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The Recovery of the Effort Capacity during Training Camps

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Abstract

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This research intends to design a pattern for the recovery of exercise capacity in centralized training sessions. Recovery is a complex process aimed at restoring and overcoming the initial values of homeostasis, pursued in all planning structures, starting from the training lesson (breaks between exercise sessions), continuing with post effort recovery, stage and weekly recovery, and even post-Olympic cycle recovery. Recovery after effort is an increasingly significant component that conditions the athletic performance, being considered a performance reserve. The research is one of practical nature and was conducted over a period of one year. The subjects participating in the research are CSO Pantelimon rugby players, who are also in the National Division of Rugby. The findings of the research resulted from weight control and heart rate measurement. The research methods used were scientific documentation, observation, experiment, measurement, statistical and mathematical method, graphical method. The research results were reflected by developing a recovery pattern for the exercise capacity, able to substantiate accumulations from the centralized training session. The research findings confirm the working hypothesis in the light of the results obtained.

Keywords: Recovery; training camp; scheme.

1. Introduction

This research intends to design a pattern for the recovery of the exercise capacity in centralized training sessions. Recovery is a complex process aimed at restoring and overcoming the initial values of homeostasis, pursued in all planning structures, starting from the training lesson (breaks between exercise sessions), continuing with weekly, stage, annual recovery, and even with post-Olympic cycle recovery. The recovery process totals the natural or artificial means used to accelerate the process of rebalancing local homeostasis (Drăgan, 1991). Other authors believe that recovery is addressed to the bodies damaged during exercise, representing the reconstitution of the morphofunctional integrity of the body affected by effort (Crețu & Bratu, 2003: 64). Recovery after exercise is an increasingly significant component that conditions the athletic performance, being considered a performance reserve (Badea, 2012). Therefore, optimal recovery enables the athlete to perform the next training session feeling rested, healthy and injury-free (Hausswirth & Mujika, 2013: 205).

2. Materials and methods

The research is one of practical nature and was conducted over a period of one year, during the centralized training sessions, corresponding to both macro cycles specific to the first and second half of the championship. The subjects participating in the research are CSO Pantelimon rugby players, i.e. 32 athletes including 17 forwards and 15 backs, who are also in the National Division of Rugby. The findings of the research were achieved by daily body weight measurement and heart rate measurement at the end of the micro cycles. The body weight was determined by weight measurement, with medical scales, every morning upon waking, after grooming (Drăgan, 2002). The heart rate was determined in the morning, upon waking, by using heart rate monitors: lying down, then after a minute of standing and subsequently after a standard effort consisting in 20 squats for up to 40 seconds (Drăgan, 2002). The research methods used are scientific documentation, observation, experiment, measurement, statistical and mathematical method, graphical method.

3. Results

In the light of the aforementioned elements, the scientific approach suggests a recovery of the exercise capacity comprising indicative suggestions for intra-effort recovery, a recommendation for post-training recovery, as well as other suggestions concerning daily recovery and micro cycle recovery.

In order to have an overall and adequate perception of the research results, it is necessary to show the related planning and the framework program of the activities. The centralized training session was conducted during two weeks and was structured on four micro cycles consisting in seven straining sessions based on a 3-3-1 scheme, similar in dosage, as shown in the table and graph below.

Table 1. Micro cycles related to one-week centralized training session

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
MAE1+ FM1	MAE2+FM2		MAE1+ FM3	MAE2+FM4		
Tth (indv.+comp.)	Tth (indv.+col.)	Commando	Tth (indv.+comp.)	Tth (indv.+col.)	Commando	Free time
AE3	VC-LC+indv.	cold - hot recovery	AE6	VC-LC+indv.	cold - hot recovery	
Stretching	Stretching	Video	Stretching	Stretching	Video	

Legend: MAE-sit-ups and balance, FM-maximal strength, AE-aerobic, Tth-tactical and technical, VC-speed-agility, LC-lactic

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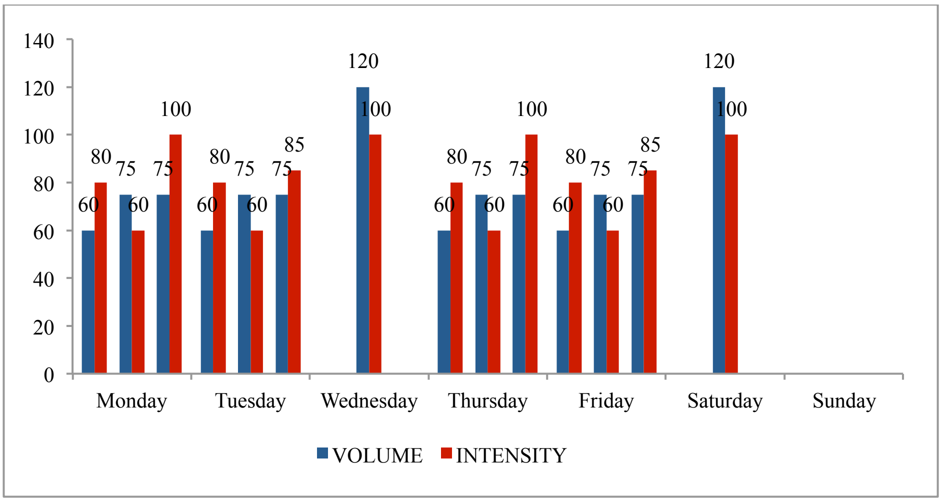

Graph 1. Dosage of effort within micro cycles

We present below the program of activities for a day with three training sessions, and for a day with just one training session.

Table 2. Framework program (3 training sessions / day)

06.45 Wake up		
	07.00 *weight measurement*	
09.00 breakfast		
	9.30 - 11.00 *active recreation*	
		11.30 / 13.00 field training
14.00 lunch		
	14.30 - 17.00 *active + passive recreation*	
		17.30 - 18.30 field training
	19.00 *stretching*	
19.45 dinner		
	20.15 - 22.30 *massage* / free time	
	22.30 – lights out, passive recreation	

Table 3. Framework program (1 training / day)

06.45 Wake up		
	08.00 *heart rate measurement*	
09.00 breakfast		
	9.30 - 10.30 *active recreation*	
		11.00 / 13.00 field training
14.00 lunch		
	14.30 - 16.30 *active + passive recreation*	
	17.00 - 18.30 *hot-cold recovery*	
19.00 video		
19.45 dinner		
	20.15 - 22.30 *massage* / free time	
	22.30 – lights out, passive recreation	

Once described the general picture of specific activities of the centralized training sessions, we can show the recommendations on guidance recovery schemes that will emphasize means of active recovery, the very essence of this research.

The recommendations on intra-effort recovery are concerning the content of the breaks between reps, sets, and training sequences. Thus, most experts support active recovery during these breaks, representing sub maximal motor structures made in order to maintain the performance level between training activities (Hausswirth & Mujika, 2013: 29). At the same time, it should be noted that in the case of maximum efforts lasting less than 6 seconds, passive recovery of a suitable duration is preferable, as it does not weaken performance (30"-120") (Dupont et al., 2004, quoted by Hausswirth & Mujika, 2013: 31). In this research, intra-effort correlates with the intensity and volume of the structures, and we used both passive and active recovery, which consisted in Fartlek, walking, breathing exercises and muscle relaxation. At the end of the training session, we applied the following active recovery scheme: 100m running 15%; 150m running 50% for predominantly anaerobic exercise, and 75% for predominantly aerobic exercise or mixed exercise; 100m running 25%; 150m running 50% for predominantly anaerobic exercise, and 75% for predominantly aerobic exercise or mixed exercise; 50m walking with muscle relaxation and breathing exercises; muscle stretching exercises, mild/ moderate intensity, 10" for each large muscle group, one repeat.

Throughout the recovery sequences, hydration was ensured with still mineral water, 500ml, ingested in small quantities. Also, after the training session and shower, the athletes performed a sequence of lower-body immersion in cold water with ice (below 5 degrees Celsius), 30"-60", 1-2 repetitions. This immersion is mainly aimed at reducing muscle and joint inflammatory processes (Hausswirth, 2010: 35).

Daily recovery includes passive and active recreation, according to the abovementioned framework programs, and the stretching sequence. This sequence was done on the days with three training sessions, according to the program described above, by progressive passive stretching, according to the following algorithm: 6 series (5"-10"-15"-20"-25"-30") for each muscle group concerned, alternatively, 6-8 exercises, sub maximal amplitude, with a partner. This type of stretching helps to reduce joint stiffness, favours muscle elasticity, soothes the psyche of the athlete (Hausswirth, 2010: 3) and prevents sports accidents. This algorithm resulted from the collaboration with INCS Bucharest, the director of the institution, Pierre de Hillerin. Daily recovery was complemented with hydration, nutrition, medication and rehabilitation massage, knowing that “a 5-minute massage can recover as a 20-minute passive break” (Rouges, quoted by Weineck, 1995).

The micro cycle recovery was completed with a hot-cold sequence, according to the framework program, consisting of: immersion in cold water (8-10 degrees Celsius) with the whole body, for 2-3 minutes, alternating with dry sauna, 10-12 minutes, in 3 series. The purpose of the recovery, due to hot-cold alternation, is to favour venous circulation with its beneficial effects. Note that the sequence begins and ends with cold water.

For the biological control of recovery, we measured the body weight and heart rate, according to the methodology described above. The results obtained are shown below.

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Table 4. The results of body weight in micro cycles 1 and 2 – the forwards

	Testing 1	Testing 2	Interpretation 1	Testing 3	Interpretation 2	Testing 4	Interpretation 3	Interpretation 1-4
	Kg	Kg	Kg	Kg	Kg	Kg	Kg	%
Subject 1	114.300	114.200	- 0.100	114.00	- 0.200	113.800	- 0.200	< 1
Subject 2	117.250	117.250	0	117.200	- 0.50	117.100	- 0.100	< 1
Subject 3	120.400	120.300	- 0.100	120.350	+ 0.050	120.250	- 0.100	< 1
Subject 4	115.00	115.050	+ 0.050	114.900	- 0.150	114.950	+ 0.050	< 1
Subject 5	118.650	118.350	- 0.300	118.200	- 0.150	118.100	- 0.100	< 1
Subject 6	112.450	112.300	- 0.150	112.200	- 0.100	112.000	- 0.200	< 1
Subject 7	108.850	108.800	- 0.050	108.100	*- 0.700*	107.950	- 0.150	< 1
Subject 8	110.500	110.450	- 0.050	110.300	- 0.150	109.900	- 0.400	< 1
Subject 9	105.350	105.150	- 0.200	105.200	+ 0.050	105.200	0	< 1
Subject 10	112. 900	112.900	0	112.700	- 0.200	112.600	- 0.100	< 1
Subject 11	103.200	103.100	- 0.100	103.050	- 0.050	102.800	- 0.250	< 1
Subject 12	107.150	107.200	+ 0.050	107.100	- 0.100	107.150	+ 0.050	< 1
Subject 13	99. 350	99.300	- 0.050	99.200	- 0.100	99.050	- 0.150	< 1
Subject 14	102.800	102.650	- 0.150	102.550	- 0.100	102.300	- 0.250	< 1
Subject 15	97.300	97.00	- 0.300	96.600	- 0.400	96.500	- 0.100	< 1
Subject 16	97. 150	97.100	- 0.050	97.00	- 0.100	97.100	+ 0.100	< 1
Subject 17	98.750	98.800	+ 0.050	98.500	- 0.300	98.400	- 0.100	< 1

Table 5. The results of body weight in micro cycles 1 and 2 – the backs

	Testing 1	Testing 2	Interpretation 1	Testing 3	Interpretation 2	Testing 4	Interpretation 3	Interpretation 1-4
	Kg	Kg	Kg	Kg		Kg	Kg	%
Subject 1	86.200	86.100	- 0.100	85.800	- 0.300	85.500	- 0.300	< 1
Subject 2	82.350	82.300	- 0.150	82.050	- 0.250	82.000	- 0.050	< 1
Subject 3	80.150	80.200	+ 0.050	80.000	- 0.200	80.100	+ 0.100	< 1
Subject 4	78.650	78.500	- 0.150	78.450	- 0.050	78.200	- 0.250	< 1
Subject 5	78.800	78.750	- 0.050	78.850	+ 0.100	78.700	- 0.150	< 1
Subject 6	94.450	94.300	- 0.150	94.150	- 0.150	93.800	- 0.350	< 1
Subject 7	80.650	80.600	- 0.050	80.400	- 0.200	80.250	- 0.150	< 1
Subject 8	84.250	84.350	+ 0.100	84.300	- 0.050	84.050	- 0.250	< 1
Subject 9	81.100	80.900	- 0.200	80.600	- 0.300	80.450	- 0.150	< 1
Subject 10	83.350	83.250	- 0.100	83.250	0	83.000	- 0.250	< 1
Subject 11	84.900	84.750	- 0.150	84.650	- 0.100	84.500	- 0.150	< 1
Subject 12	89.300	89.000	- 0.300	88.800	- 0.200	88.100	*- 0.700*	*< 1.5*
Subject 13	98.500	98.300	- 0.200	98.000	- 0.300	97.000	*- 1.000*	*< 1.6*
Subject 14	78.750	78.500	- 0.250	78.100	- 0.400	77.900	- 0.200	< 1
Subject 15	86.150	86.100	- 0.050	85.950	- 0.150	85.800	- 0.150	< 1

The results obtained in measuring the body weight in the case of the forward compartment show variations of up to 300g in the micro cycle 1, and up to 500g in the micro cycle 2. In the backs, we can see variations of up to 300g in the micro cycle 1 and up to 1000g in the micro cycle 2. These variations are primarily weight loss.

Table 6. The results of heart rates (HR) in micro cycles 1 and 2 – the forwards

	HR clinostatism	HR orthostatism	HR post exercise	HR clinostatism	HR orthostatism	HR post exercise	Evaluation
Subject 1	61	74	108	63	73	110	G
Subject 2	65	79	104	64	77	107	G
Subject 3	64	73	102	64	75	99	VG
Subject 4	65	76	107	62	76	104	G
Subject 5	59	70	95	61	73	98	VG
Subject 6	62	71	101	63	74	106	G
Subject 7	64	75	106	63	76	104	G
Subject 8	60	73	97	59	70	92	VG
Subject 9	61	72	100	61	69	99	VG
Subject 10	58	70	96	59	69	94	VG
Subject 11	60	71	97	58	71	98	VG
Subject 12	57	66	92	58	65	90	VG
Subject 13	57	69	94	55	67	91	VG
Subject 14	59	70	93	57	68	92	VG
Subject 15	60	70	94	61	72	94	VG
Subject 16	63	74	102	61	74	101	G
Subject 17	60	73	99	58	69	98	VG

Legend: VG - very good, G - good

Table 7. The results of heart rates (HR) in micro cycles 1 and 2 – the backs

	HR clinostatism	HR orthostatism	HR post exercise	HR clinostatism	HR orthostatism	HR post exercise	Evaluation
Subject 1	55	66	88	57	70	94	VG
Subject 2	57	70	91	57	69	91	VG
Subject 3	54	67	84	58	70	95	VG
Subject 4	60	74	100	60	75	102	G
Subject 5	58	69	97	59	71	99	VG
Subject 6	55	68	96	57	70	100	G
Subject 7	59	70	99	59	71	97	VG
Subject 8	56	69	96	58	70	99	VG
Subject 9	60	74	98	59	75	97	VG
Subject 10	56	70	95	58	70	98	VG

Subject 11	58	67	94	57	69	95	VG
Subject 12	60	73	97	62	74	103	G
Subject 13	55	66	93	56	67	97	VG
Subject 14	53	63	90	55	66	94	VG
Subject 15	57	68	94	56	71	99	VG

Legend: VG - very good, G - good

Heart rate results in micro cycles 1 and 2, in the forward compartment, reflect variations of 9 to 14 beats/minute between the clinostatic measurement and the orthostatic measurement, reaching a difference of 37 beats/minute between the orthostatic measurement and the post effort measurement. On the backs compartment, we see similar variations between the clinostatic measurement and the orthostatic measurement, but the difference is smaller, of only 30 beats/minute, between the orthostatic measurement and the post effort measurement.

4. Discussions and conclusions

The scientific approach has resulted in proposals concerning the intra- and post effort recovery of the players.

First, we must emphasize the framework programs used for this research. They ensure a correct dosage and correct alternation in terms of training sequences and recovery sequences, thus ensuring the frame of an efficient training.

Most studies on the effects of active or passive recovery reflect the positive influences of active recovery with respect to passive recovery (Hausswirth & Mujika, 2013: 29). Therefore, the intra-effort recovery proposed within the research is mainly active, according to the pattern presented in the research results.

Research on stretching underlines that its use as a singular recovery method is not recommended. However, the use of muscle strains associated with other methods of recovery has optimal results (Hausswirth & Mujika, 2013: 67). Consequently, our work shows two alternatives of muscle strains associated with and adapted to the recovery process and the peculiarities of rugby.

Recovery by immersion in water at different temperatures has many benefits (Hausswirth & Mujika, 2013: 199). Proposals for rehabilitation methods used in the research describe two types of immersion in cold water, immediately after effort, and associated with sauna, in the hot-cold recovery sequence.

The results obtained after measuring the body weight and the heart rate reveal the following:

- Accepting the opinion of sports doctors, who argue that a variation of less than 3% of the body weight during various stages of preparation is tolerable, and a variation of +/- 1kg/24 hours is allowed (Drăgan, 2002), we can say that the recorded values are lower than those mentioned above, the changes in the body weight of the players are normal, and the level of recovery of the exercise capacity is adequate;
- The evolution of results following the measuring of the heart rate is evaluated positively, since variations of the values of the three measurements fall within tolerable limits. We support this assertion given that players are in the period of preparation, and therefore we can explain the slightly

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higher values of heart rate, to which we add the morphofunctional peculiarities of the rugby players on positions. Consequently, we can state that the recovery was adequate.

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