

Strategies to reduce pre-competition body weight in mixed martial arts

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Summary

Introduction: In Mixed Martial Arts (MMA), just like other combat sports categorized by body weight, some athletes use rapid weight loss techniques to have certain advantages in the competition.

Objective: Therefore, this study aimed to analyze the frequency of rapid body weight reduction in the period of 12 months before a competition and the methods used to achieve it, in a group of athletes from the City of Curitiba, Paraná, Brazil, from state and national competitions.

Materials and methods: Twenty-five fighters, mean age of 24.4 ± 4.1 years, participated in the study. To analyze the strategies used in body weight reduction, a validated 3-section questionnaire for weight loss in fighters was applied before weighing.

Results: Of total 25 volunteers, all 25 (100%) said that they have already used weight loss techniques before a competition. Most of them reported the loss of 1 to 18 kg three to sixty days before a competition, up to 10 times a year, using the following methods: increased physical activity, gradual diet, training in heated areas, and reduced fluid intake. The coach, training colleagues, and older athletes influenced the athlete's decision to adopt rapid weight loss methods as a supposedly competitive advantage.

Conclusions: In conclusion, rapid weight loss was frequent among all Mixed Martial Arts fighters investigated in this study, and the most commonly used methods were increased physical activity, gradual diet, training in heated areas, and reduced fluid intake.

Key words:

Weight loss. Athletes. Fighters.

Estrategias para la reducción de peso corporal en competición de artes marciales mixtas

Resumen

Introducción: En las artes marciales mixtas (MMA), al igual que en otros deportes de combate en los que existen categorías por masa corporal, es habitual el uso de estrategias de pérdida de masa corporal en fechas próximas a las competiciones con el fin de obtener algún tipo de ventaja.

Objetivo: El presente estudio tuvo como objetivo verificar la frecuencia de la reducción del peso corporal en los últimos 12 meses antes de la competición y los métodos utilizados para lograrlo, en un grupo de competidores a nivel estatal y nacional de Curitiba, Paraná, Brasil. Los participantes fueron 25 combatientes con una edad media de $25,4 \pm 4,1$ años.

Material y métodos: Para comprobar las estrategias empleadas en la reducción de la masa corporal, se aplicó a los deportistas un cuestionario validado, completado antes del pesaje.

Resultados: Los 25 sujetos (100%), indicaron que utilizaron técnicas para reducir su masa corporal para competir, con la finalidad de hacerlo en una categoría inferior. La mayoría indicó una pérdida de 1 a 18 kg en el período anterior a la competición, de una duración entre 3 a 60 días, de 1 a 10 veces al año a través de los siguientes métodos: Restricción de la ingesta de líquidos, sesiones de sauna, dieta gradual, aumento de la duración del entrenamiento y entrenamiento en lugares con altas temperaturas. La orientación para escoger un método de reducción de masa corporal proviene del entrenador, el compañero habitual de entrenamiento o atletas mayores.

Conclusiones: La pérdida rápida de masa corporal fue común entre los luchadores de artes marciales mixtas estudiados. Los métodos más utilizados fueron: restricción de la ingesta de líquidos, sesiones de sauna, dieta gradual, aumento de la carga de entrenamiento por encima de lo habitual y entrenar en lugares con temperatura elevada.

Palabras clave:

Reducción de peso. Atletas. Luchadores.

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Introduction

Mixed Martial Arts have gained attention in the sporting scene and among people in general, leading to the worldwide popularization of this sport category¹. It should be noted that this type of fighting is considered complex, as it combines different techniques and styles of varied fights, of domain or percussion style².

When determining the temporal structure, to help understand the physiological aspects of the predominance of each energy system and its changes with the stimuli, the fights have in general three to five rounds, 5-minute duration and 1-minute intervals, showing that it is an intermittent sporting practice, whose energy metabolism is anaerobic with aerobic demand²⁻⁴.

Then, pure strength, strength resistance and muscular power are important neuromuscular variables to be developed, so that the athlete is successful in the fight⁵. However, one characteristic of combat sports is the categories according to the athlete's body weight. Therefore, in order to balance the competitions, the athletes fight opponents of similar weights, and many athletes use aggressive methods to reduce their body weight and have a supposed advantage in relation to their opponent⁶.

However, rapid weight loss is said to impact the athlete's physical performance during the fight⁷. The harmful physiological effects caused by sudden weight loss include: smaller blood and plasma volume and lower muscle glycogen utilization rate⁸, loss of muscle mass⁹, which in turn directly affects the variable of skeletal muscle strength¹⁰, a prerogative for fighters who wish to win⁷.

Regarding the effects of weight loss on strength, the results found in the literature are divergent¹¹. When evaluating 20 judo athletes, Degoutte *et al.*¹² observed that, after seven days of weight loss, the fighters presented a considerable loss of grip strength of the left arm. In another study, Ratamess *et al.*¹³, when analyzing 16 wrestling fighters who had weight loss 10 days before the competition, did not report any change in the variable of grip strength for these athletes.

Although weight loss is well documented for other types of fights, the literature has insufficient national studies on weight loss in MMA athletes. Therefore, this study aimed to analyze the frequency of rapid reduction of body weight in the period of 12 months before a competition and the methods used to achieve it, in a group of state and national level competitors in the city of Curitiba, Paraná, Brazil.

Material and method

This is a cross-sectional study that analyzed a sample of 25 male Mixed Martial Arts (MMA) athletes, mean age of 24.4 ± 4.1 years, training 6 times a week for 3 hours a day and participating in state and national competitions, in the City of Curitiba, Paraná. Of these athletes, 11 were from the 52-66 kg categories, 13 were from the 70-93 kg categories, and 1 athlete was from the 100 kg category.

The study included athletes who: (1) were between 18 and 40 years old; (2) were participating, at the time of data collection, in regional tournaments or more important competitions; (3) had practiced MMA for at least two years. The study excluded: (1) athletes who, at the moment

of data collection, decided not to participate in the study; (2) athletes who, after data collection, chose to withdraw their informed consent, so that their data could not be used in the study.

All athletes, after being informed of the procedures to which they would be submitted, signed an informed consent term. Then the questionnaire on weight loss was applied at the training site of the athletes. This study was approved by the ethics and research committee of the Faculdade Dom Bosco, in Curitiba, Paraná, under protocol n° 1.124.722.

Questionnaire on pre-competition rapid weight loss

A questionnaire was applied to obtain information on rapid weight loss. The questionnaire has 21 closed-ended questions on weight loss in the pre-competitive period of MMA athletes, and it is an instrument that has been validated for judo¹⁴. It had to be adapted to MMA, since there is no validated instrument for this sport. This instrument has three sections: the first collects general data of the participants, the second collects data on weight and diet history of every participant, and the third refers to the weight loss methods used by the athletes in the last 12 months.

Several items were evaluated with this instrument, such as current MMA category; whether the fighter has moved to higher categories; the participant's weigh on his last vacation; whether he had already lost weight for the competition; the highest amount of weight he has ever lost for a competition and how many times it happened in the last 12 months; how many kilos he usually loses before a competition; how much time before a competition the athlete usually measures his weight; at what age he started to lose weight for a competition; how much weight he usually gains the week after a competition; degree of influence exerted for weight loss¹⁴.

Statistical analysis

Data were inserted in a Microsoft Excel® spreadsheet and processed by software Bio State 5.0, year 2007, for data analysis. Shapiro-Wilk normality test was applied, which indicated a symmetrical distribution. The values of mean, standard deviation, minimum and maximum amplitudes, and standard error were calculated. In addition, absolute and relative frequencies and chi-square test were used to test different proportions with the answers provided. The statistical significance level considered in this study was $p \leq 0,05$.

Results

Table 1 shows the values for the anthropometric and general characteristics of all 25 athletes who comprised the sample. The total body mass of MMA fighters presented values of 79.5 ± 12.7 kg and mean height of 176.4 ± 7.5 cm. The age at which the athletes began to practice MMA presented mean values of 16.0 ± 4.8 years in a range of 7–28 years. Regarding the number of competitions the athletes participated in 2015, the mean values were 3.0 ± 1.4 competitions in a range of 1 - 6 competitions. For the number of victories in 2015, the athletes presented 2.2 ± 1.1 victories, in a range of 1 - 6 victories.

Table 1. Anthropometrical variables and general data of Mixed Martial Arts athletes.

Variables (n=25)	Mean±SD	Min.–Max.	Standard error
Age (years)	25.4±4.1	18-35	0.82
Total body weight (Kg)	79.5±12.7	60-104	2.53
Height (cm)	176.4±7.5	154-188	1.50
Age (years) when started practicing	16.0±4.8	7-28	0.95
Age (years) when started competing	19.6±3.7	12-28	0.74
Number of competitions	3.0±1.4	1-6	0.27
Number of victories	2.2±1.1	1-6	0.22

Table 2. Historical body weight in Mixed Martial Arts fighters.

Variable (n=25)	Mean±SD	Min.–Max.	Standard error
Weight during vacation (kg)	82.2±12.1	65-105	2.47
Higher weight loss (kg)	13.9±4.2	3-21	0.83
How much weight lost (kg)	9.3±3.2	1-18	0.63
How many times the athlete lost weight	3.3±1.9	1-10	0.37
How long to lose weight (days)	24.5±11.5	3-60	2.29
Weight recovered after a competition (kg)	9.5±4.4	3-20	0.88

Table 3. Techniques of rapid weight loss used by Mixed Martial Arts athletes.

Techniques (n=25)	Always n (%)	Sometimes n (%)	Almost never n (%)	I don't use anymore n (%)	Never n (%)	Total n (%)	P-value
Gradual diet*	14(56)	9(36)	-	2(8)	-	25(100)	0.0001
Reduced fluid intake*	18(72)	6(24)	1(4)	-	-	25(100)	0.0001
Exercise more than usual*	13(52)	7(28)	4(16)	-	1(4)	25(100)	0.0001
Training intentionally in heated rooms*	8(32)	13(52)	3(12)	-	1(4)	25(100)	0.0001
Sauna*	15(60)	8(32)	-	-	2(8)	25(100)	0.0001
Training with rubber/plastic suits	11(44)	11(44)	1(4)	-	2(8)	25(100)	1.00

*Chi-square test with significant level lower than 0.05 for the calculation of differences between methods

Table 2 shows the values of body weight history for the 25 athletes who comprised the sample. The weight of the fighters during the vacation period was heterogeneous 82.9 ± 12.1 kg due to the fact that they compete in different weight categories. The highest amount of weight the athletes lost was 13.9 ± 4.2 kg and they usually lose 9.3 ± 3.2 kg on average before a competition. The same athletes lost weight 3.3 ± 1.9 times in the last 12 months, and it takes approximately 24.5 ± 11.5 days. When observing the post-competition weight gain, the mean values were 9.5 ± 4.4 kg, in a range of 3 - 20 kg. The mean age at which the fighters started these weight loss cycles presented average values of 20.7 ± 2.9 years, in a range of 15 - 28 years.

Table 3 shows the most frequent weight loss techniques used by the MMA fighters who comprised the sample. Reduced fluid intake was the most representative technique (72%); other methods included sauna (60%), gradual diet to lose weight in two weeks (56%), exercise more than usual (52%), and training in hot places (32%).

Table 4 presents the percentages of individuals who influenced the MMA athletes of this study for rapid weight loss before a competition. The coach (72%) was the person who most encouraged the fighter to lose weight, followed by training colleagues and older athletes (both 64%). Relatives (72%) and the doctor (56%) were the people who showed no influence on the fighters.

Discussion

MMA is a recent sport, categorized by body weight, in which many fighters compete in categories whose weight limit is below their actual weight¹⁵. Regarding the anthropometric aspects, the Brazilian fighters of Curitiba, Paraná, are relatively larger and heavier than the athletes studied by Del Vecchio and Ferreira¹⁶, of the City of Pelotas, Rio Grande do Sul, which presented 170 ± 6 cm and 76.0 ± 10.27 kg versus 176.4 ± 7.5 cm and 79.5 ± 12.7 kg obtained in this study. As the MMA fight

Table 4. People who influenced the Mixed Martial Arts fighters to lose weight.

People (n=25)	Influence						P-value
	No influence n (%)	Little influence n (%)	Unsure n (%)	Some influence n (%)	High influence n (%)	Total n (%)	
Training colleague*	1(4)	4(16)	1(4)	3(12)	16(64)	25(100)	0.0001
Fellow fighter*	-	1(4)	2(8)	6(24)	16(64)	25(100)	0.0001
Doctor*	14(56)	-	5(20)	2(8)	4(16)	25(100)	0.0001
MMA coach*	2(8)	1(4)	-	4(16)	18(72)	25(100)	0.0001
Parents*	18(72)	2(8)	-	2(8)	3(12)	25(100)	0.0001

*Chi-square test with significant level lower than 0.05 for the calculation of differences between the influencers.

is categorized by body weight, such anthropometric measures would not be a differentiation in the fight¹⁷.

Regarding the general characteristics of the fighters in this study, they are older, begin to practice and compete later when compared to the study conducted by Mazzocante *et al.*¹⁸, who analyzed 18 Brazilian judo senior fighters, aged 22.7 ± 3.9 years, and who presented 13.8 ± 4.8 years of practice and 10.8 ± 2.1 years of competition. However, when correlating this study with the study conducted by Matthews and Nicholas¹⁹, who analyzed the weight loss in 7 MMA fighters from the United Kingdom aged 24.6 ± 3.5 years, the fighters presented body weight of 69.9 ± 5.7 kg and 3.1 ± 2.2 years of competition, values that are lower than those for the Brazilian fighters, which shows this sport has been practiced for a longer time in Brazil¹.

Regarding the pre-competition rapid weight loss behavior, most athletes of combat sports reduce their body weight few days before the competition to have a competitive advantage over lighter opponents²⁰. This study found that 100% of the fighters lost weight for a competition, with the athletes reporting weight loss of 1 to 18 kg in the period of three to sixty days before a competition, up to 10 times a year.

A study with taekwondo black belt fighters from the State of Rio Grande do Sul obtained 91.3% of fighters who lose weight for a competition, which is very close to the value obtained in this study. Also in the same study, the athletes reported that they lost 1 to 3 kg three to four days before a competition, up to twice a year, which are lower values when compared to this study²¹. However, in another study with jiu jitsu fighters, Ribas *et al.*⁶ reported weight loss of 5.5 ± 4.3 kg about three to ninety days before a competition, up to four times a year.

When studying the pattern of Iranian Wrestlers, Kordi *et al.*²² obtained pre-competition weight losses of 3.3 ± 1.8 kg. When evaluating Brazilian judo athletes, Fabrini *et al.*²³ observed losses of 4.5 ± 3.5 kg. Then, regardless of the type of fight, the athletes use weight reduction techniques; however, these methods may impact the performance and endanger the health of the athlete⁶. It should be noted that this cycle of weight loss and gain does not observe the Code of the World Anti-Doping Agency (WADA)²⁴. In 2013, a Brazilian MMA fighter tried to lose 15 kg in seven days, but he died in a sauna the day before his fight²⁵.

In terms of rapid weight loss methods, the taekwondo (TKD) fighters from Rio Grande do Sul reported that they skipped meals, practiced more exercises, and trained with warm, plastic or rubber clothes²¹. In

the study conducted by Matthews and Nicholas¹⁹, 86% of MMA athletes adopted gradual diet, 86% reduced their fluid intake, 71% exercised more than usual, 43% used a sauna, 71% used a salt water hot tub, and 43% trained with plastic clothes. In the study of Ribas *et al.*⁶, performing more exercises than usual was the most representative technique 86.36%, followed by gradual diet to lose weight in two weeks 63.63%, reduced fluid intake 54.54%, and training in heated areas 54.54%. When investigating judo athletes, Artioli *et al.*²⁶ observed dehydration in 68.4% of them, reduced energy intake in 63.1%, reduced intake of sweets and fats in 47.4%, practice of more exercises in 26.3%, and total or partial restriction of food intake at dinner as the most frequent techniques used by these athletes.

Another study conducted by Perón *et al.*²⁷ with Brazilian Olympic boxing athletes, the authors found that 83.3% of the athletes had a strategy to increase sweating, and the same percentage of 83.3% used fasting or semi-fasting to reach the category weight. In Muay Thai fighters, Ribas *et al.*²⁸ observed that diet 28% and dehydration 34% were the main rapid weight loss methods. These values agree with those obtained in this study, but the techniques used by MMA athletes seem to be more aggressive and promote higher weight loss when compared to other combat sports¹⁹.

However, two situations should be taken into account: first, the techniques that promote dehydration and the methods of extreme diet can cause reduced aerobic and anaerobic performance. Second, the fighters who use these methods do not recognize the harmful effects or do not realize the negative impact on the body²⁶. If they could understand that, they would not use sauna or wear plastic clothes during their training sessions, as these techniques have caused a fatality in MMA in 2013, according to the literature¹⁹.

The negative impacts on the fighter's body include: reduced performance, reduced power, smaller blood and plasma volume, reduced venous return, lower efficiency of the myocardium, reduction in maximum oxygen consumption, weakening of the thermoregulatory process and increase of central temperature during rest and exercise, increased GH and reduced testosterone levels, low immune function, and temporary interruption of growth¹¹.

Regarding the persons who encouraged the MMA fighters to use weight loss techniques, when investigating boxing fighters, Lucena *et al.*²⁹ found that the coach 42% as the person who most influenced the

athlete to lose weight, followed by another fighter – boxing or another type of fight 21%. When investigating jiu jitsu fighters, Ribas *et al.*⁶ observed that the coach 63.6% was the person who most encouraged the fighters to lose weight, followed by training colleagues 40.9%, and older athletes 36.3%. When analyzing TKD athletes, Diniz *et al.*²³ pointed out that physicians has almost no influence on the athlete, and training colleagues had a reasonable to high influence 62.5%. The person who most influenced was the TKD instructor, in 77.7% of the cases.

Although the studies have reported that the person who most encouraged weight loss of the athletes was the coach, Juzwiak and Ancona-Lopez²⁰ suggest that this professional in the various types of fight many times does not have proper knowledge of weight loss strategies to conduct this process with the fighters.

Conclusions

In conclusion, this study observed that rapid weight loss is frequent among the investigated Mixed Martial Arts fighters, who tend to lose 1 to 18 kg during the competition season, and the most frequent methods were increased physical activity, gradual diet, training in heated areas, and reduced fluid intake. It also observed that the MMA coach is the person who most encourages such practice, followed by training colleagues and older athletes. However, this study presents a limitation regarding its method, as the questionnaire has been validated for judo, not for MMA. However, it has been used for different combat sports and fulfills the study objectives.

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