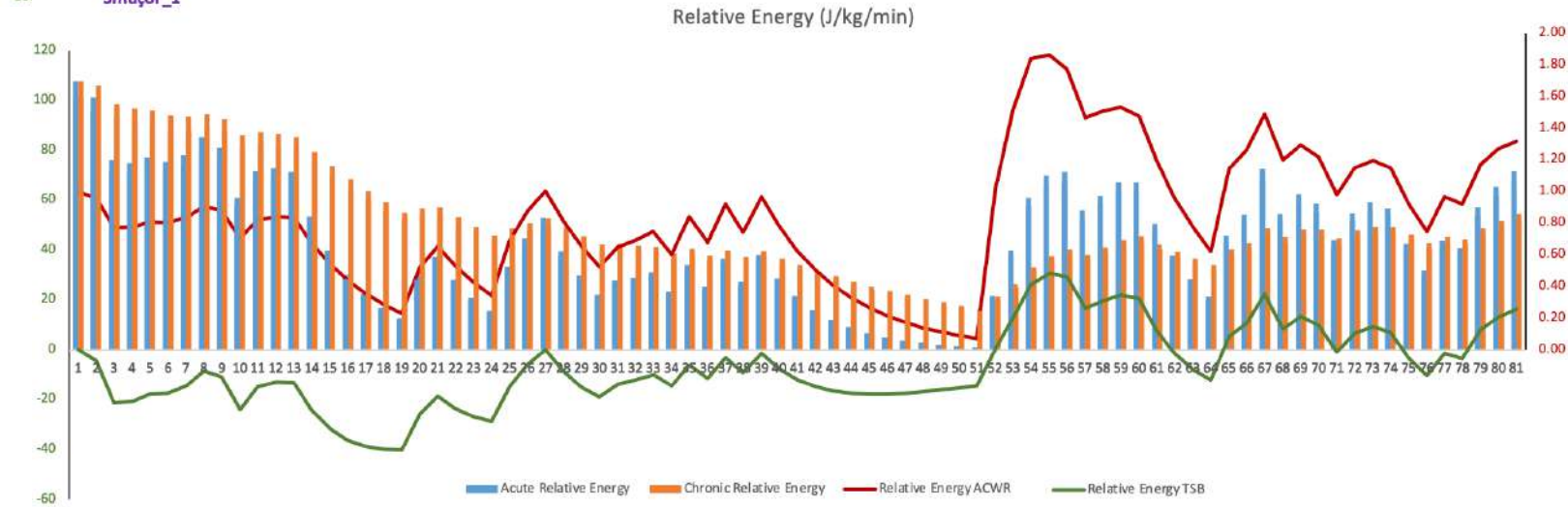
## Voleybol External Yük: Milli Takım 81 günlük yüklenme, ACWR & TSB



Smaçör\_1



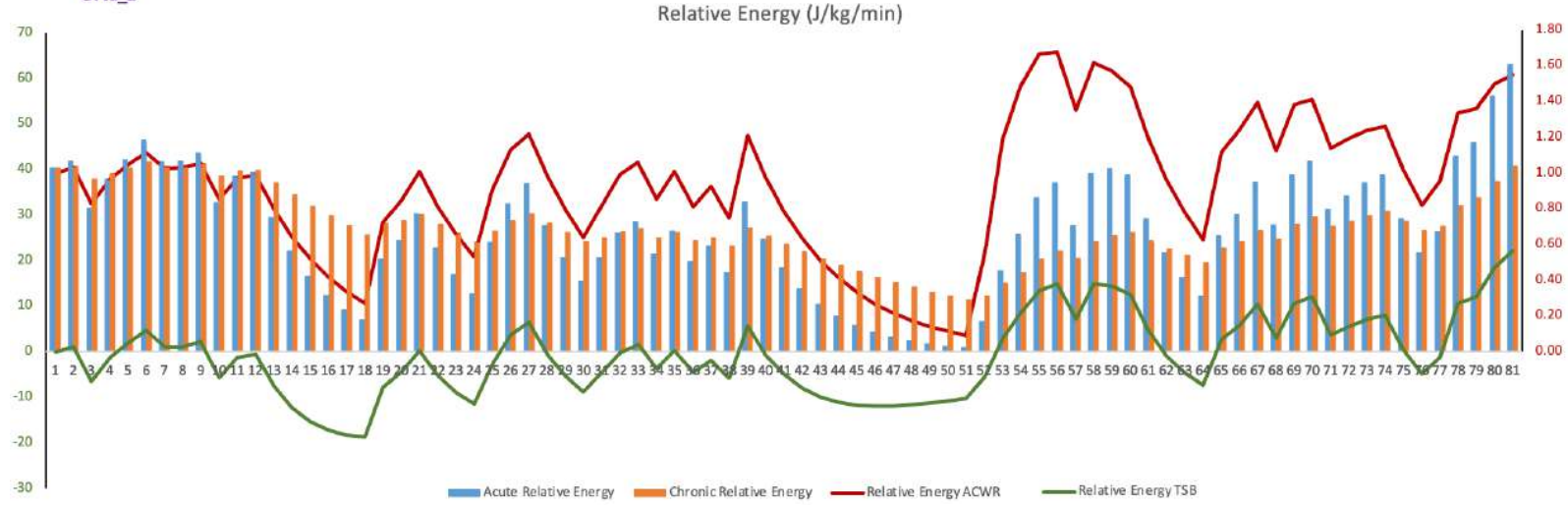
Smaçör\_1



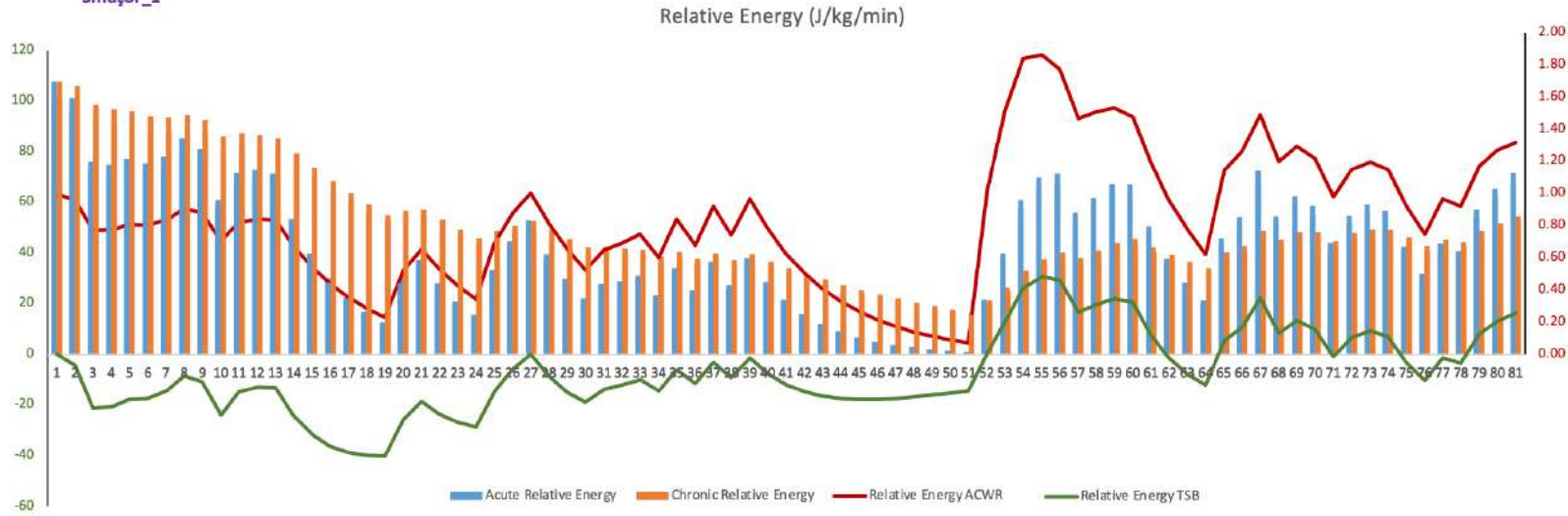
## Voleybol External Yük: Milli Takım 81 günlük yüklenme, ACWR & TSB



Orta\_1



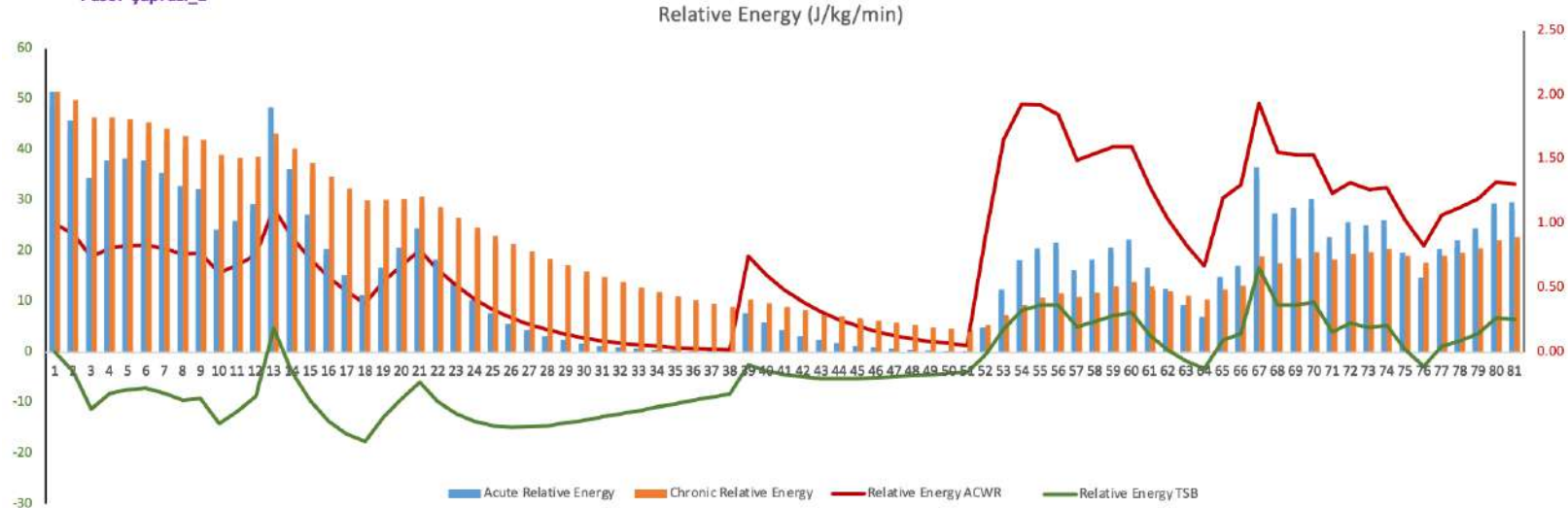
Smaçör\_1



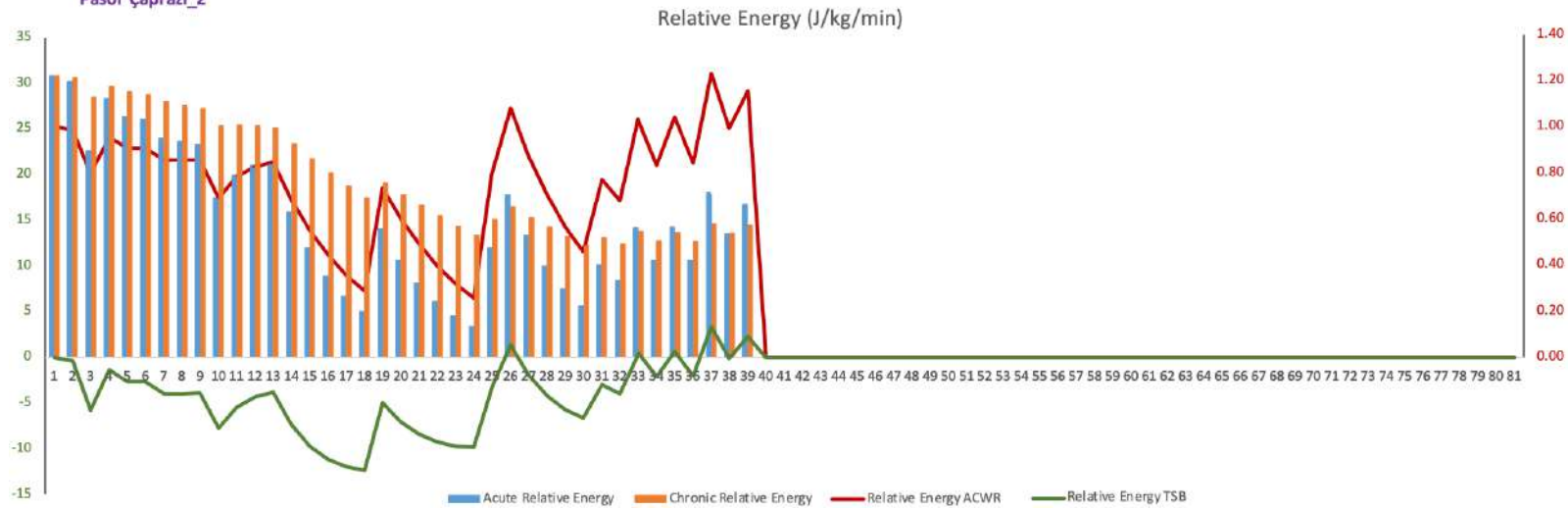
## Voleybol External Yük: Milli Takım 81 günlük yüklenme, ACWR & TSB



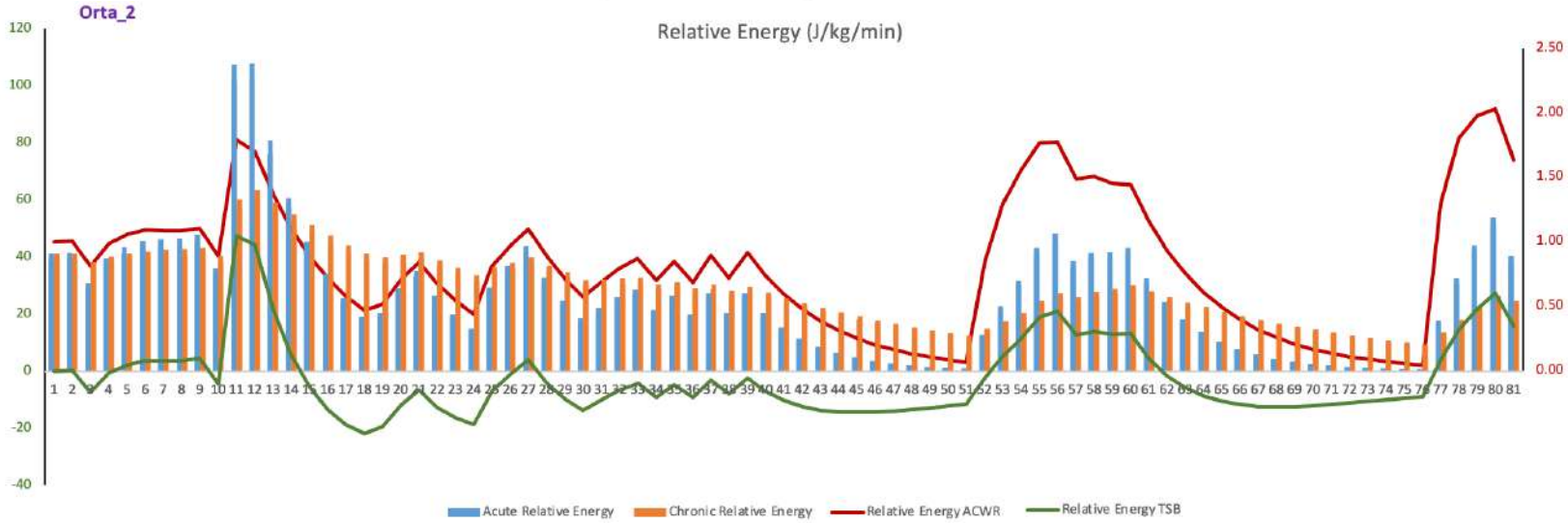
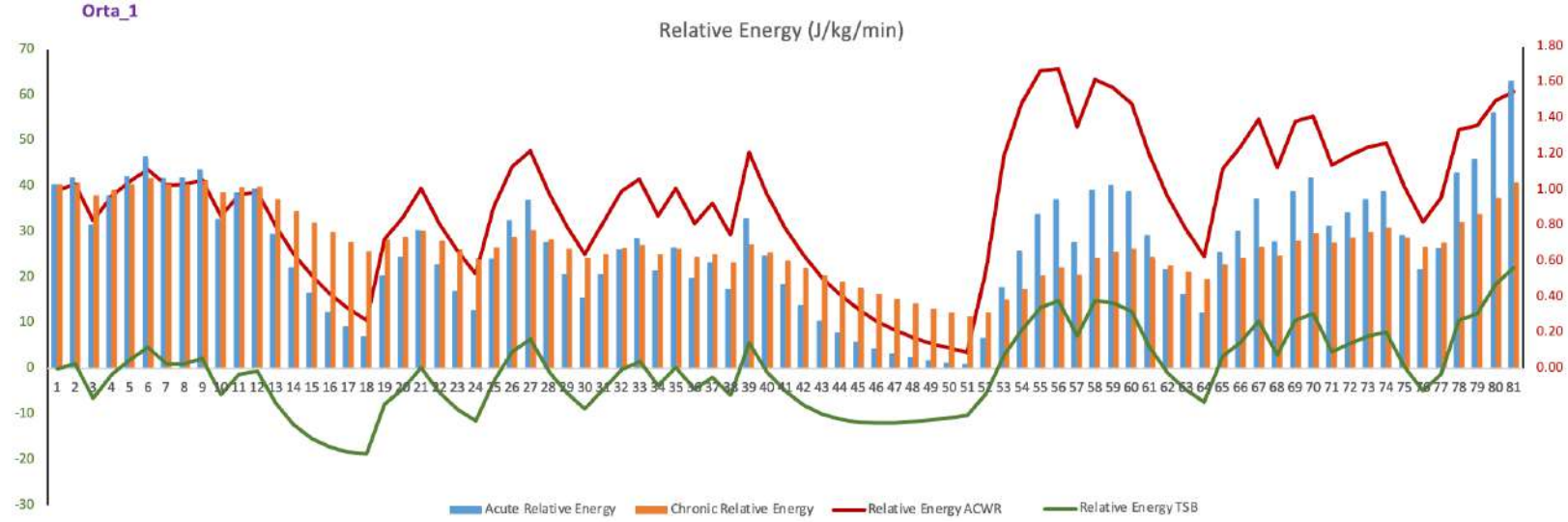
Pasör Çaprazı\_1



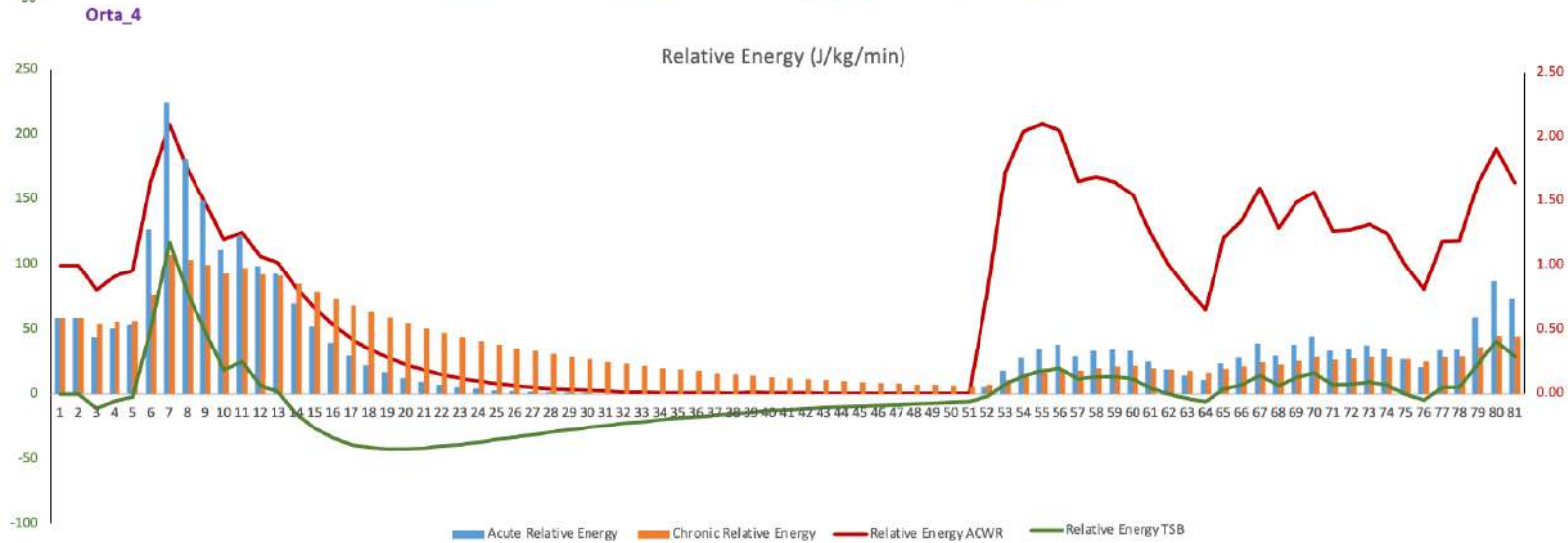
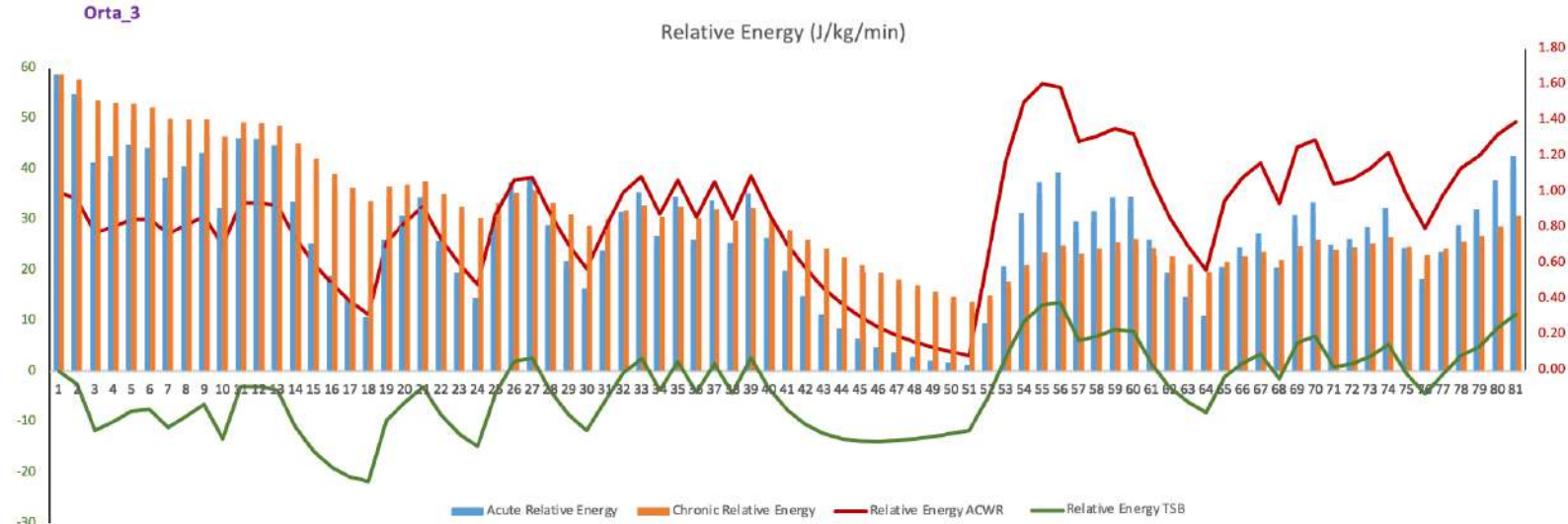
Pasör Çaprazı\_2



## Voleybol External Yük: Milli Takım 81 günlük yüklenme, ACWR & TSB

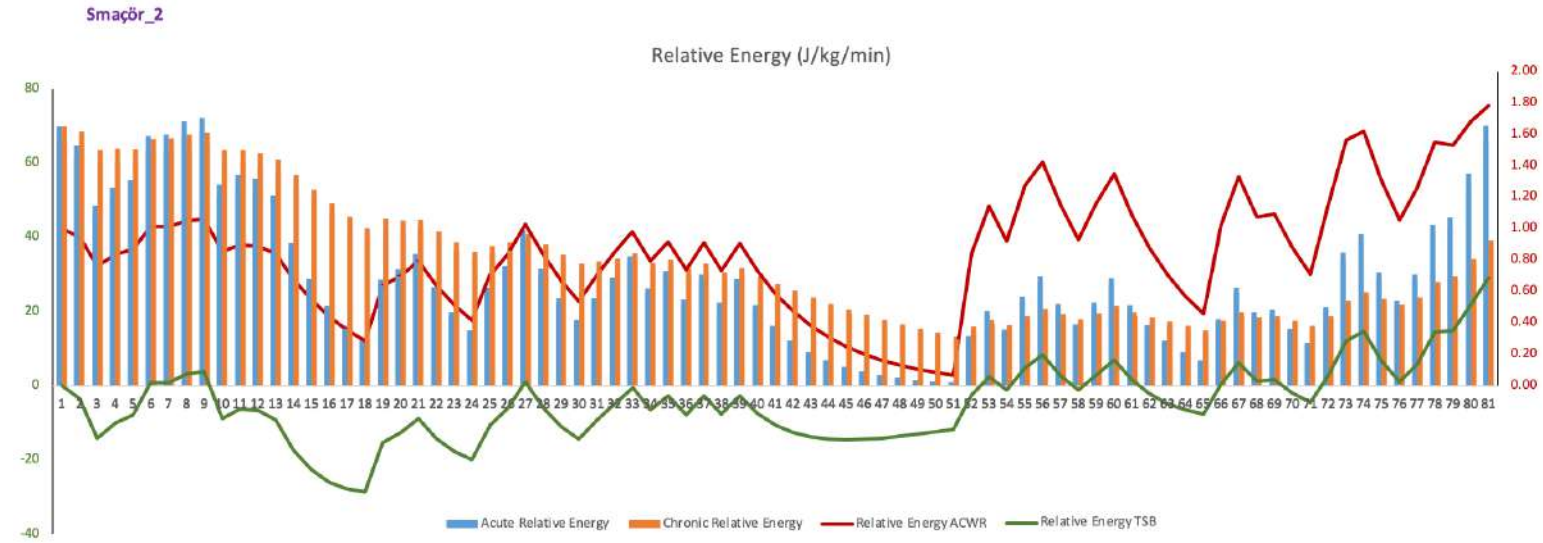
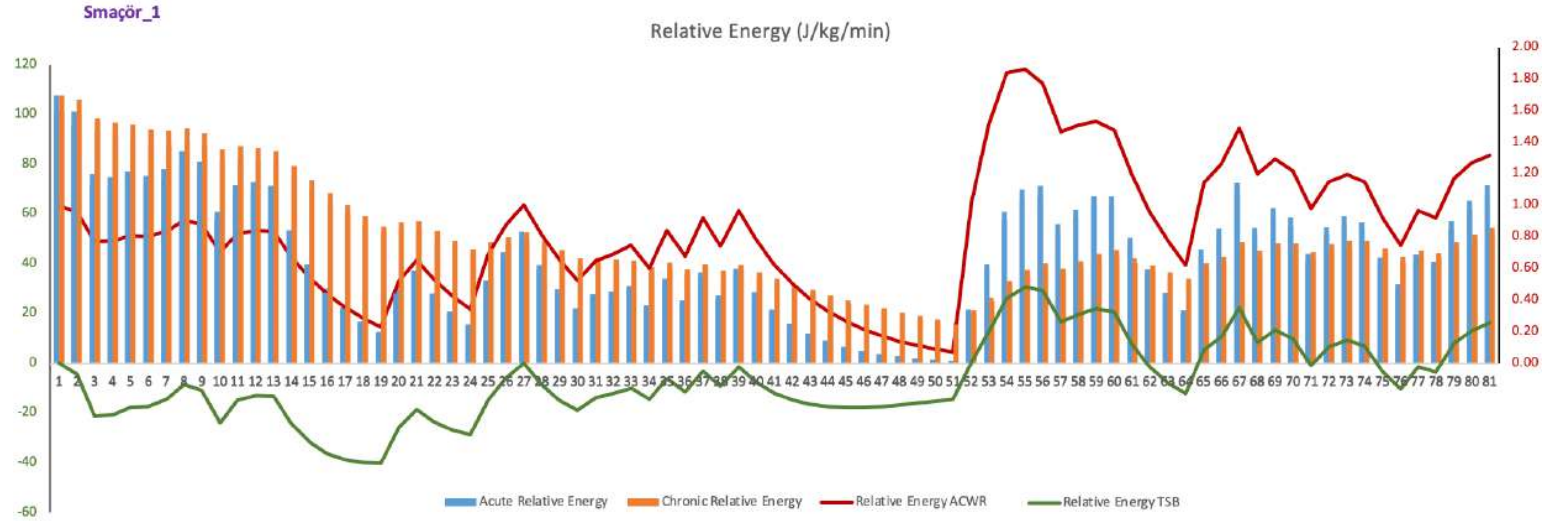


## Voleybol External Yük: Milli Takım 81 günlük yüklenme, ACWR & TSB

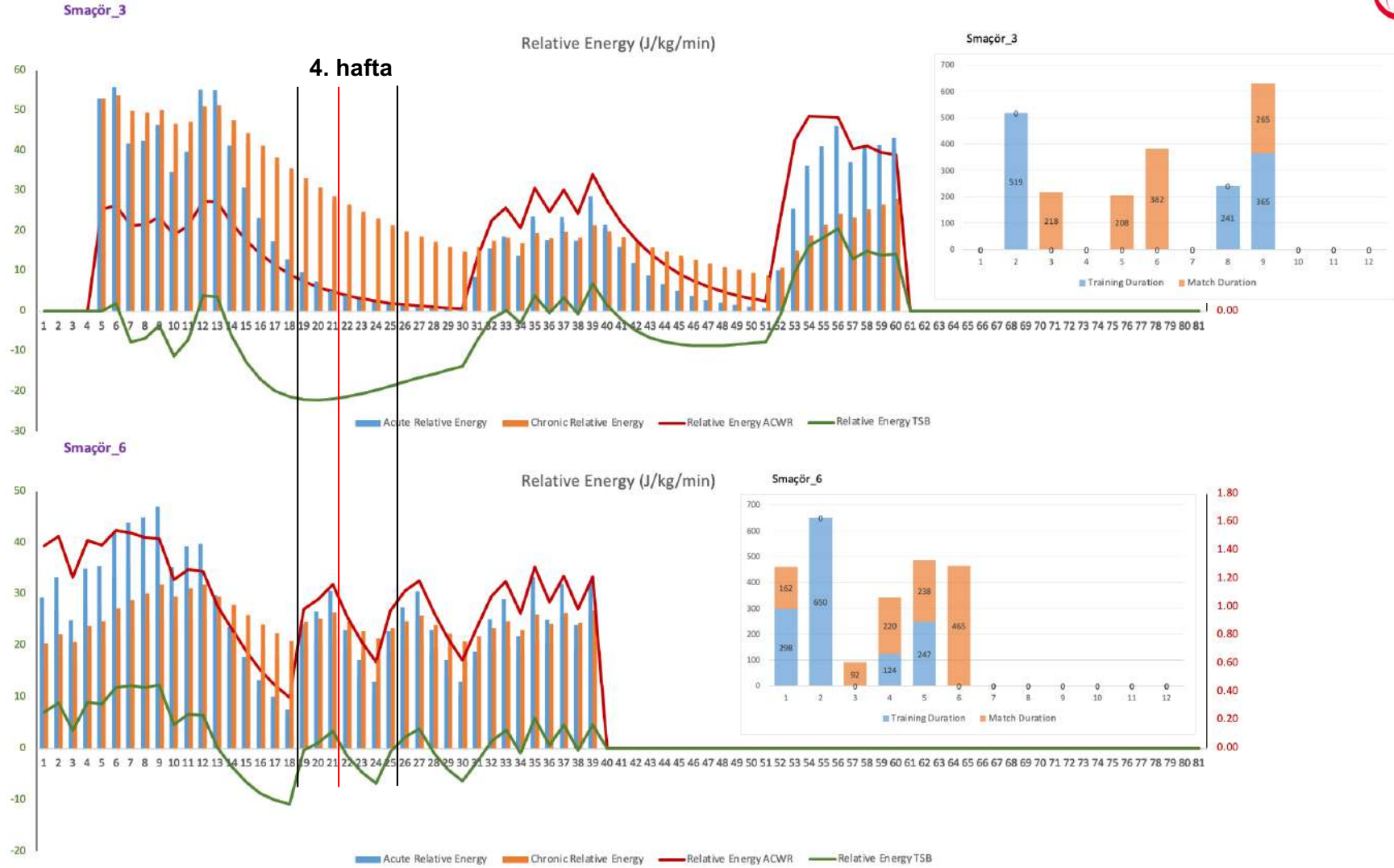




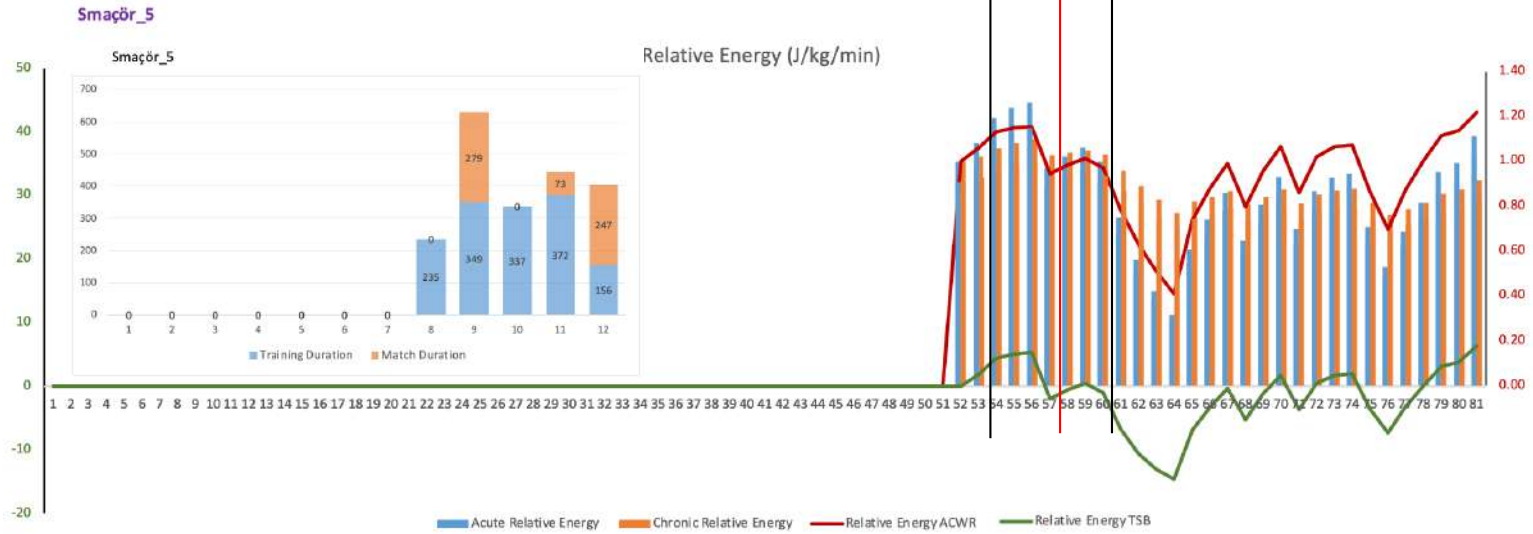
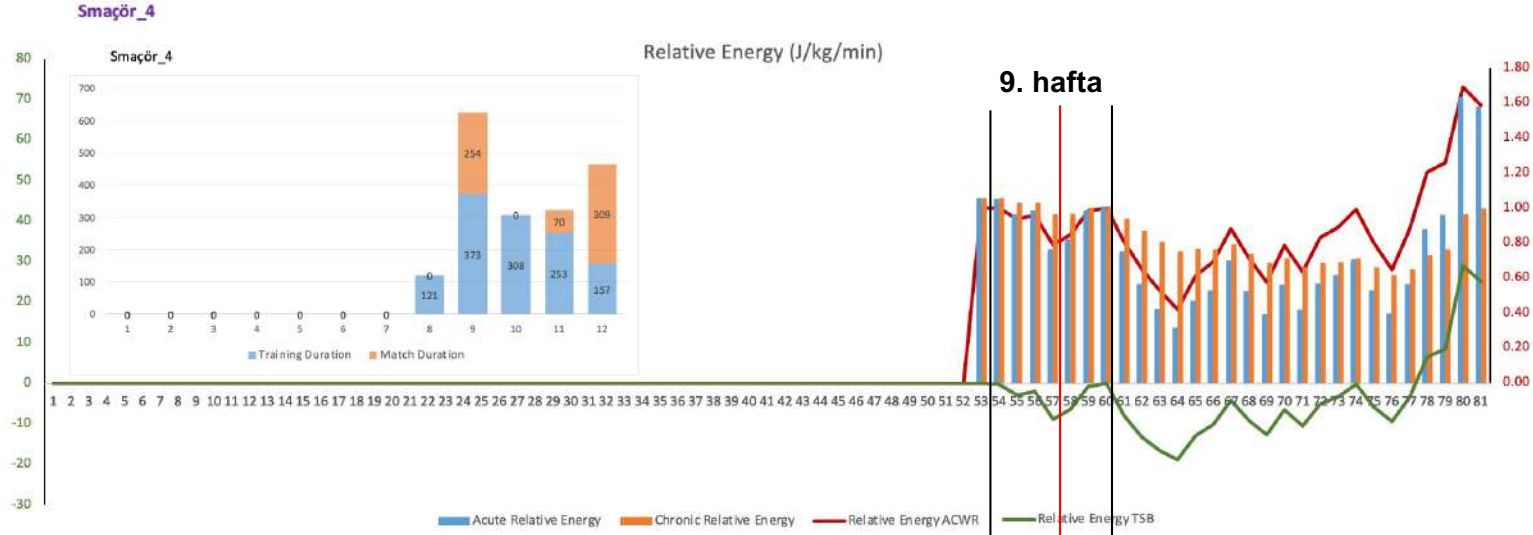
## Voleybol External Yük: Milli Takım 81 günlük yüklenme, ACWR & TSB



## Voleybol External Yük: Milli Takım 81 günlük yüklenme, ACWR & TSB



## Voleybol External Yük: Milli Takım 81 günlük yüklenme, ACWR & TSB

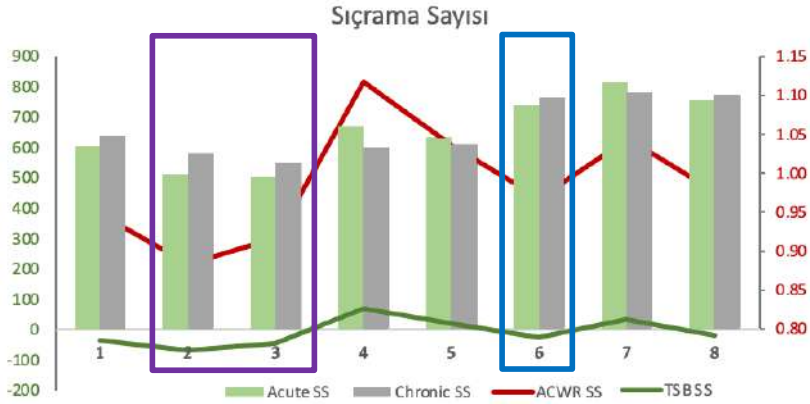


## Voleybol Haftalık ACWR<sub>EWMA</sub> : Kulüp 8 haftalık yüklenme, ACWR & TSB

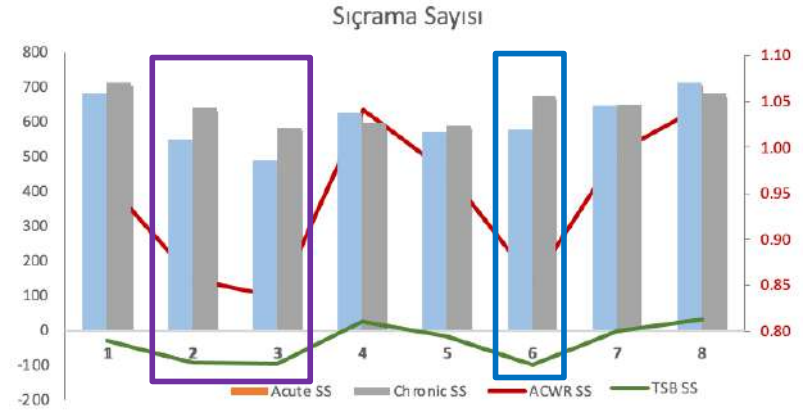


Pasör Çaprazı

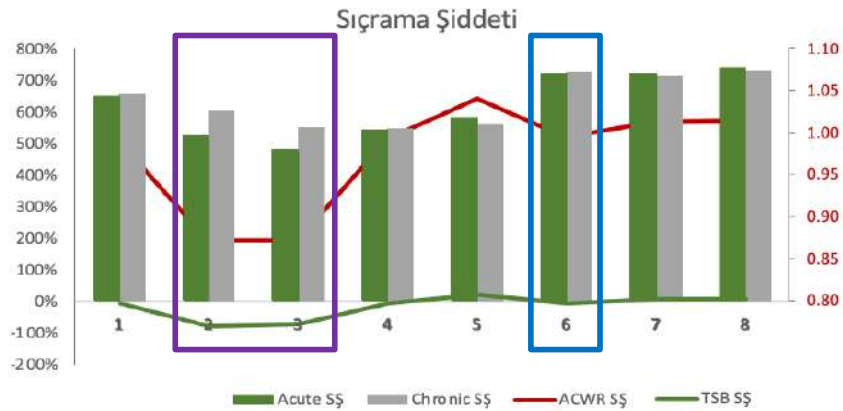
Hafta	Antrenman	Maç
1	5	1
2	3	2
3	3	2
4	5	1
5	6	1
6	8	0
7	7	1
8	7	1



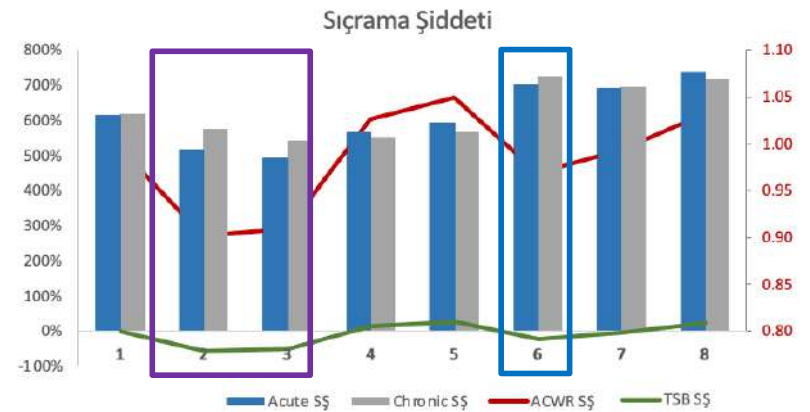
Smaçör



Pasör Çaprazı



Smaçör

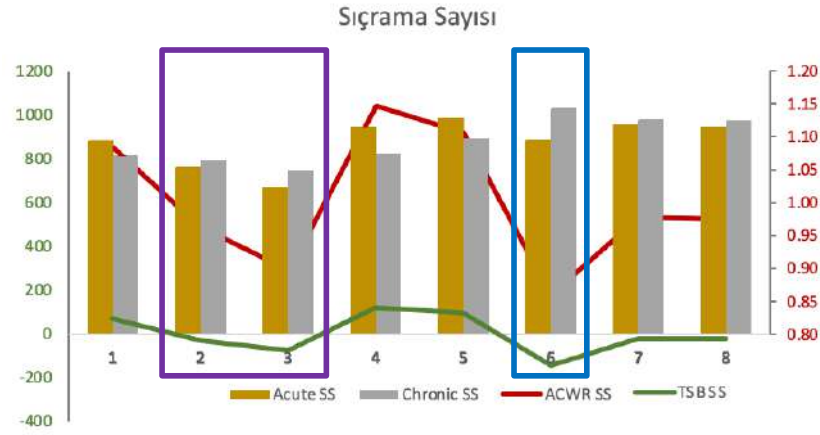


## Voleybol Haftalık ACWR<sub>EWMA</sub> : Kulüp 8 haftalık yüklenme, ACWR & TSB

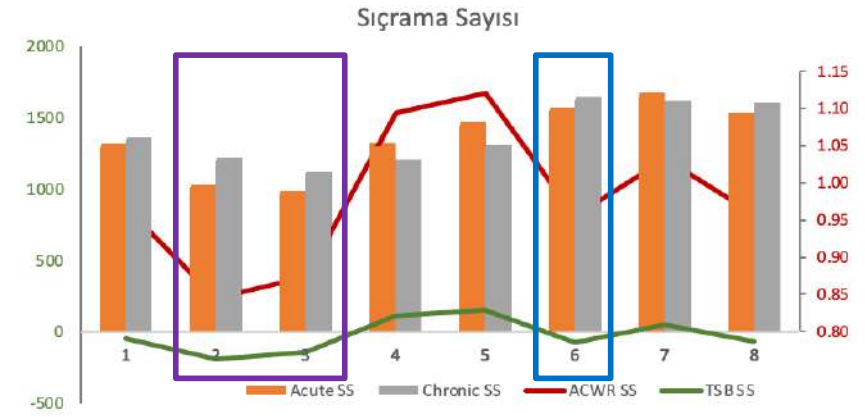


Hafta	Antrenman	Maç
1	5	1
2	3	2
3	3	2
4	5	1
5	6	1
6	8	0
7	7	1
8	7	1

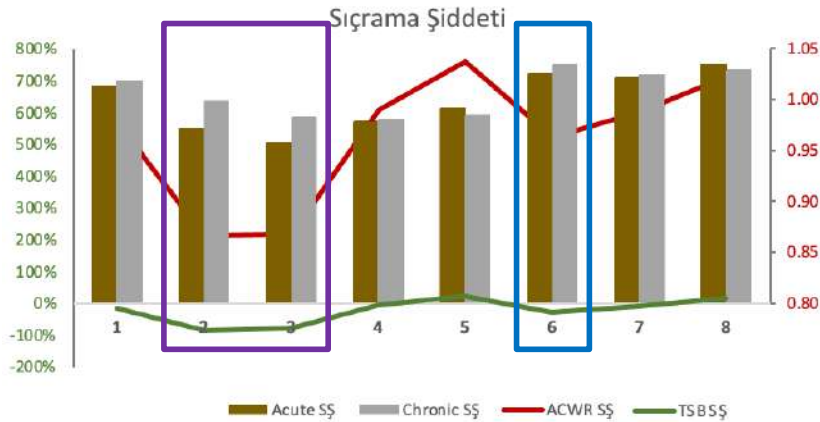
Orta



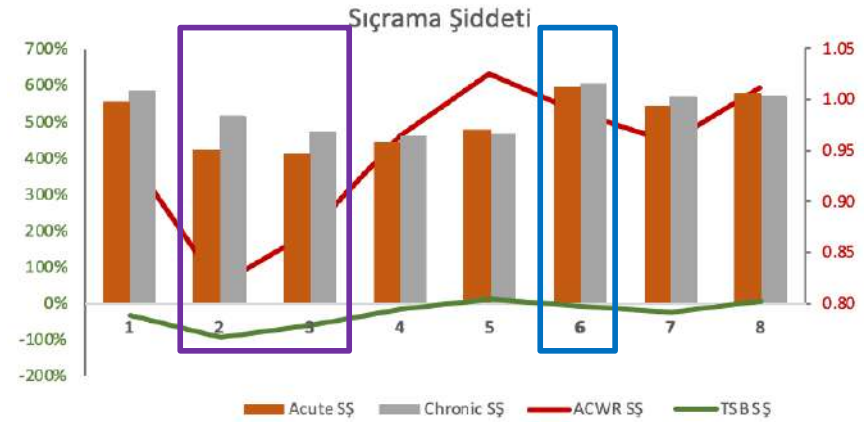
Pasör



Orta



Pasör

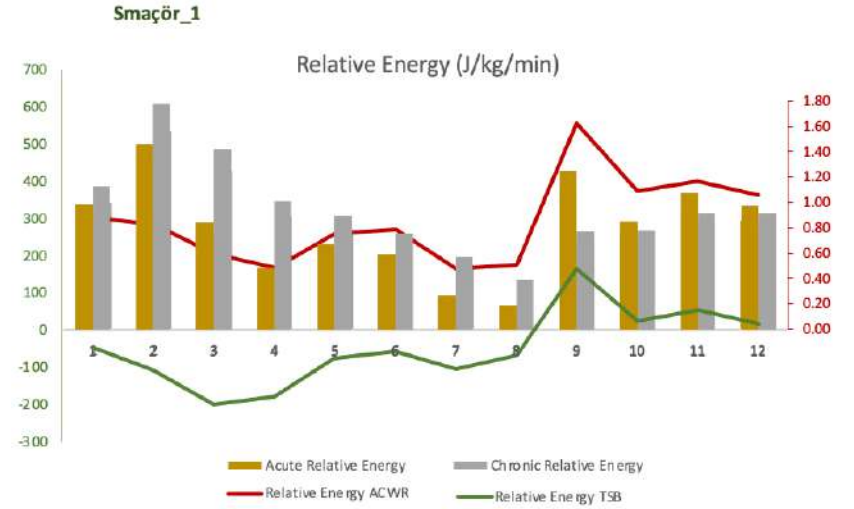
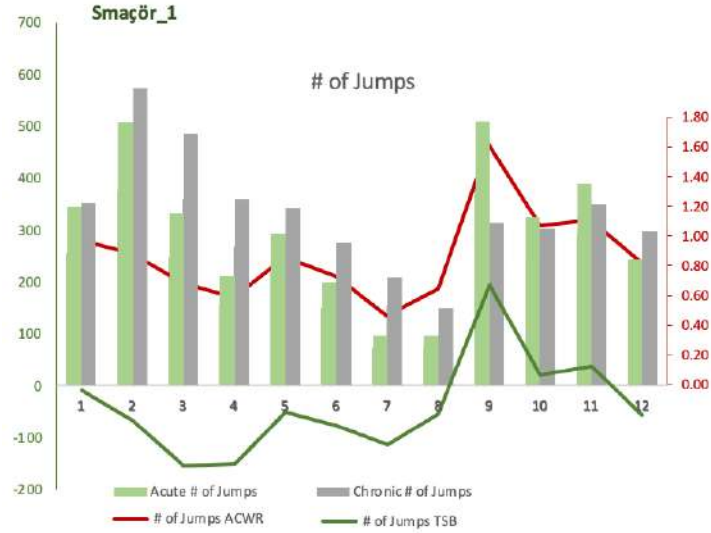


## Voleybol External Yük: Milli Takım 12 haftalık yüklenme, ACWR & TSB



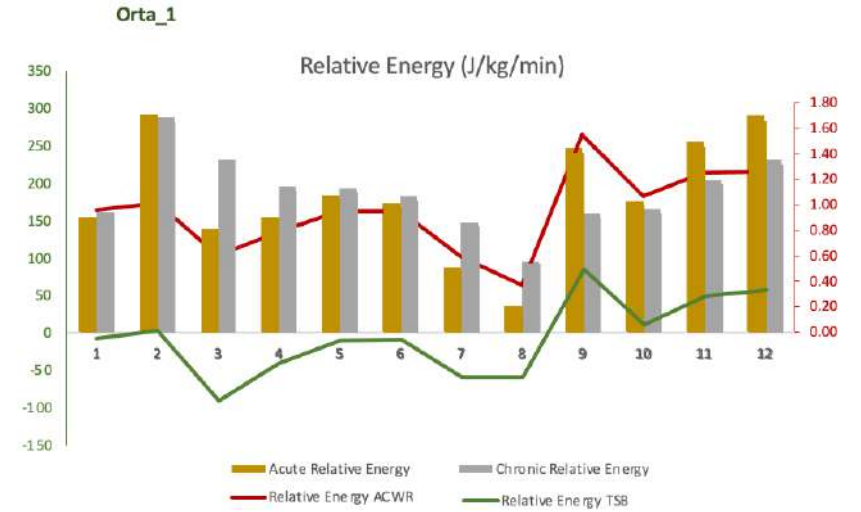
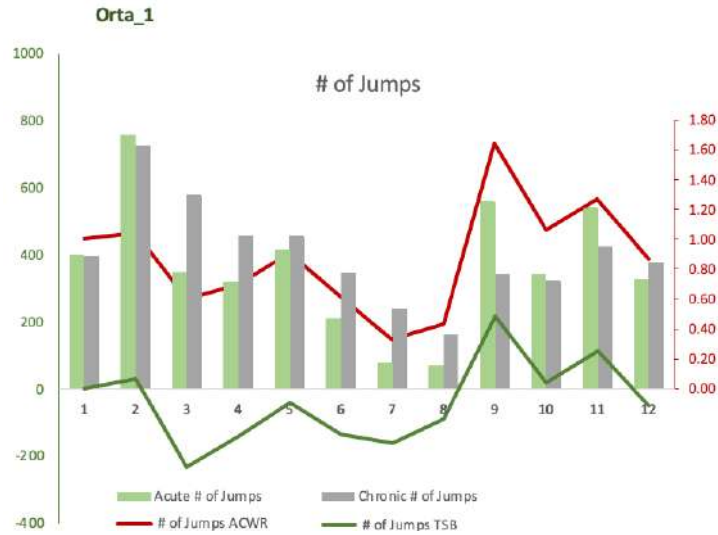
Smaçör\_1

Week	Training	Match	Training Duration	Match Duration
1	2	1	286	160
2	6	0	648	0
3	0	2	0	259
4	1	2	121	230
5	2	2	240	201
6	0	4	0	427
7	0	0	0	0
8	2	0	246	0
9	4	3	376	340
10	3	0	335	0
11	4	1	384	77
12	2	3	155	232



Orta\_1

Week	Training	Match	Training Duration	Match Duration
1	2	1	244	130
2	6	0	616	0
3	0	2	0	104
4	1	3	113	294
5	2	2	203	164
6	0	4	0	389
7	0	0	0	0
8	2	0	234	0
9	4	3	361	250
10	3	0	311	0
11	4	1	341	80
12	2	3	149	261

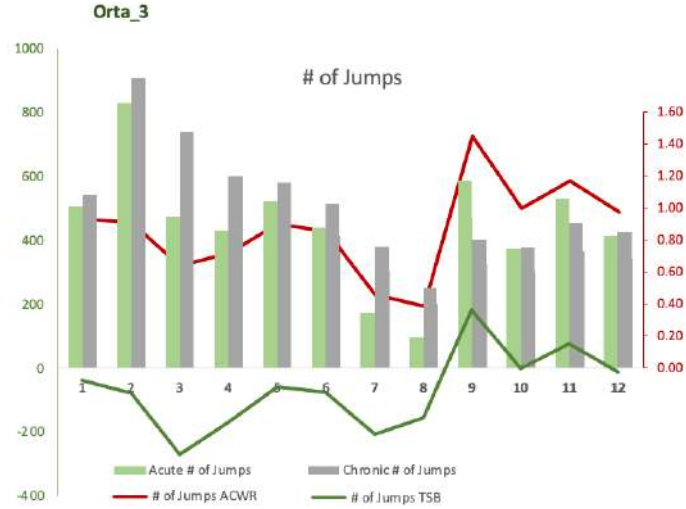


## Voleybol External Yük: Milli Takım 12 haftalık yüklenme, ACWR & TSB

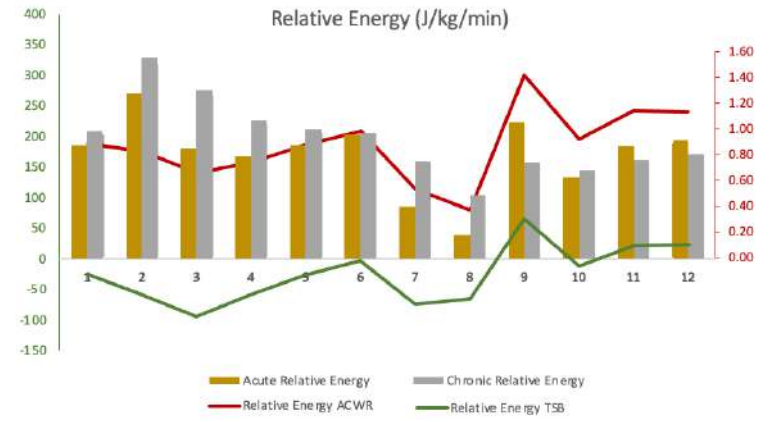


Orta\_3

Week	Training	Match	Training Duration	Match Duration
1	2	1	250	130
2	6	0	674	0
3	0	2	0	231
4	1	3	117	336
5	2	2	235	207
6	0	4	0	414
7	0	0	0	0
8	2	0	235	0
9	4	3	306	293
10	3	0	311	0
11	4	1	314	75
12	2	3	157	235

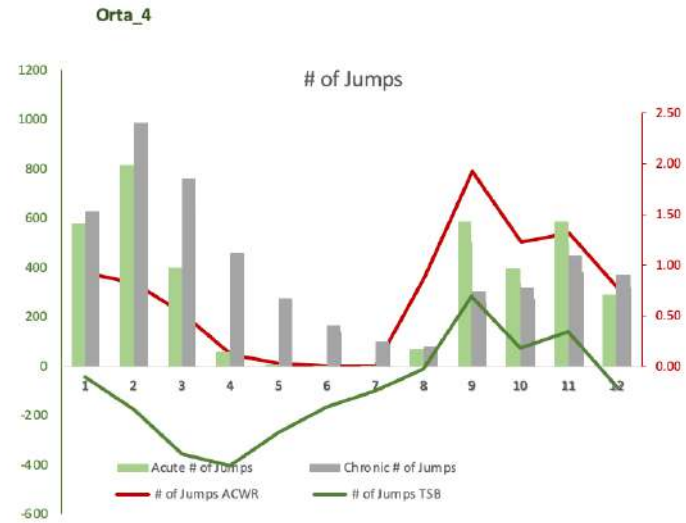


Orta\_3

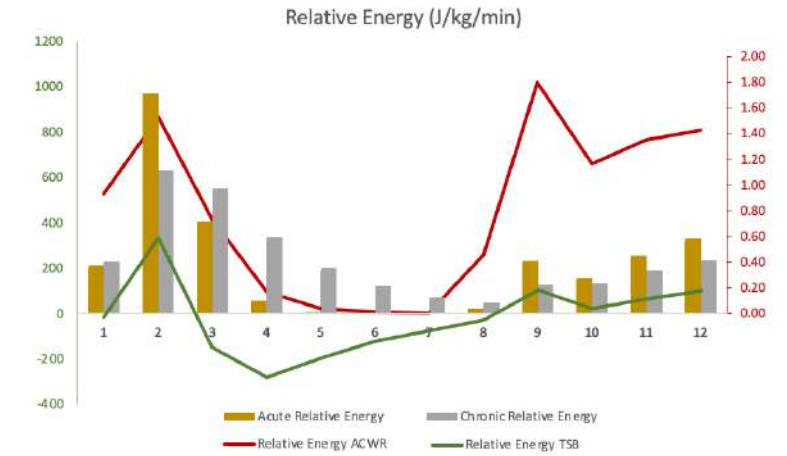


Orta\_4

Week	Training	Match	Training Duration	Match Duration
1	2	1	234	114
2	6	0	560	0
3	0	2	0	194
4	1	3	0	0
5	2	2	0	0
6	0	4	0	7
7	0	0	0	0
8	2	0	241	0
9	4	3	317	271
10	3	0	310	0
11	4	1	359	68
12	2	3	90	232



Orta\_4

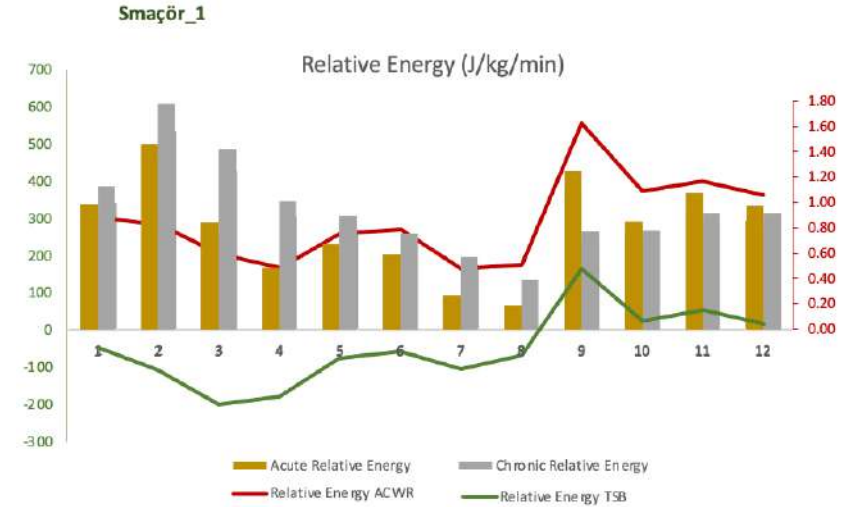
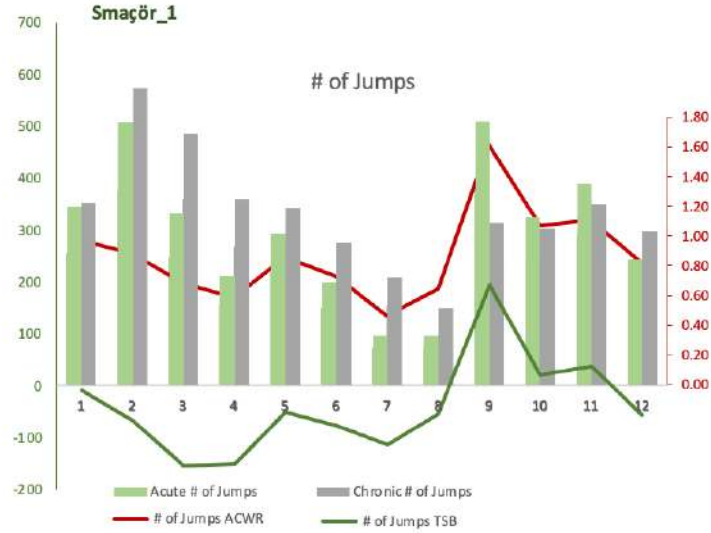


## Voleybol External Yük: Milli Takım 12 haftalık yüklenme, ACWR & TSB



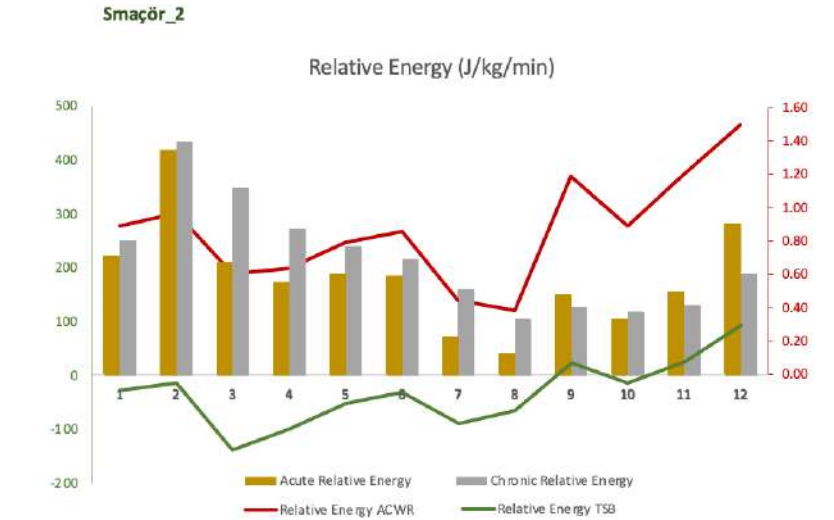
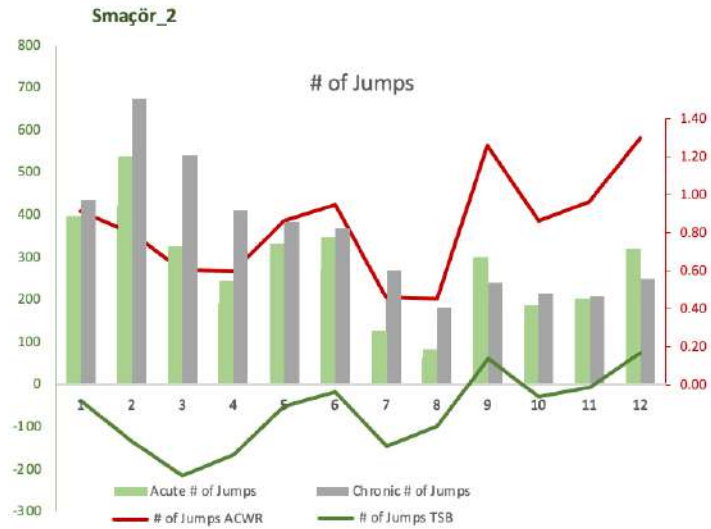
Smaçör\_1

Week	Training	Match	Training Duration	Match Duration
1	2	1	286	160
2	6	0	648	0
3	0	2	0	259
4	1	2	121	230
5	2	2	240	201
6	0	4	0	427
7	0	0	0	0
8	2	0	246	0
9	4	3	376	340
10	3	0	335	0
11	4	1	384	77
12	2	3	155	232



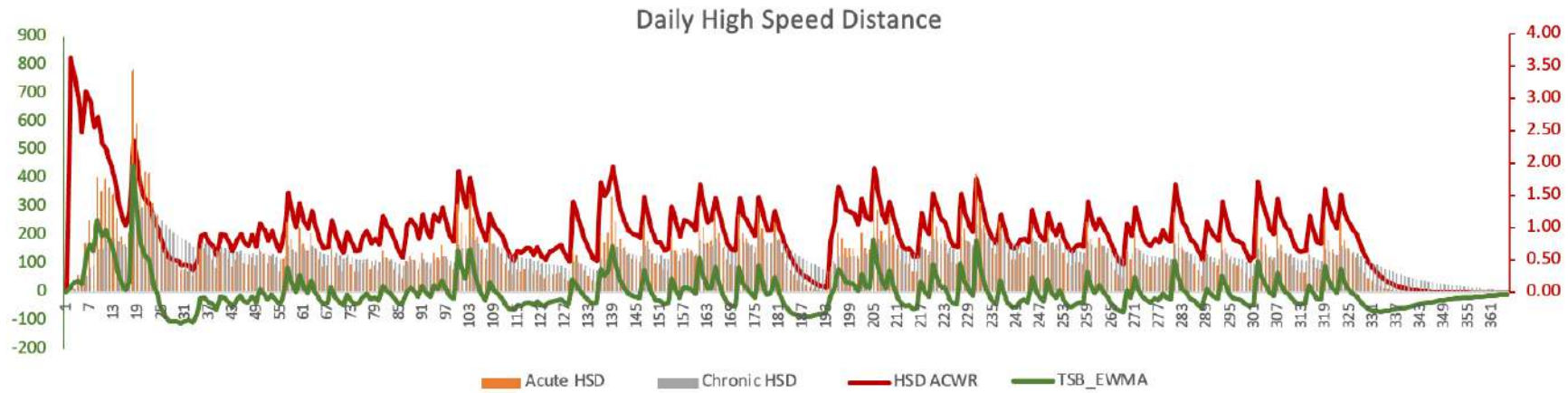
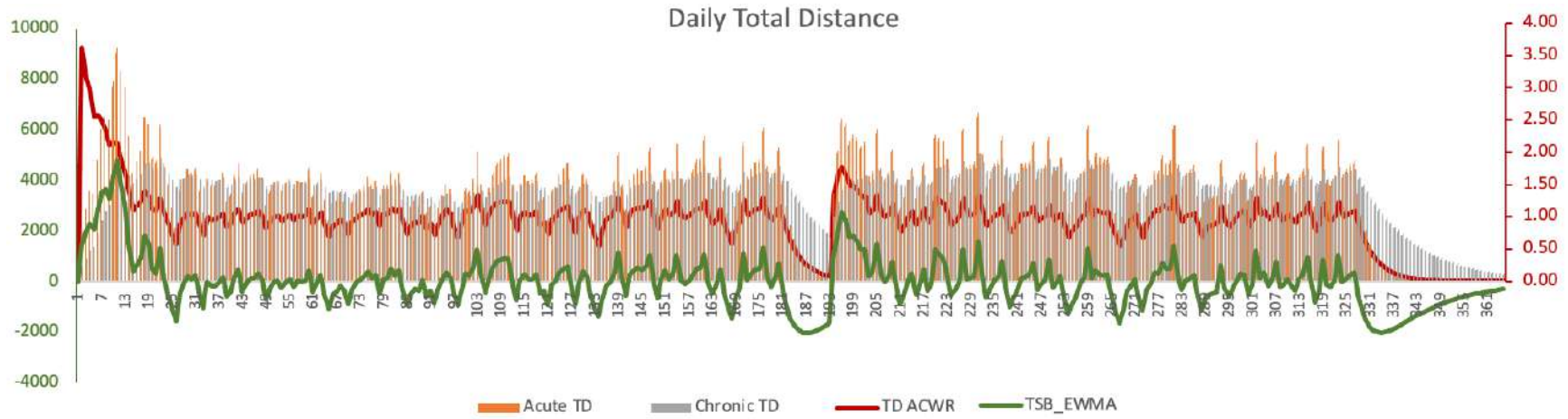
Smaçör\_2

Week	Training	Match	Training Duration	Match Duration
1	2	1	301	151
2	6	0	689	0
3	0	2	0	243
4	1	3	118	309
5	2	2	247	238
6	0	4	0	512
7	0	0	0	0
8	2	0	231	0
9	4	3	228	222
10	3	0	185	0
11	4	1	176	88
12	2	3	159	323

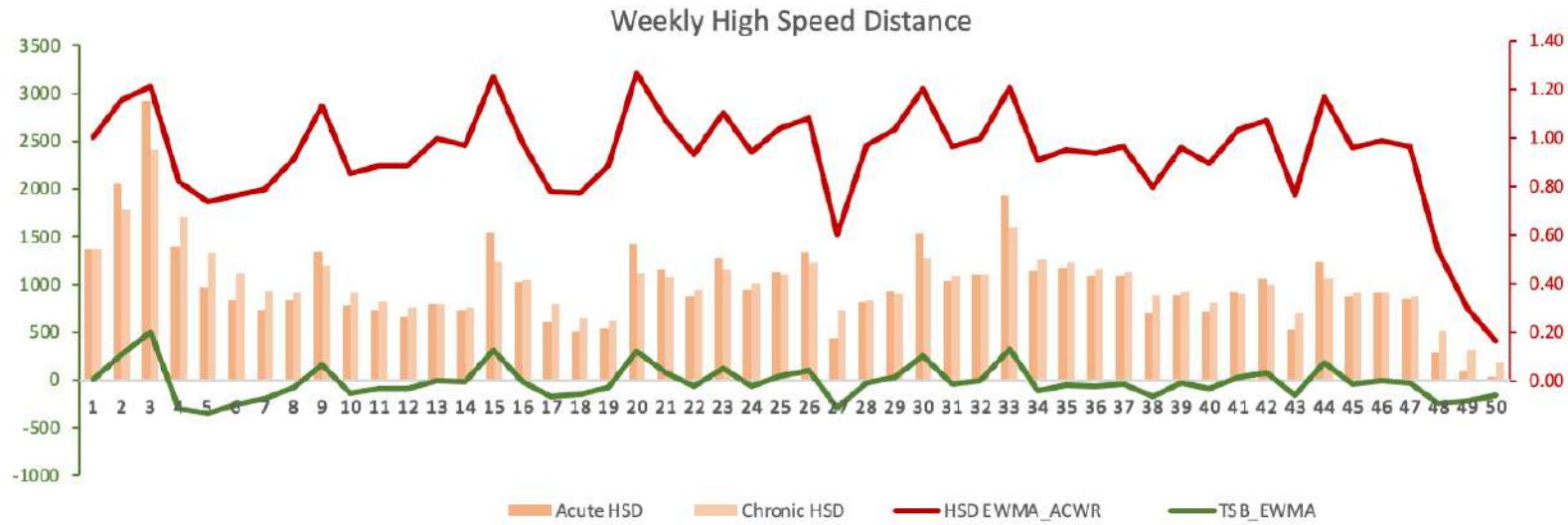
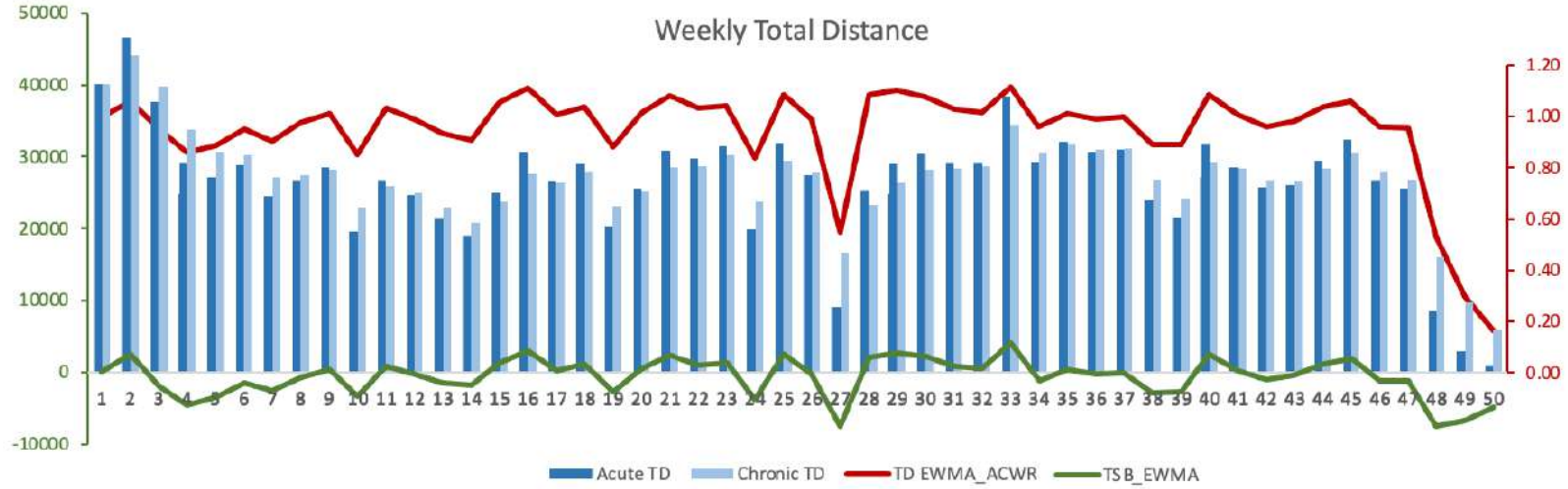




## Futbol External Yük: Günlük Yüklenme



## Futbol External Yük: Haftalık Lokomotor Yüklenme



## Antrenman Yükünün Takibi

### Objektif Yaklaşım: Teknoloji

- External
  - ❖ Lokomotor (Hız, Mesafe)
  - ❖ Mekanik (İvmelenme)
- Internal (Kalp atım hızı)
  - ❖ Banister TRIMP
  - ❖ Edward's TRIMP
  - ❖ Lucia's TRIMP
  - ❖ iTRIMP



### Subjektif Yaklaşım:

- Algılanan Zorluk Derecesi (RPE)
  - ❖ sRPE hesabı

### 1- ACWR:

- a-  $ACWR_{Rolling}$  Model
- b-  $ACWR_{EWMA}$  Model

### 2- Training Monotony & Strain

**Analyzing the seasonal changes and relationships in training load and wellness in elite volleyball players**

Filipe Manuel Clemente<sup>1,2\*</sup>, Ana Filipa Silva<sup>1,3</sup>, Cain Craig Truman Clark<sup>4</sup>, Daniele Conte<sup>5</sup>, João Ribeiro<sup>6,7</sup>, Bruno Mendes<sup>7</sup>, Ricardo Lima<sup>1,7</sup>

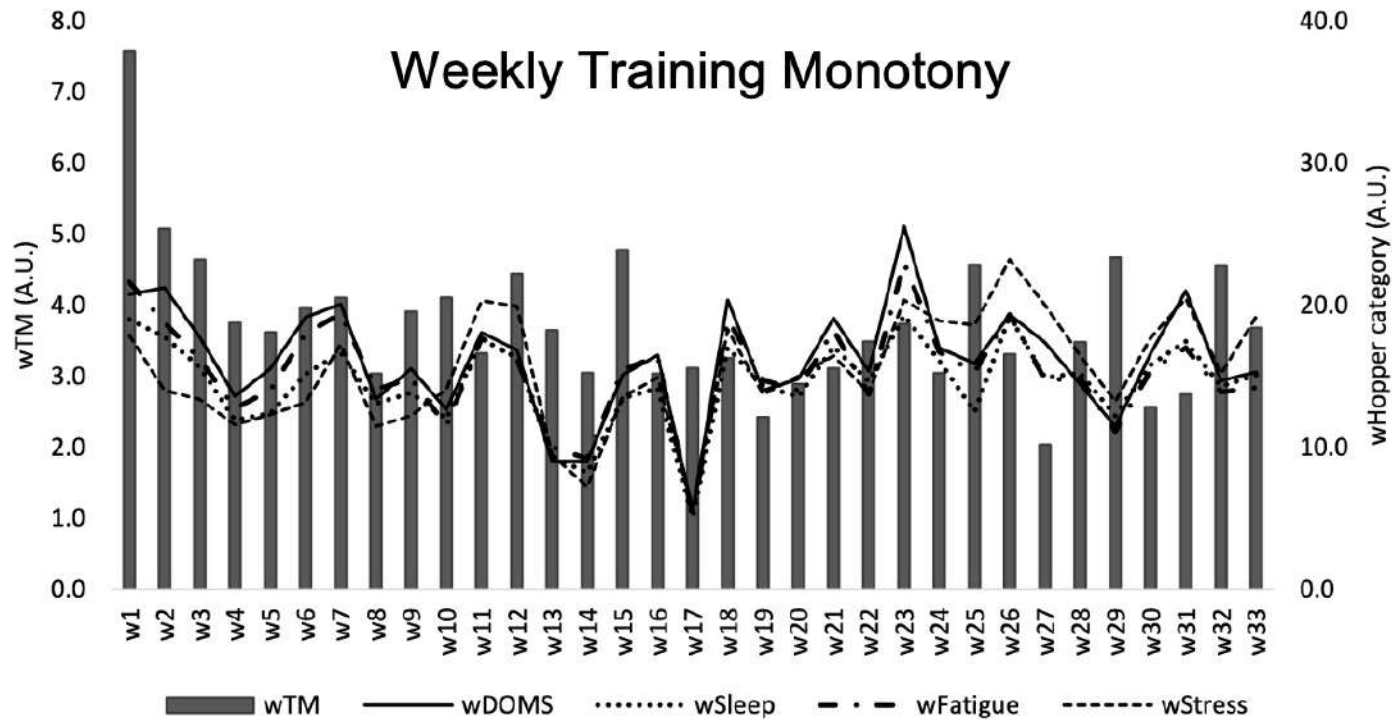


**Monotony:**

Haftalık Ortalama / Haftalık Standart Sapma

**Strain:**

Haftalık Monotony \* Haftalık Yük



wACWL: weekly acute:chroni work load;  
wDOMS: weekly muscle soreness;  
wSleep: weekly sleep;  
wFatigue: weekly fatigue;  
wStress: weekly stress;  
wTM: weekly training monotony;

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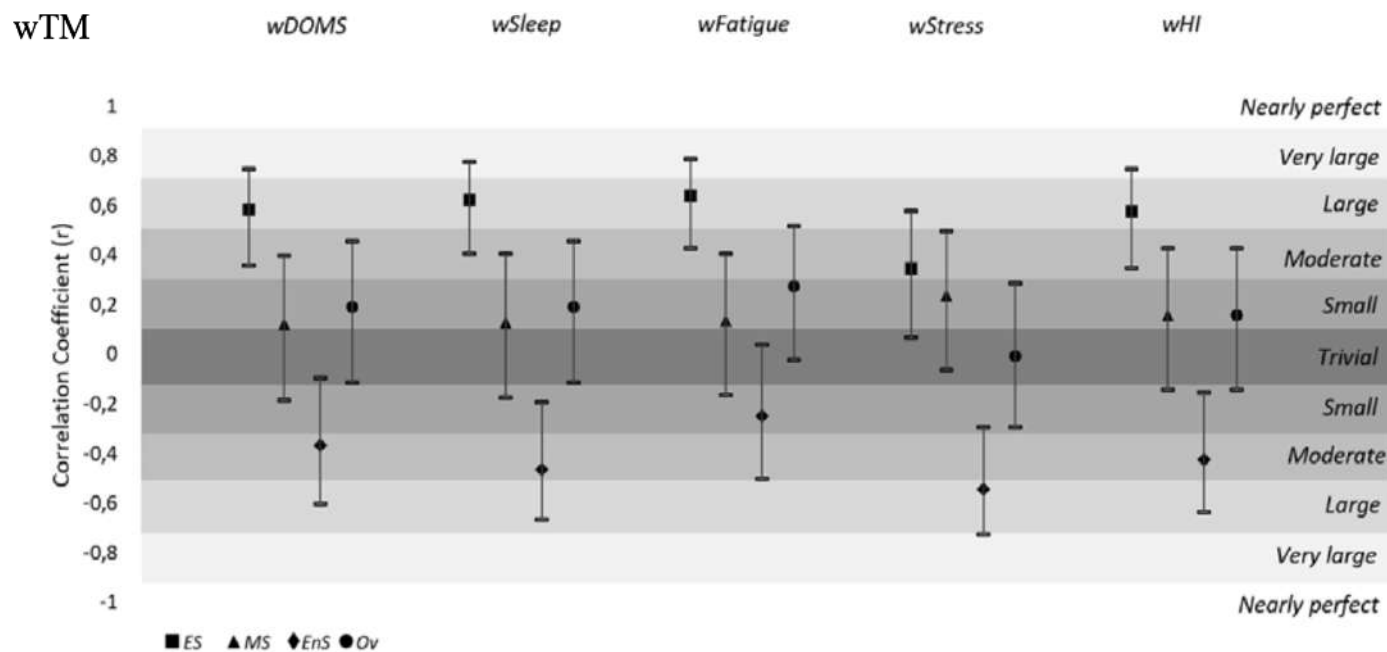


**Monotony:**

Haftalık Ortalama / Haftalık Standart Sapma

**Strain:**

Haftalık Monotony \* Haftalık Yük



wACWL: weekly acute:chronic work load;  
wDOMS: weekly muscle soreness;  
wSleep: weekly sleep;  
wFatigue: weekly fatigue;  
wStress: weekly stress;  
wTM: weekly training monotony;  
wHI: weekly hoop index

**Figure 4.** Correlations between (a) wACWL and (b) wTM and the well-being categories during the early season (ES), mid-season (MS), ending season (EnS) and overall (Ov).

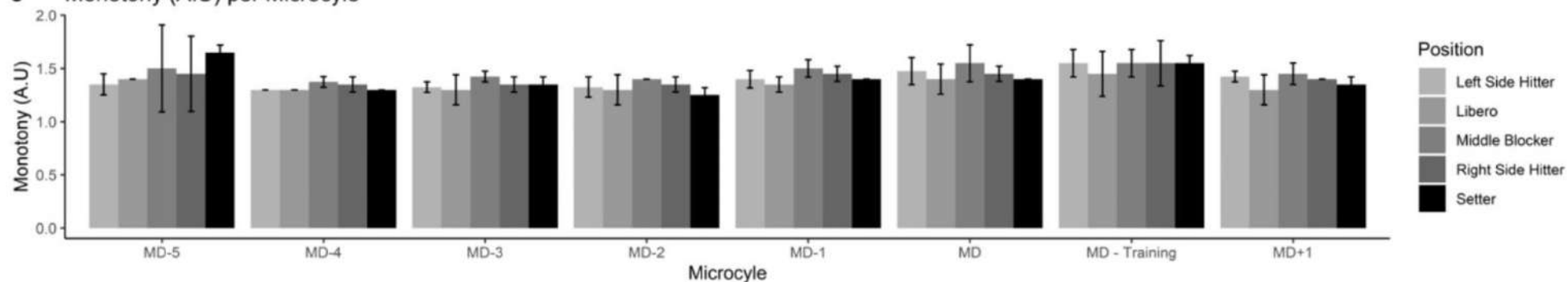
## Monotony & Strain

# Within-week differences in external training load demands in elite volleyball players

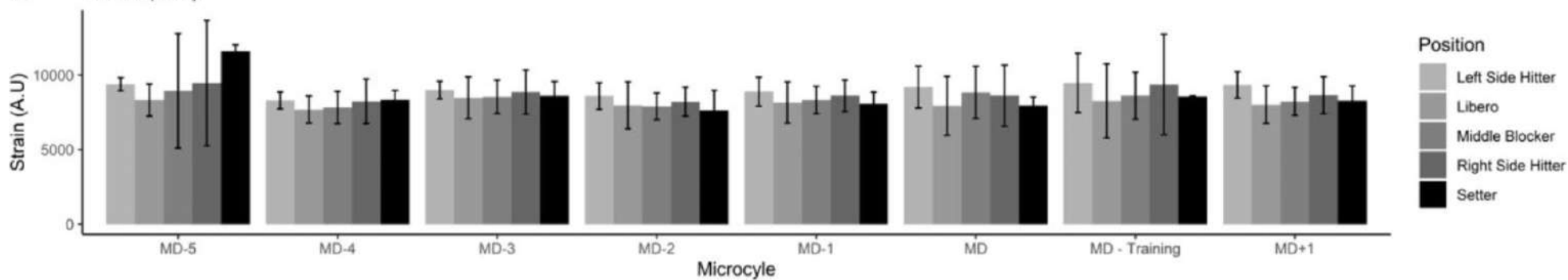


Zeki Akyildiz<sup>1</sup>, Henrique de Oliveira Castro<sup>2</sup>, Erhan Çene<sup>3</sup>, Lorenzo Laporta<sup>4</sup>, Coskun Parim<sup>3</sup>, Emre Altundag<sup>1</sup>, Cengiz Akarçesme<sup>1</sup>, Giovanni Guidetti<sup>5</sup>, Giovanni Miale<sup>6</sup>, Ana Filipa Silva<sup>6,7</sup>, Hadi Nobari<sup>8,9,10\*</sup> and Filipe Manuel Clemente<sup>7,11</sup>

**J** Monotony (A.U) per Microcycle



**K** Strain (A.U)

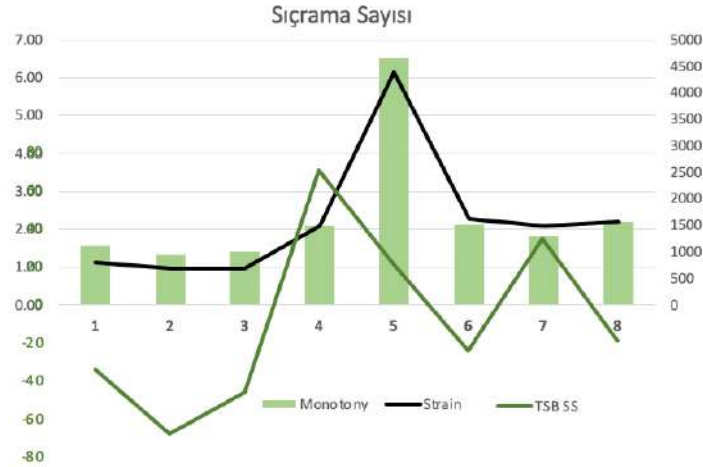


## Monotony & Strain: Voleybol kulübü 56 gün / 8 haftalık yüklenme



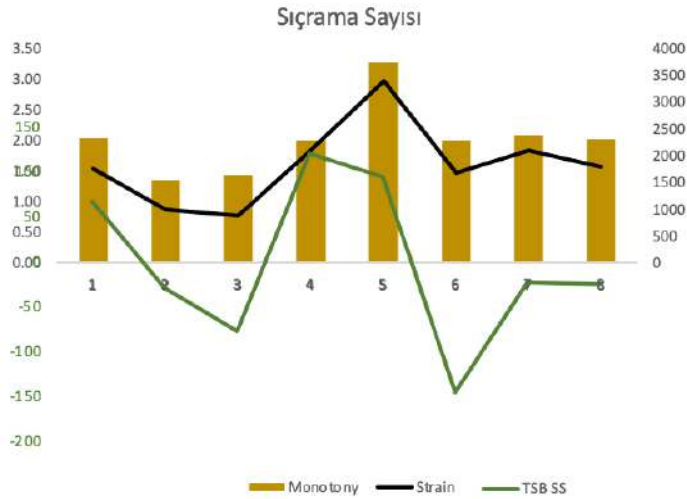
### Pasör Çaprazı

Hafta	Antrenman	Maç
1	5	1
2	3	2
3	3	2
4	5	1
5	6	1
6	8	0
7	7	1
8	7	1



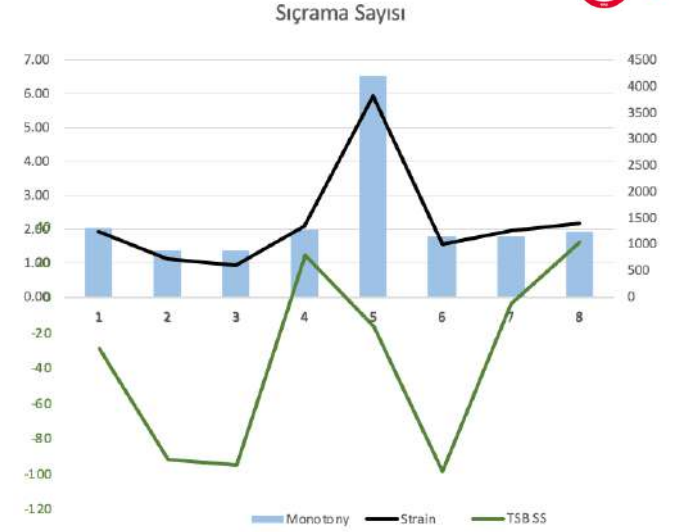
### Orta

Hafta	Antrenman	Maç
1	5	1
2	3	2
3	3	2
4	5	1
5	6	1
6	8	0
7	7	1
8	7	1



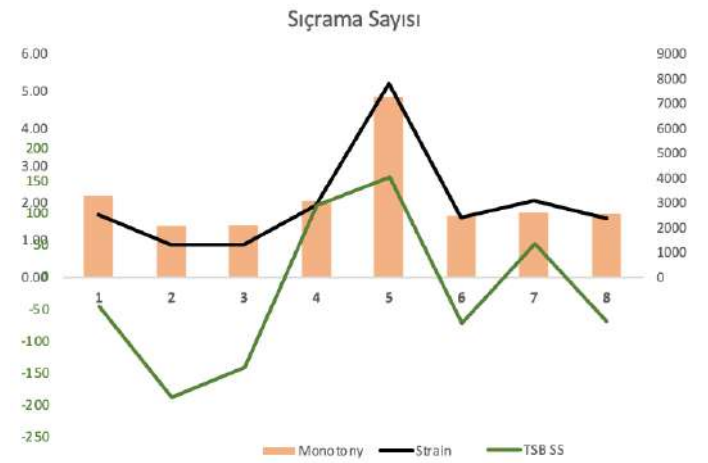
### Smaçör

Hafta	Antrenman	Maç
1	5	1
2	3	2
3	3	2
4	5	1
5	6	1
6	8	0
7	7	1
8	7	1



### Pasör

Hafta	Antrenman	Maç
1	5	1
2	3	2
3	3	2
4	5	1
5	6	1
6	8	0
7	7	1
8	7	1

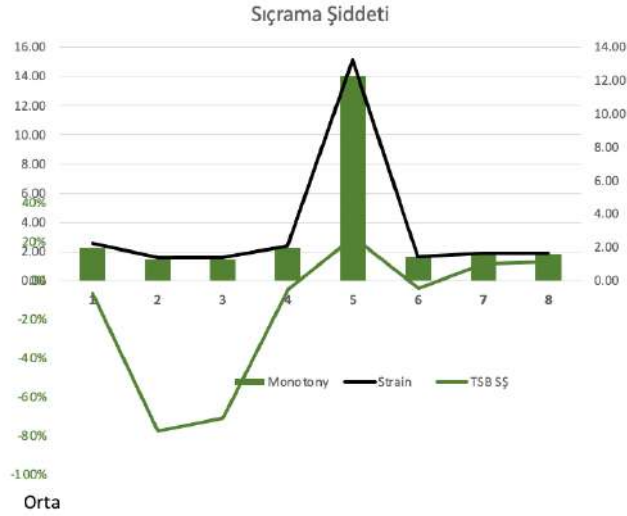


## Monotony & Strain: Voleybol kulübü 56 gün / 8 haftalık yüklenme



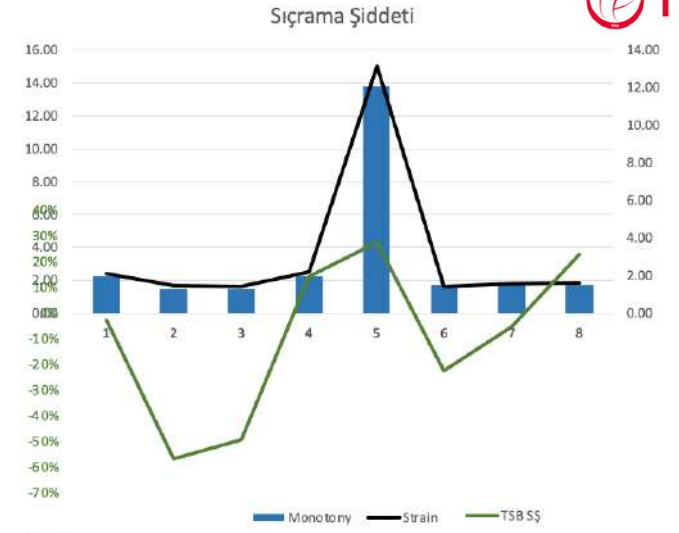
Pasör Çaprazı		
Hafta	Antrenman	Maç
1	5	1
2	3	2
3	3	2
4	5	1
5	6	1
6	8	0
7	7	1
8	7	1

Pasör Çaprazı

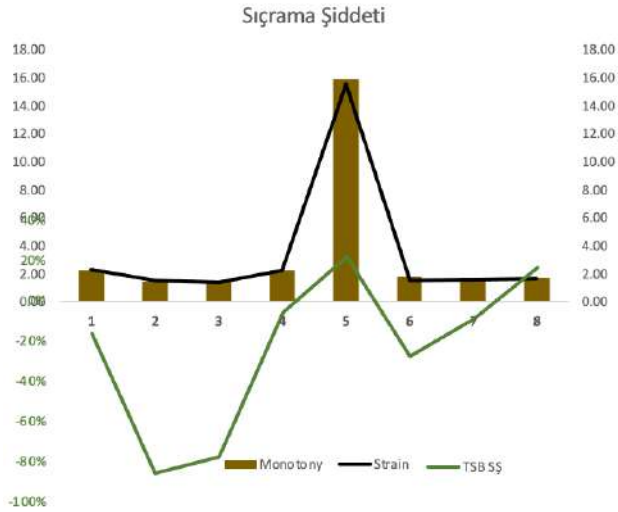


Smaçör		
Hafta	Antrenman	Maç
1	5	1
2	3	2
3	3	2
4	5	1
5	6	1
6	8	0
7	7	1
8	7	1

Smaçör

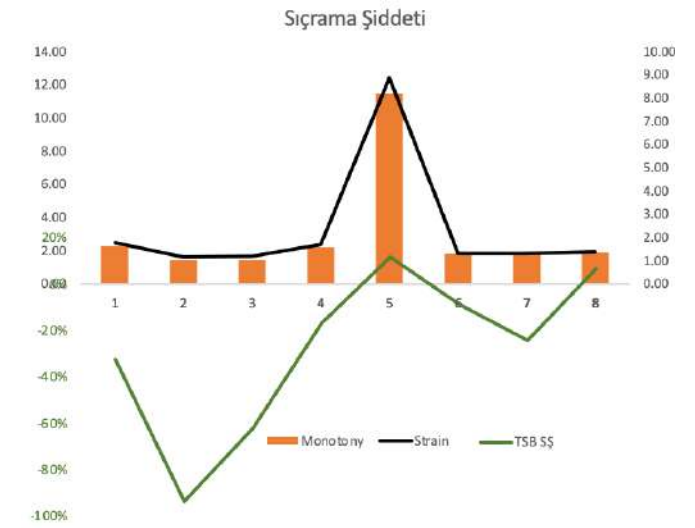


Orta		
Hafta	Antrenman	Maç
1	5	1
2	3	2
3	3	2
4	5	1
5	6	1
6	8	0
7	7	1
8	7	1



Pasör		
Hafta	Antrenman	Maç
1	5	1
2	3	2
3	3	2
4	5	1
5	6	1
6	8	0
7	7	1
8	7	1

Pasör



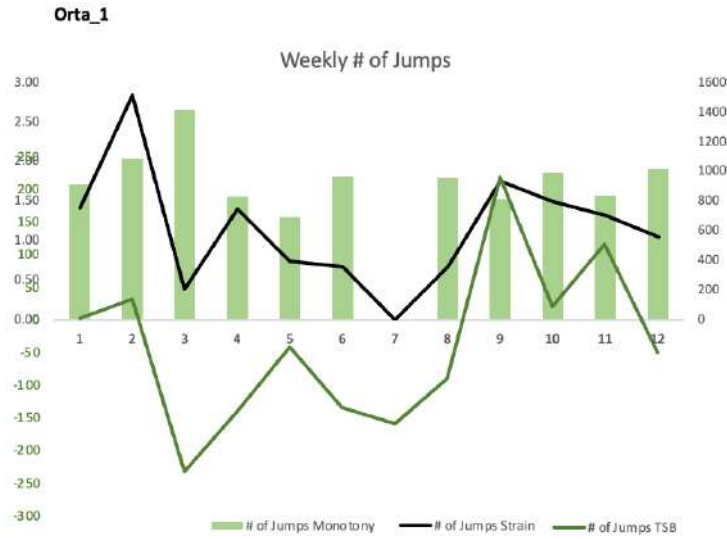


## Monotony & Strain: Milli Takım 81 gün / 12 haftalık yüklenme



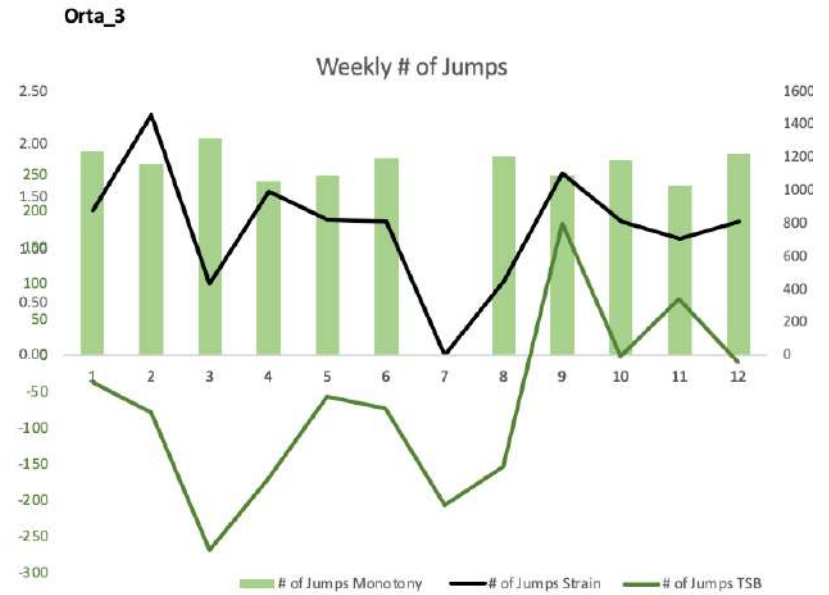
Orta\_1

Week	Training	Match	Training Duration	Match Duration
1	2	1	244	130
2	6	0	616	0
3	0	2	0	104
4	1	3	113	294
5	2	2	203	164
6	0	4	0	389
7	0	0	0	0
8	2	0	234	0
9	4	3	361	250
10	3	0	311	0
11	4	1	341	80
12	2	3	149	261



Orta\_3

Week	Training	Match	Training Duration	Match Duration
1	2	1	250	130
2	6	0	674	0
3	0	2	0	231
4	1	3	117	336
5	2	2	235	207
6	0	4	0	414
7	0	0	0	0
8	2	0	235	0
9	4	3	306	293
10	3	0	311	0
11	4	1	314	75
12	2	3	157	235

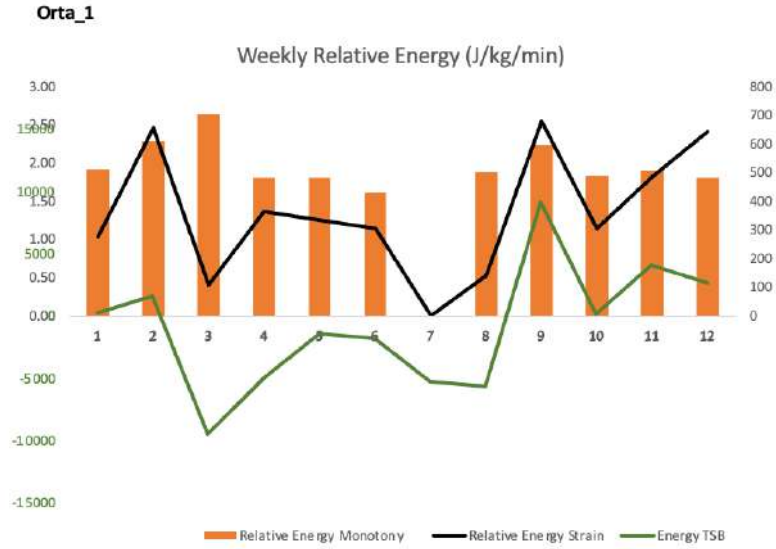


## Monotony & Strain: Milli Takım 81 gün / 12 haftalık yüklenme



Orta\_1

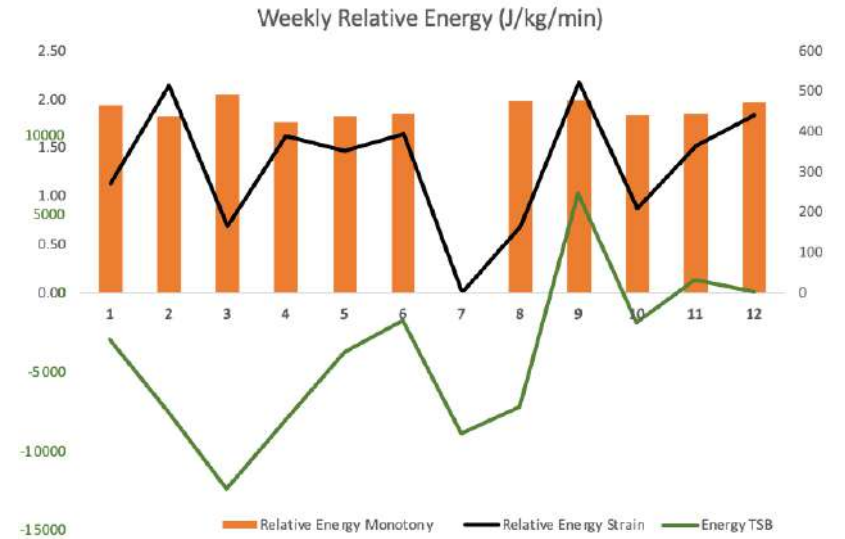
Week	Training	Match	Training Duration	Match Duration
1	2	1	244	130
2	6	0	616	0
3	0	2	0	104
4	1	3	113	294
5	2	2	203	164
6	0	4	0	389
7	0	0	0	0
8	2	0	234	0
9	4	3	361	250
10	3	0	311	0
11	4	1	341	80
12	2	3	149	261



Orta\_3

Week	Training	Match	Training Duration	Match Duration
1	2	1	250	130
2	6	0	674	0
3	0	2	0	231
4	1	3	117	336
5	2	2	235	207
6	0	4	0	414
7	0	0	0	0
8	2	0	235	0
9	4	3	306	293
10	3	0	311	0
11	4	1	314	75
12	2	3	157	235

Orta\_3





# Türkiye Voleybol Federasyonu

## 5. Kademe Antrenör Eğitimi

### **Antrenman Yüğü Takibi ve Antrenmanın Planlaması**

**Doç.Dr. Alper Aşçı**

Haliç Üniversitesi Beden Eğitimi ve Spor Yüksekokulu