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Weight loss and lactic acid relation during wrestling match in elite Greco-Roman wrestlers

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Abstract

The purpose of the study is to determine the relation between weight loss and lactic acid during matches in elite Greco-Roman wrestlers. This study was carried out in Champions Tournament Preparation Camp, which took part in Turkish Wrestling Federation's 2011 activity programme and which was the final preparation camp before International Prix Samurgashev Tournament between 27-30/04/2011 in Rostov, Russia, by the participation of 24 Greco-Roman wrestlers. The average age of the participants is 18.61 ± 1.01 and their average height is 173 ± 8.79 . The wrestlers have trained with wrestlers of their weight category. In this study a total of 12 competitions were taken into consideration. The height, weight, heart rates, dehydration and lactate levels were measured. SPSS 17 – a packaged software – was used in statistical analysis of the data. In the analysis of the data, descriptive correlation analysis were used in examining the descriptive statistical methods and relationships and significance was tested at a level of $p < 0.05$. It was determined that during the matches there were no meaningful levels relationships statistically between weight loss and lactate acid. ($p > 0.05$) Consequently, it can be said that during matches there was no relationship between weight loss and lactate acid deposition in the wrestlers.

Keywords: Greco-Roman, Wrestling, Lactate, Weight Loss.

1. Introduction

Wrestling is where two athletes or people try to gain a superiority over the other by using his technical talent, power and intelligence without using any equipment in accordance with FILA's (Federation Internationale des Luttes Associees) rules on a standard mat [1]. In other words, it is a combat no equipment are used within a certain period of time and over a certain surface and where two athletes try to make the opponent's back touch the floor or to gain a technical superiority over the other. In international bouts, wrestling is done in two different disciplines which are free-style and Greco-Roman style [2]. Greco-Roman wrestling is a modern type of wrestling in accordance with rules determined by FILA where wrestlers hold the opponent above the belt. This discipline emerged in Europe and spread throughout the world [3].

Wrestling is a dynamic sports branch which requires constant action during the bouts. Wrestlers have to improve their motoric features, aerobic and anaerobic capacities with several training methods due to meeting their needs in circulatory, respiratory and muscular systems. When we look at the duration and the intenseness of wrestling, we see that since it is a short time and overloaded sports branch ATP-CP is used more. After ATP-CP, lactate acid system is used. Marginally oxygen energy system is used [4, 5].

It is recorded that, during endurance sports activities, under hot and humid conditions, wrestlers lose 2.5-5 kg body weight within an hour. Actually this loss is due to perspiration. Even losing 3% from the body weight through perspiration affects the performance of the athlete in a bad way [6]. In trainings, dehydration is increased in 2 ways. Firstly respiration fastens and causes dehydration in lungs and perspiration through increased body temperature follows it [7, 8]. Generally since weight loss signifies dehydration, checking weight can help determine dehydration effectively. For this reason, serial measurements in body weight are critical, accurate, easy and achievable hydration status indicators and they can be used in everywhere [9, 10].

During trainings with highest intensities, the level of lactate acid in blood can increase to 16-20 mmol/L. This increase in lactate acid in blood shows that wrestlers are in close relation with high anaerobic capacities [11]. In muscles, this ratio is seen in high levels. With this accumulation of lactate acids in muscles, the acid-base equilibrium of the body is destroyed

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and an acidic medium is constituted. This acidic medium affects a set of physiological functions, prevents the body to work properly and is soon bone-tired [12].

In terms of general characteristics of wrestling, after 2 minutes with highest intensity of 3 halves, weight loss occurs in the athlete during the bout. As fluid intake is against the rules, the wrestler cannot get enough fluids. Especially in elite tournaments, bouts according to weight categories result in the same day which means wrestlers have to attend successively 5-6 matches and fatigue is observed in wrestlers based on dehydration and lactate acid accumulation. As a result, the athlete cannot perform properly especially because of bout fatigue. At this stage, dehydration which occurs in the body signifies an important relation with fatigue.

The aim of this study is to determine the relation between lactate acid and weight loss which occurs in Greco-Roman wrestlers during the matches.

2. Method

The study took place in Turkish Wrestling Federation’s 2011 final preparation camp before International Prix Samurgashev Tournament. Necessary permissions were taken from the federation. The wrestlers filled in a personal form and a volunteer form saying that they don’t have any health problems or injuries. Additionally, Clinic Research Ethics Committee’s reports, which are necessary for the study, were taken.



2.1 The selection of experimental subjects: Experimental subjects’ group is made up of Greco-Roman wrestlers (n=24) who plays at national team’s level. The wrestlers are divided into categories according to their weights by their trainers and have done training matches with wrestlers close to their weight.

after warm-up, at the end of the first half which is 2 minutes after the start, at the end of the 4th minute, at the 6th minute – which is after the match – and 3 minutes after the bout. Every time they were weighed, they were dried and they only had their wrestling jerseys on.

Chart 1: The physical characteristics of the athletes who took part in the research

Variables	N=24
Age (year)	18.61 ± 1.01
Height (cm)	173 ± 8.79
Weight (kg)	77.88 ± 18.84
Time of training	6.8 ± 1.35

2.4 Heart rate: It was measured by telemetric monitors placed on the arm and transmitters placed on the chest (Polar, Finland s610i). Due to characteristic features of Greco-Roman wrestlers, the transmitter didn’t stay on chest throughout the match but was measured hurriedly before the match, during the breaks and at the end of the match.

2.2 Height measurement: It was done by stadiometer which varies with 0.1 cm (Holtain Ltd. England).

2.5 Lactate measurement: Accutrend Lactate/Accusport Portable Lactate Analyzer and Lactate Strip were used. By the help of AccuChek Softlix Lancet Needle, a little amount of (0.5-7 ml) blood was dripped on the Strip which was taken from the ear of the subject. It was concluded in 60 seconds. In total, blood was drawn 5 from the subject after the warm-ups, at the end of 2nd minute, at the end of 4th minute, at the end of 6th minute and 3 minutes after the bout.

2.3 Weight and weight loss measurements: It is done by electronic Scales which vary with 5 gr (Scales belonging to Wrestling Federation). Firstly, the wrestlers were weighed before warm-ups. After, they have been weighed 15 minutes



2.6 Test Protocol

The athletes who will take part in the matches are chosen according to their divisions by the national team coaches.

The athletes who arrived on match time were ready 30 minutes before.

Athletes personally warmed-up. It was asked from the athletes to go near the people in charge who are on two sides of the mat.

At first the wrestlers' body mass was measured. They were dried by towels and, with bare foot and with wrestling jerseys, they were weighed. Secondly, their heart rate and lactate acid measurement were done at the same time by two assistants waiting on the corner.

All the measurements to be completed took only 30 seconds and breaks in each halves were carefully, for it not to pass 30 seconds.

Every measurement was recorded.

In total 12 bouts were done in accordance with FILA's rules before a referee and each of them has been evaluated.

When the match started, device calibration and preparations were set up for the next measurement.

Matches were done with 30 minutes of pauses.

During the bouts, the temperature of the room and the humidity were constantly checked.

2.7 The analysis of the data

The statistical analysis of the data were analysed by correlation analysis for examining descriptive statistics and its relations

with the help of SPSS 17 package programme and significancy was tested at a level of $p < 0.05$.

3. Findings

Chart 2: The changes in body mass (kg)

	N	Average	Sd.	Min.	Max.
After warm-up	24	79,714	19,209	55,050	126,600
2 nd minute	24	79,658	19,198	55,000	126,500
4 th minute	24	79,600	19,172	54,950	126,400
6 th minute	24	79,525	19,157	54,900	126,250
After 3 rd minute	24	79,477	19,151	54,850	126,200

Chart 3: The change in the number of heart rate (HR bt/min)

	N	Average	Sd.	Min.	Max.
Afterwarm-up	24	93,37	15,367	67	124
2 nd minute	24	156,66	17,013	128	182
4 th minute	24	167,20	13,282	140	195
6 th minute	24	174,20	10,517	154	196
After 3 rd minute	24	128,20	14,145	100	160

Chart 4: The changes in lactate acid (mmol)

	N	Average	Sd.	Min.	Max.
Afterwarm-Up	24	1,84	0,343	1,1	2,4
2 nd minute	24	4,87	1,377	2,2	7,7
4 th minute	24	5,94	1,503	3,2	9,3
6 th Minute	24	7,06	1,891	1,2	11,5
After 3 rd minute	24	6,60	1,299	4,4	9,2

Chart 5: The correlation results of the elite Greco-Roman wrestlers before the bout and at the end of the 2nd minute

		VA values at the end of the 2 nd minute	HR values at the end of 2 nd minute	LA values at the end of 2 nd minute
VA values before	r	1,000	0,192	-0,325
bout	p	0,000 *	0,369	0,121
	n	24	24	24
HR values before	r	0,596	0,146	-0,372
bout	p	0,002 *	0,497	0,073
	n	24	24	24
LA values before	r	0,017	0,270	0,222
bout	p	0,936	0,202	0,297
	n	24	24	24

* $p < 0.05$

When Chart 5 is examined, it is seen that there is a positive relation between the VA values before the bout and at the end of the 2nd minute ($r=1.000$ $p < 0.05$). Besides, there is a

significant relation between HR values before the bout and VA values at the end of the 2nd minute ($r=0.596$ $p < 0.05$).

Chart 6: The correlation results of wrestlers before the bout and at the end of the 4th minute

		VA values at the end of the 4 th minute	HR values at the end of 4 th minute	LA values at the end of 4 th minute
VA values before	r	1,000	-0,056	0,024
bout	p	0,000 *	0,794	0,913
	n	24	24	24
HR values before	r	0,595	0,168	0,249
bout	p	0,002 *	0,432	0,241
	n	24	24	24
LA values before	r	0,017	-0,091	-0,017
bout	p	0,936	0,674	0,937
	N	24	24	24

* $p < 0.05$

According to Chart 6, there is positive relation between the VA values before the bout and at the end of the 4th minute

($r=1.000$ $p < 0.05$), and HR values before the bout and VA values at the end of the 4th minute ($r=0.595$ $p < 0.05$)

Chart 7: The correlation results of wrestlers before the bout and at the end of the 6th minute

		<i>VA values at the end of the 6th minute</i>	<i>HR values at the end of 6th minute</i>	<i>LA values at the end of 6th minute</i>
<i>VA values before</i>	r	1,000	0,042	-0,277
<i>bout</i>	p	0,000 *	0,844	0,191
	n	24	24	24
<i>HR values before</i>	r	0,595	0,263	-0,338
<i>bout</i>	p	0,002 *	0,214	0,106
	n	24	24	24
<i>LA values before</i>	r	0,017	-0,094	0,159
<i>bout</i>	p	0,935	0,663	0,458
	N	24	24	24

*p<0.05

When Chart 7 is examined, it is seen that there is a significant relation between the VA values before the bout and VA values at the end of the 6th minute ($r=1.000$ $p<0.05$), and HR values

before the bout and VA values at the end of the 6th minute ($r=0.595$ $p<0.05$).

Chart 8: The correlation of wrestlers before the bout and at the end of 3rd min

		<i>VA values at the end of the 3rd minute</i>	<i>HR values at the end of 3rd minute</i>	<i>LA values at the end of 3rd minute</i>
<i>VA values before</i>	r	1,000	0,284	-0,179
<i>bout</i>	p	0,000 *	0,178	0,402
	n	24	24	24
<i>HR values before</i>	r	0,595	0,440	-0,266
<i>bout</i>	p	0,002 *	0,031	0,209
	n	24	24	24
<i>LA values before</i>	r	0,018	-0,343	-0,102
<i>bout</i>	p	0,935	0,100	0,635
	N	24	24	24

*p<0.05

When Chart 8 is examined, it is seen that there is a positive relation between VA values before the bout and 3 minutes after the bout has started ($r=1.000$ $p<0.05$). There is also a significant relation between HR values before the bout and VA values at the end of the 3rd min ($r=0.595$ $p<0.05$).

4. Discussion

In this study, weight loss and lactic acid relation during wrestling bouts in elite Greco-Roman wrestlers has been examined.

In the study where their physical and physiological profiles were evaluated, the results were as; age: 21.6 ± 2.5 (year), time of training: 10.5 ± 2.9 (year), height: 172 ± 6.6 (cm), weight: 80.4 ± 17.5 (kg) and body mass index: 22 ± 4.4 (kg/m^2) [13]. In Akyuz's research [14] the average age of the 40 wrestlers was 19.03 ± 0.83 years and their average height was 1.73 ± 0.07 cm; in Eroglu's research [15], the average age of the 40 wrestlers was 19.64 years and their average height was 173.55 cm.

Especially during match times, it is frequently seen in articles that wrestlers lose weight excessively in order to provide and advantage for themselves. In Demirkan's post graduate thesis [16], body composition that occurred in wrestlers and their hydration states were examined during camp period. In consequence of studies, there were no significant differences between the body compositions before and after the bouts.

In a research conducted by Akyuz (2009), 40 wrestlers who are in youth national team have participated. It was asked from the participants to lose 3-5% of the body mas within 48 hours by using their former methods. The first measurement, which was 75.19 kg, has regressed to 73.0 kg after dehydration. The result achieved within 48 hours is remarkable [14]. In other studies on Turkish wrestlers; Eroglu (2002) presents rapid dehydration as 4.75% [15], Aydos presents temporary weight loss before the bout as 4.52% [17] and Kilic presents weight loss due to sauna and training as 3% [18]. The main difference

between these studies and our study is that the weight loss is observed throughout the bout. The purpose of weight loss in these studies is to lose weight before stepping on the scale.

In another study, 66 young and star wrestlers were used as subjects in post graduate thesis named as "The effect of acute weight loss on developmental age of the wrestler". It is said that there was a total of 3% dehydration as a result of trainings [19]. In similar researches, by getting interval trainings and exercises between 60-90 minutes done, it is observed that there is 2-6% loss in their weight [20, 21, 22]. In another study, a 1.45 ± 0.3 kg weight loss was seen due to a 2 hour training in a hot place [23]. On the other hand, in our study, when the average weight value was 79.714 kg before the bout, it fell to 79.477 kg after the bout. There is a 0.237 kg of decrease after the bout compared with before the bout.

In an organism, perspiration with exercise results in dehydration. There are two types of dehydration: acute and chronic. Acute dehydration is the process where one loses water because of several causes during trainings and chronic dehydration is when one does not intake enough liquid within 24 hours following the training. Sudden changes in body weight indicate to lost water through perspiration from the body during training because there is no component in the body to lose this amount of mass in a short period of time. The loss of body weight leads to thinking dehydration and the increase in body weight leads to thinking water retention [24, 25]. Lactate studying in our country about wrestlers is first encountered in Çınar's 1990 research [26]. Studies were mostly done by bout model assumptions and with blood lactate tests, wrestler's training and bout levels were compared. These studies, which were done in final camp trainings before World Championship and Olympic games, provided information about lactate tests applied in practice and athletes' aerobic capacities and improvements. It was particularly analysed whether bout model assumption done in training conditions could reach bout levels or not [27].

In his post graduate thesis (1990), Cinar has determined the lactate value of Turkish and foreign wrestlers (n=19) who took part in European Wrestling Championships after the bouts as 11.59 mmol. In a doctoral thesis conducted in 1992 after Cinar's 1990 study, Savranbasi took a reading on lactate on 26 wrestlers. In the research conducted, in Greco-Roman wrestling, blood lactate acid kinetics was examined in 5 minutes bout and training conditions. In total, at the end of 6 minutes training matches after warm-ups and 5 minutes later, blood samples were evaluated by lactate acid measurements [28]. Consequently, it was stated that after 30 minutes they couldn't recover fast enough for another bout due to the fact that blood lactate acid concentration was above the anaerobic threshold (4-5 mmol/L). Again in the study, named "The Blood Lactate Levels and Technical Productivity of Greco-Roman National Team Wrestlers' in Training and Bout Conditions", conducted by Savranbasi and others in 1996, they found that lactate concentration was 14.9 ± 4 mmol/L, the first measuring of lactate concentration after the match was 11.9 ± 2.1 mmol/L and the second measuring of lactate concentration after the match was 11.3 ± 3.3 mmol/L [29]. In another study, Filiz (1999) has done a research on lactate acid levels which accumulate in blood as a result of maximum loading on wrestlers [30]. 20 wrestlers have participated in a study and they have been categorized according to their weights. It was found out that 48 kg.-13,2 mmol/L, 52 kg. -12 mmol/L, 57 kg.-12,3 mmol/L, 68 kg.-9,8 mmol/L, 74 kg.-13,3 mmol/L, 82 kg.-10,7 mmol/L, 90 kg.-10,7 mmol/L, 100 kg.-14,6 mmol/L, 130 kg.-15 mmol/L. While the highest LA level belongs to a 130 kg wrestler with 184 bt/min and 15.9mmol/L, the lowest LA level belongs to a 68 kg wrestler with 180 bt/min and 8.2 mmol/L. When looked at the studies conducted abroad; Kreamer and others (2001) and Barbas and others (2011) have recorded blood lactate levels before bout respectively as 1.7 and 2.2 mmol and 1.3 and 2.5 mmol, Mahdi in 2007 found out that initial lactate level below 2.3 mmol, and Karnincic and his friends (2009) have studied wrestlers' lactate profiles during a Greco-Roman wrestling bout in another study. The initial lactate level was found higher than other studies listed above. It was found as 2.6 mmol. When there were national wrestlers on one side, there were club wrestlers on the other side. Lactate levels were respectively recorded as 2.61 mmol before the bout, 8.60 mmol after the 1st half, 11.82 mmol after the 2nd half and 12.55 mmol at the end of the bout. At a result of the study, significant differences were observed in wrestlers' blood lactate concentration during the bout. In our study, lactate levels have increased starting from 1.84 mmol/L to 7.06 mmol/L [31, 32, 33, 34].

There are other domestic and foreign studies published about the lactate states of wrestlers other than the ones listed above. For instance; lactate profiles of free-style wrestlers who participated the 32nd European Wrestling Championship by Cinar and Tamer in 1989 [35], physiological profiles of elite free-style wrestlers by Callan and others in 2000 [36] the anaerobic capacities and the changes in lactate after Wingate test by Lutoslawska and others in 1998 [37], the lactate profiles of the wrestlers in 1998 World Greco-Roman Wrestling Championship by Nilsson and others in 2002 [38], the physiological profiles of elite free-style wrestlers who prepare for the bouts by Utter and others in 2002 [39], and anaerobic capacities by measuring arms and legs of the wrestlers by Hubner-Wozniak and others between 2004-2006 were put forth [40, 41]. All these studies are contributed to the litterateur.

5. Conclusion and Advices

Between our study and litterateur, similar results were found in lactate concentrations of the athletes and weight loss. When our study is evaluated as before the bout and after the bout, differences between body weight (VA), the number of heart rate (HR) and lactate levels (LA) was found. Before the bout and in other measurements, there were no differences between "weight loss and lactic acid relation"-which make up our title. After all, it can be said that there is no relation between lactate acid accumulation and weight loss which occurs in wrestlers during the bout.

6. Advices

If the studies are conducted in real matches instead of training matches, the credibility of the results will increase. Besides, by looking at both of the styles, lactate concentration and weight loss comparisons can be made. If wrestlers competing in 5-6 matches every day during wrestling championship is taken into consideration, wrestlers' conditions can be evaluated at maximum loading by making them take part in bouts one after the other.

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