A study examining the effects of changed rules of wrestling competitions on the muscular damage levels of the elite wrestlers

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Note: The study was presented as an oral presentation at the 12th International Sports Sciences Congress.

Abstract

This study aims to examine the effects of changing rules of wrestling competitions on the elite wrestlers' muscular damage levels. Twenty male wrestlers from the wrestling team established by the Izmir Metropolitan Municipality, which competes in the 1st Wrestling League, volunteered to take part in the research. The age average of the wrestlers was 20.4±2.8 years, their average age of sports 7.45±4.29 years, their height average 173,8 ±4,97 cm, and weight average 77.4 ±16.22 kg. Some blood samples of 5 cc each were taken from each wrestler's forearm vein by means of the vacutainer (a closed blood taking system) for the two competitions separately before and after the competitions; and on 24th, 48th, and 72nd hours following the competitions in the research. For looking at the levels of Creatine Kinase (CK), Lactate Dehydrogenase (LDH), Aspartate Aminotransferase (AST), and Alanine Aminotransferase (ALT), serums were obtained by centrifuging the blood samples those taken to determine the levels of the skeletal muscle damages of the wrestlers at 1000 RPM for 20 minutes. The enzyme levels of the blood samples (the serum of which was decomposed) were determined by the SIEMENS ADVIA biochemistry auto-analyzer using the SIEMENS kit. While the repetitive measurements were assessed via one-way analysis of variance (ANOVA), the Bonferroni testing was applied in order to determine from which measurement times the differences were originated. The Paired Samples-t testing, meanwhile, was performed in order to compare the blood samples collected from the athletes at same times for the both completed competitions having different rules. No significant difference was observed between AST and ALT values on the aminotransferase of the wrestlers according to two different rules (p>0.05). Whereas significant differences were confirmed between the values of 48 hours after and 72 hours after the competition for the LDH values (p<0.05), no significant difference, on the other hand, were detected between other values (p>0.05). Although significant differences were observed between the results obtained following competition and 72 hours after the competition for the CK values (p<0.05), there was no significant difference between other values (p>0.05). Consequently, it was observed that when the wrestlers took part in two-day wrestling competitions, the basal values were reached 72nd hour after the competition, and no muscle damage remained, whereas when they took part in half-day wrestling competitions it was confirmed at the end of the 72nd hour that the LDH and CK levels of the wrestlers couldn't come close to the basal and the muscle damage was present (p<0.05).

Keywords: Wrestling, exercise, muscle damage, creatine kinase.

INTRODUCTION

It's a well-known truth that exercising causes muscle damages at different levels. The muscle damage is a condition that leads to severe exhaustion, loss of function, weakness, and pain following some unusual and severe exercises. The delayed muscle damage occurring due to exercises as a result of micro-traumas has been identified at first time by Hough in the year 1902 (5). The studies relating to muscle damages resulted from exercises have increased rapidly at last 10 years, and many studies have been published, meanwhile, on the relevant subject (3,4,8,13). The shape of contractions by which muscle damage is observed more severely is the eccentric contraction. The eccentric muscle contractions are the contractions of elongated neck muscle with negative character (such as descending the stairs, running down the hill, etc.) (1).

Although the skeletal muscle damage is related to the severity and volume of the exercises, it is much more pronounced following an unusual exercise. The delayed onset muscle soreness (DOMS) are more common at the beginning of any season. It was observed, meanwhile, that even one single exercise protocol has been found to play a protective role against to muscle damages probably to be met during an exercise carried out afterwards at the similar intensity or following a much more

heavy exercise. It can be claimed, when we take into consideration the effective renewal process and protective aspect of exercises after exercise sourced muscle damage, that the muscle damage is inevitable in terms of adaptation to training (11).

It is considered, therefore, that muscle damage suffered by wrestlers is ignored somewhat whereas their muscular durability are put into prominence together with rule alterations taking into account the rule changes in wrestling sports adapted in recent years. This study has been planned taking into consideration the two different rule changes with remarkable importance through last 8 years. While the number of competitions completed by wrestlers during championships remains constant, competition intervals has become gradually shorter. Furthermore, determining the muscle damage using the findings obtained during the competitions scheduled to be made with 2 different competition rules shall provide the wrestlers, coaches and administrators with some new approaches for the events.

In this study, it is aimed to investigate the effects of muscular damage levels with the changing rules of wrestling competitions on the elite wrestlers.

MATERIAL & METHODS

Subject Selection

The study was initiated with 20 male volunteered wrestlers between ages of 18 and 28 all of whom compete in the 1st Wrestling League representing the wrestling team established by the Izmir Metropolitan Municipality. At the beginning of the study, information and consent forms describing the competition schedule and the purpose of the relevant study were filled out by the wrestlers and their signed consents were obtained accordingly. In addition, since 5 wrestlers in the study group have been accepted as hyper-responder (CK>1000 IU/L) ones, their measurement results of CK didn't been added in the listing of study group.

Competition Schedule of FILA 2003

A competition lasts 2 periods each continuing 3 minutes. At the end of the half ending 0-0, binding for somersaults is applied. At the end of 2nd period, the one reaching a total of 3points is victorious wrestler. If wrestlers cannot reach a total of 3points, 3rd period of 3 minutes is started. So, the wrestler first getting three points over the course of the 3rd period is the victorious one. If the wrestlers could not still reach a total of 3 points at the end of the 3rd

period, passivity aspects and warnings evaluations for sportsmen are taken into consideration accordingly. The competitions take 2 days in total. A total of 5 competitions, 1 competition in the morning session of 1st day, 2competitionsin the evening session of that day, one in the morning session of Day 2, and final one in the evening session of Day 2, are completed accordingly. The breaks between each competition are applied to beat least 30 minutes. The wrestling performed per aforespecified rules represent the common loading method.

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The competitions are initiated at 13.00 and continue, without any break, a total of 5 competitions for the circuit method of wrestling. The wrestler overcoming at the end of first 2 cycles each lasting 2 minutes is the victorious one. If equity is evidenced for 2 cycles, Cycle 3 is performed. When equity is observed at the end of each cycle, passivity, warnings and grand techniques are taken into account. A resting period of 15 minutes minimum is applied for each wrestling competition. The competitions performed per aforespecified rules represent the heavy loading method.

Data Collection

The athletes participating in the study were subjected, separately, to the competitions with two different wrestling rules drew attention for their importance in the last 8 years. Blood samples of the wrestlers were collected, for each event, from their forearm veins before competitions, after competitions, at 24th hours after competitions, at 48th hours after competitions, and at 72nd hours after competitions during certain hours of day (± 2 h). Performed competitions were arranged in accordance with the FILA rules of the years 2003 and 2009 (current rules), and 2 weeks resting period were applied between the competitions. Also, resting periods and nutrition times of the wrestlers were kept under control, and attention was paid to the implementation of the same diet.

Data Analysis

Serum CK, LDH, AST and ALT values were checked so that the damages to the skeletal muscles of athletes who participated in the study could be determined. Blood samples collected, at different time intervals, from the wrestlers had been taken from their forearm veins using the vacutainer (closed blood collection) system by medical experts, and the samples were decomposed to serums by centrifuging, at laboratory conditions, the samples

20 minutes long at 1000 rpm to find out the enzyme activation. The serum levels of blood samples of which enzymes decomposed earlier were determined by the SIEMENS ADVIA biochemistry auto-analyzer using the SIEMENS kit.

The wrestlers were subjected to the competitions in compliance with FILA rules in order to evaluate the variables those to be investigated during the study. All of the blood samples were analyzed in laboratory by experts.

Statistical Analysis

The testing for normality of the data given was accomplished applying the Kolmogorov-Smirnov testing, and it was observed that all of the variables showed normal distribution. Whereas repeated measurements of the competitions were evaluated by means of one-way analysis of variance (repeated measures ANOVA), the Bonferroni testing was applied for multiple comparisons to determine from which time intervals the differences resulted. The Paired Samples t-test was performed, therefore, to compare the blood samples collected at the same times for the competitions held per two different

rules. The confidence interval was selected as 95%, and values of $p < 0.05$ and below were considered statistically significant. All of the statistical calculations were carried out using SPSS 16 package program that was written for Windows.

RESULTS

Table 1. The demographic characteristics of the athletes participated in the study

N=20	Mean ± SD
Age (years)	20.4 ± 2.8
Height (cm)	173.8 ± 4.97
Body Weight (kg)	77.4 ± 16.22
Training Age (years)	7.45 ± 4.29

This study was applied on selected male athletes with age average of 20.4 ± 2.8 (years), height average of 173.8 ± 4.97 (cm), weight average of 77.4 ± 16.22 (kg), and training age average of 7.45 ±4.29 (years).

Table 2. Measurement values of AST, ALT, LDH, and CK, and timed T values for the athletes performing wrestling half-day and two days

| Variables		Mean(IU/L.) ±SD				
AST	N	M_{pre}	M_{post}	M_{24h}	M_{48h}	M_{72h}
Half-day wrestling	20	24.65±7.36	37.3±11.01	38.15±13.67	30.85±11.13	25.1±6.94
Two days wrestling	20	24.75±8.5	35.8±9.23	32.8±6.9	26.15±6.74	23.1±5.87
T value	20	-0.035	0.548	1.675	1.865	1.212
Significance	20	0.972	0.590	0.110	0.078	0.240
ALT	N	M_{pre}	M_{post}	M_{24h}	M_{48h}	M_{72h}
Half-day wrestling	20	24.2±11.59	29.6±13.98	26.45±12.68	28.5±13.75	25.35±12.84
Two days wrestling	20	26.6±13.29	31.55±14.13	29.25±12.12	26.55±12.15	24.5±12.02
T value	20	-0.652	-0.497	-0.827	0.554	0.292
Significance	20	0.522	0.625	0.419	0.586	0.774
LDH	N	M_{pre}	M_{post}	M_{24h}	M_{48h}	M_{72h}
Half-day wrestling	20	147.55±23.66	241.25±38.48	207.55±36.55	187.35±35.61	171.15±28.21
Two days wrestling	20	148.3±24.8	224.45±28.45	189.45±28.15	163±25.17	152.9±20.72
T value	20	-0.103	1.740	1.559	2.394	2.316
Significance	20	0.919	0.098	0.135	0.027*	0.032*
CK	N	M_{pre}	M_{post}	M_{24h}	M_{48h}	M_{72h}
Half-day wrestling	15	124.32±35.89	354.35±137.91	528.89±213.46	296.01±131.6	197.25±79.86
Two days wrestling	15	120.16±33.09	449.31±172.06	470.18±162.24	226.82±79.48	129.47±29.07
T value	15	0.359	-2.314	0.480	1.587	2.863
Significance	15	0.725	0.036*	0.639	0.135	0.013*

*p<0,05
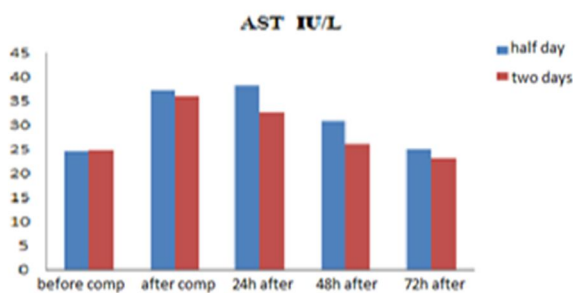
Figure 1. AST readings for athletes wrestling half-day and two days.

No significant difference was observed depending on time, as shown on Figure 1, for the comparisons made between AST readings of athlete group during different competitions (p>0.05).
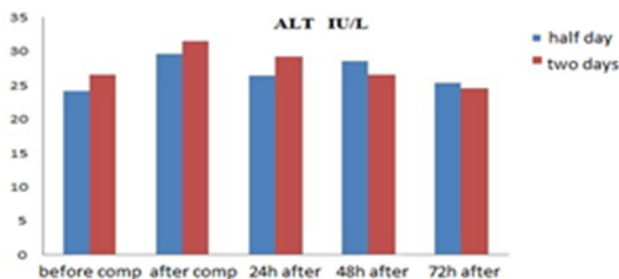

Figure 2. ALT readings for athletes wrestling half-day and two days.

No significant difference was found out depending on time, as shown on Figure 2, for the comparisons made between ALT readings of athlete group during different competitions (p>0.05).
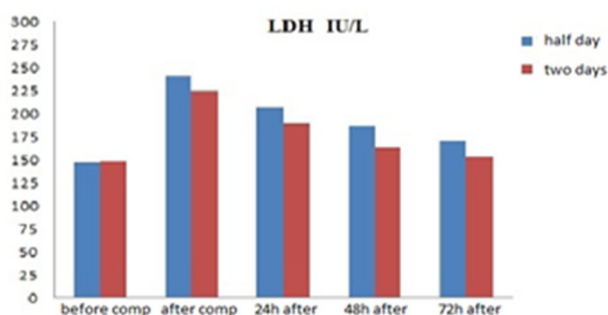

Figure 3. LDH readings for athletes wrestling half-day and two days.

Whereas some significant differences were determined, as shown on Figure 3, for the comparisons made between LDH readings of athlete group during different competitions, depending on time, 48 hours after the competitions and 72 hours after the competitions (p<0.05), no meaningful

difference was observed between other values (p>0.05).

Whereas some significant differences were determined, as shown on Figure 4, for the comparisons made between CK readings of athlete group during different competitions, depending on time, after the competitions and 72 hours after the competitions (p<0.05), no meaningful difference was observed between other values (p<0,05). Furthermore, since 5 wrestlers were considered as hyper-responder ones (CK>1000 IU/L), their CK readings didn't been include in the listing of the study group.
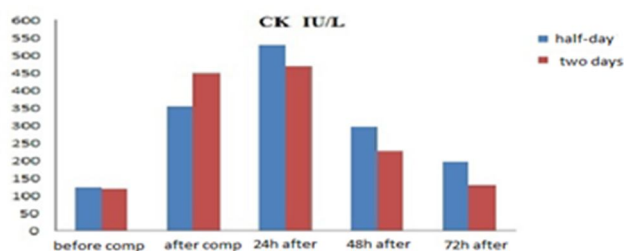

Figure 4. CK readings for athletes wrestling half-day and two days.

DISCUSSION

Although many studies on the beneficial effects of physical activity have been accomplished, some studies, though few in number, have recently been encountered on the negative effects of physical activities (15). It was determined, meanwhile, that there were no significant difference between the averages of age, height and training age of the athletes participated in this study. Therefore, the group has been considered to have a homogeneous structure in itself.

The muscle damage of skeletal origin causes the muscle-specific components to pass into the bloodstream through the membrane rupture. The component that was most known to has been lost is the Muscle Creatine Kinase. Other indicators which determine the muscle damage are the levels of lactate dehydrogenase (LDH) increased in serum and structural muscle protein (Aminotransferase) (9). Aforespecified indicators have been taken, during our studies, as reference to identify muscle damage in the light of relevant info. No significant difference was observed for the comparisons carried out between AST and ALT levels measured at the same time during different competitions on the study group (p>0.05). However, it is a fact that there is a quantitative superiority for the measured values

during half-day wrestling competitions (p>0.05). It was observed, meanwhile, that after the measurements, AST and ALT values began to rise soon after the exercises, increased to peak level on24thhour, and returned to the basal level after 72nd hour. It has been considered that subject increases were resulted from damages in skeletal muscles of the athletes.

Whereas a significant difference, in favor of the time-dependent half-day wrestling athletes, was found out when a comparison was accomplished between the LDH measurements of study group for different competitions 48 hours after the competitions and 72 hours after the competitions (p<0.05), no meaningful difference was observed between other levels (p>0.05). It has been claimed that when the widely held two-day competitions were performed, the athletes recovered in terms of LDH levels and they could again be loaded, but they couldn't gather themselves and their physiological fatigue remained as was when they performed half-day wrestling a day.

Indeed, although significant increases were observed in terms of LDH levels by Saengsirisuw et al. on the athletes of Thai boxing during normal and intense exercises, it was determined on their blood samples collected 12 hours after the exercises that the LDH levels approximated to the basal levels (10).

Again, Mashiko et al. exercised some endurance training on 25 college men's rugby club athletes with a mean age of 20.2 for 3 hours and 2 times per day, total 6 days a week. They found out throughout the camping period that the levels of LDH and CK increased significantly (7).

In another study performed, Chan et al. claimed, as a result of eccentric exercises carried out for 7 day son 22male college students, that the LDH levels of the subjects reached their peak on the 4th day (2).

It was considered, therefore, that the measurement results in this study both showed similarity to all of the studies in the literature, and the increase in LDH levels was an indication that the wrestling athletes were exposed to muscle damages. It was thought that the difference as a result of the evaluations carried out on the athletes within half-day and two days was resulted from the short age of recovery time for the half-day wrestling competitions and successive severe loadings.

Whereas a significant difference, first in favor of the wrestlers performed 2 days time-dependent wrestling for the measurements just after the competitions and then in favor of the athletes performed half-day wrestling for the measurements 72 hours after the competitions, was found out when a comparison was accomplished between the CK measurements of the study group (p <0.05), no meaningful difference was observed between other levels (p>0.05). Furthermore, since 5 wrestlers were accepted as hyper-responder ones, their CK readings didn't been added on the listing of the study group.

In some studies those showed similarities with this study, therefore, Harbili et al. subjected 11 healthy men (mean age = 21.45 ± 0.93 years) subjects to six sets of 8 repetitions of maximal eccentric exercises at 60 deg/sec speed in a style their knee joints to go from 180 degrees full extension to 90 degrees flexion position on the isokinetic dynamometer, and they observed that the CK levels of the subjects peaked on 3rd day after relevant exercises (6).

When Brandon et al., again, examined the effects of the 30-minute high-intensity eccentric exercise on the oxidative muscle metabolism on 13 healthy male subjects with a mean age of 23,they found out that their CK values reached at the highest level 48 hours after the exercises (14).

Craig et al., in another study, determined following a study performed on 10malesprinters with an average age of 22.4 that their levels of post-exercise and 24 hours after exercise increased gradually, peaked 48 hours after exercise, and drew near the basal level 72 hours after exercise (12).

It was claimed that the data about exercises of intensive and long-term, as mentioned in the literature, caused more damage than has been said. The presence of muscle damage/destruction is concerned for the measurement taken after wrestling competitions performed in conformance with two different wrestling rules. It has been claimed that a need, in wrestling sports, for a loading of intense and severe style causes such destruction. In addition, it has been thought that the cause of an increase on behalf of two days competitions for the levels measured following the competition was due to the habit of wrestlers who took their place for 2nd day competitions after spending their time eating and resting following 1st day competition during which their CK levels

peaked, and then they again began to spend effort during 2nd day competitions.

It's well-known that FILA struggle for maximizing the attractiveness ratings by making amendments continually on the competition time constant. The material concerns have also been taken into account for the championship competitions performed per the current changes in the time constant. Furthermore, it is an inevitable result for the athletes that they also change, due to the rule changes, the training methods and consequently have some adaptation problems thereof. In this context, when we take into consideration the muscle damages to be put by unusual exercises on the organism;

Presence of muscle damage has been found out as a result of two type of competitions in this study that was planned taking into consideration that FILA has been looking for, with the last changes on the competition rules(continuing half-day), the muscular endurance in athletes, but ignored the muscle damages to be suffered by the athletes. However, the rate of muscle damage was determined to be much more for the half-day events. The half-day competitions represent the method of intensive loading, and the competitions continuing two days represent the method of common loading. On the other hand, it was observed that LDH and CK reached to the basal levels and no muscle damage remained for two days of wrestling due to nutrition and resting periods, but LDH and CK didn't draw near the basal levels and the muscle damage still kept its presence at the end of 72nd hour for half-day wrestling competitions because of the competitions continuing without interruption (p<0.05). It was considered, meanwhile, that the athletes couldn't be able to perform recovery at the end of 72nd hour, their time to be ready for the next events prolonged when the competitions have been organized at frequent intervals, and so they couldn't exhibit their maximum performances.

It is claimed that if the athletes performs, in a sport branch like wrestling containing intensive loading in it, one or two competitions maximum every day (common performance) it shall keep them from suffering acute muscle damages, and so be an important advantage for them to perform their maximum abilities.

It is thought there of that coaches should take into consideration the muscle damages that shall occur on the athletes, and so apply some nutrition and ergogenic aids and similar improvements for speeding up their recovery times after the competitions.

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