

Sports massage and local cryotherapy as a way to reduce negative effects of rapid weight loss among kickboxing contestants

Authors' Contribution:

- A** Study Design
- B** Data Collection
- C** Statistical Analysis
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Abstract

Background and Study Aim:

Kickboxing is a sport which assumes the division into weight categories. The purpose of the research was to establish how many contestants reduce their body weight before start, and whether classic massage and local cryotherapy help to minimize negative effects of rapid weight loss.

Material/Methods:

The research covered 9 women and 16 men performing kickboxing. The research method was author's questionnaire and chosen tests of motor fitness by Denisiuk.

Results:

In selected groups 33% of contestants reduce their body weight in the pre-start period before every competitions. This reduction, in average, amounts to 4.07% at men and 3.93% at women. The most commonly applied body weight reduction methods included reducing the amount of food and liquids, increased physical activity and procedures in the sauna. During the reduction of body weight, contestants felt deterioration of mood, smaller strength and endurance, and headaches. Functional trials performed during rapid weight loss pointed to regression of results connected with the process of reduction. Massage and local cryotherapy allowed to maintain results of a relatively consistent level, connected to the result preceding the reduction.

Conclusions:

The reduction of body weight before championships turned out to be common practice. The methods of reducing body weight in short time negatively influence the mood of contestants, which may lead to the deterioration of their effort capabilities, and what follows, weaker sports results. The use of massage and cryotherapy allows to maintain strength on a level close to the one before the reduction.

Key words:

kickboxing • combat sports • massage • local cryotherapy • rapid weight loss

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BACKGROUND

Combat sports – disciplines of sports where two contestants fight against each other.

Kickboxing – combat sport where the form of combat are strikes, performed by hands and legs.

Combat sports are disciplines, in which competition bases on direct scuffle of competing parties. **Kickboxing** is included in combat sports, where the form of combat are strikes (performed by hands and legs). Acknowledging the utilitarian aspect (extra-sport confrontation), kickboxing is included in severe means of defense [1].

During the fight, contestants may use both leg and hand techniques, with the exclusion of elbow strikes.

Kickboxing is characterized by short, interrupted effort requiring optimal level of strength, speed and endurance, similarly to boxing, judo or wrestling. Depending on the combat formula (there are five formulas in kickboxing), speed and strength are most emphasized. According to the regulations of the World Association of Kickboxing Organizations), two types of competition may be distinguished: combat on mat (semi contact, light contact) and combat on ring (full contact, low kick and K-1 rules) [2,3].

Table 1. Characteristic of groups.

	Gender	n	Height (\bar{X}) [cm]	Weight (\bar{X}) [kg]	Age (\bar{X}) [years]	Amount of competitions in the year (\bar{X})
Examined group	Women	9	166.0	59.3	22.4	6.6
	Men	16	177.3	72.3	23.2	7.8
Control group	Women	5	163.3	58.5	21.8	6.8
	Men	22	180.2	81.5	22.3	7.4

Weight limits, in which particular contestants start, are a formal condition of admitting to sports competition. Therefore, kickboxers are obliged to adapt their body weight to a particular weight category in a given time. Pursuing this, they use various methods of reducing body weight, such as: reducing the consumption of food and liquids, increasing physical activity, procedures increasing perspiration or medicines [4–6].

The main purpose of the research was to establish the relation between procedures of classic sports **massage** and **local cryotherapy** and disposition at start of kickboxing contestants reducing their body weight before championships.

Detailed purposes concerned solving the following research issues:

1. Do physiotherapy procedures (massage and cryotherapy) significantly influence the reduction of negative effects of reducing body weight of contestants?
2. Are there significant differences in disposition at start at contestants reducing and not reducing body weight before championships?
3. What methods of reducing body weight are preferred by kickboxers?
4. What are the main negative symptoms of pre-start body weight reduction at contestants and what are the ways in which they are trying to reduce them?
5. Does including physiotherapy procedures in the program of direct pre-start preparation have influence on sports results?

The application purpose was to formulate the assumptions and methodical directives for sports physiotherapists, referring to the optima preparation of contestants reducing body weight before starting in championships.

MATERIAL AND METHODS

The research covered 25 female and male contestants performing kickboxing (9 women and 16 men). All the examined contestants reduced their body weight before championships. The weight of female contestants: from 51 to 72 kg, height from 155 to 175 cm. Body weight of male contestants: from 55 to 100 kg, height from 163

to 198 cm. Average age: 22.9. All contestants were on high sports level (held class MM, M or sports class I).

The control group (n=27) included contestants qualified as reducing body weight with similar characteristics (weight, height, age, sports class) (Table 1).

To evaluate physical disposition of the contestants, chosen trials of Denisiuk's motor fitness test were used (test evaluating dynamic strength of the shoulder, back and belly and evaluating explosive strength of lower limbs) [7].

The examined contestants filled an author's questionnaire containing information about, among all, training experience, level of advancement, ways of reducing body weight (if the contestant regularly reduced body weight) and the side effects of these actions.

On the basis of training log books (and after consulting the coach) a predicted, optimal result expected for particular championships is established for every contestant.

The test evaluating dynamic strength of the shoulder, back and belly was based on throwing a medicine ball by both hands from straight knees. The examined contestant was kneeling with both legs in the middle of a mattress with a marked line, performed a throw with a ball weighing 3 kg with both hands from the back of the head. After throwing, the examined contestant performed a pad to the front. The trial was repeated three times, saving the longest throw. The result was achieved by measuring the length with tape from the line on the mattress to the place of the ball's first contact with the ground [7].

The test evaluating explosive strength of lower limbs (power trial) was based on distance jumping from a spot. The examined contestant performed a long jump from a standing position on bent knees, touching the start line with toes. The contestant performed a transfer of upper lower limbs in the bottom to the back, with a simultaneous strike to the front and leg extension. The examined contestant jumped from the floor and made a jump for the largest possible distance, landing on both feet. The

Massage – the manipulation of the soft tissues of the body. This kind of treatment can be used for a specific (therapeutic, recovery, remediation, rehabilitation, condition) purposes.

Local cryotherapy – medical, recovery or rehabilitation treatment use of low temperature.

Rapid weight loss – fast reduction of the total body mass. Especially used for preparation to start in a lower weight category by combat sports competitors.

trial was repeated twice. The result was a measurement of the distance between the starting line of the jump to the place where the back part of the heel touched the ground with precision to 1 cm [7].

The physiotherapy methods used in the experiment were: classic massage and local cryotherapy.

The sports (classic, Swedish) massage was performed on the shoulder and on the back, on the front and back part of the thighs. The massage included the following techniques: stroking, rubbing, acknowledging muscle attachments, squeezing, pressing, tapping and shaking. An average time of one massage procedure was 30 minutes. Each of the techniques was performed slowly and smoothly, without sudden changes in the intensiveness and force. The massage was performed with the biggest possible hand surface, depending on the specifics of the technique, avoiding spot pressure [8,9].

Local cryotherapy with the use of cooling aerosol type “Cool Spray” covered upper limbs and the back, and lower limbs – thighs. Each part of the body was cooled for 2 minutes from the distance of c.a. 15 cm from skin surface by applying the coolant with circular movements, in order to avoid frostbites. Before the procedure, the skin was thoroughly cleaned from humidity and cosmetics [10].

The test began 14 days before the planned start in championships. The examined group was divided into two parts, one of which was subject to classic massage (n=12), and the second – to local cryotherapy (n=13). The physiotherapy procedures were performed in 304 day breaks. In total, massage or cryotherapy was performed five times for each contestant. The first series took place 14 days before official weighing. The remaining series – in 10, 7 and 4 days before weighing. The fifth series was performed on the day of official weighing, when the contestants reached their purpose body weight.

To conduct the examination of empirical data, the following statistical data was used: arithmetic average, standard aberration and student t-test. The minimal level of validity was established on the level of $p < 0.05$ [11].

RESULTS

Among contestants qualified for examination, 33% reduced body weight before every start (the examined contestants participated in average in 7.39 championships in one season), the rest – only before the most important championships.

Contestants reduced their body weight in average for 2.85 kg, which made for 4.02% of their initial weight. More weight was reduced by men – in average 3.19 kg (4.07%), women reduced body weight by 2.19 kg (3.93%).

The reduction of body weight was initiated 9.58 days before official weighing, whereas men devoted a bit more time to this (9.84 days) than women (9.18 days). Contestants undertook the first trial to reduce body weight about the age of 18.

The most popular methods of reducing body weight included: limitation of consumption of food or liquids, increased physical activity, sauna, exercise in special clothes not passing sweat and pharmacological methods. 100% of examined contestants of both sexes pointed to reduction of consumption of food as the main method of reducing body weight. A half of examined contestants also declared reducing the consumption of liquids (87% of women and 75% of men) and increased physical activity (75% of women and 40% of men). Attending sauna was used by 17% of examined contestants (25% of women and 12% of men), and exercise in special clothes not passing sweat was practiced by 37% of examined contestants (44% of men and 25% of women). The pharmacological method was used by only 19% of women (Figure 1).

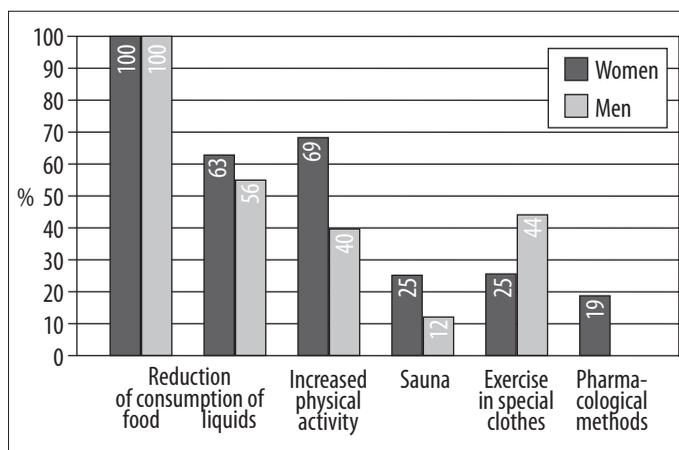


Figure 1. Rapid weight loss methods.

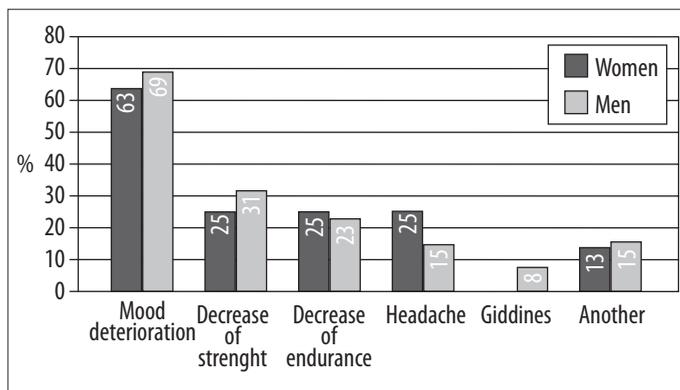


Figure 2. Negative effects of rapid weight loss.

Reduction of the consumption of food was initiated approximately 8.21 days before official weighing. Less liquids were consumed approximately 3.10 days before official weighing. Men usually sustain restrictive diet for a longer time (both for the consumption of food and liquids). About 10 days before start, contestants resorted to increased physical activity (men: 10.6 days before weighing, women: 9.1) to maximize sweating during the training. For this purpose, they also used clothes not passing sweat – in average 8.07 days (men: 7.73, women: 9 days). Significant differences between men and women concern the use of sauna. Men resort to this method longer than diet limitations, women, on the other hand, resort to sauna only on the last day before weighing.

The most common side effects of body weight reduction included: mood deterioration (concerned 63% of women and 69% of men). Every fourth female contestant complained about smaller strength and endurance and headaches. Men, apart from mood deterioration, suffered from smaller strength and endurance. The remaining complaints included, among all: disorder of menstruation, receding hair, smaller sexual drive and aggressive behavior (Figure 2).

Various methods aiming at reducing negative effects of body weight reduction were applied by 43% of examined contestants. Every fourth examined contestant used diet supplements, 14.3% of them prolonged their sleep, 7.5% of them limited the consumption of carbohydrates (only women), 7.7% prolonged the time of every next body weight reductions and 7.7% resorted to massage (only men). Every third examined contestant (63% of women and 21% of men) tried in the past to reduce their body weight permanently; however, positive effects were not attained. The most common reasons for failure were: the inability to change nutrition habits (67% of men and 40% of women), smaller strength (33% of men, 40% of women), bad mood (67% of men, not reported by women), smaller endurance and immunity (33% of men and 20% of women),

lack of time for regular eating (15% – concerns women only) and lack of determination to end the undertaken actions (15% – concerns women only).

The results of power trial for the shoulder, back and belly hovered slightly in the following trials. No statistically significant differences between the results of the first (14 days before the start) and the fifth (1 day before the start) trial in both examined groups (subject to massage and cryotherapy) were noticed. Women who applied “cold spray” noted an improvement in results ($p < 0.05$). The control group featured, however, significant deterioration of results (validity on the level of $p < 0.01$), whereas men has worse results than women (Figure 3).

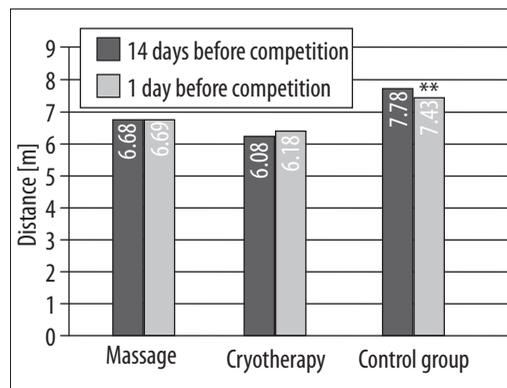


Figure 3. Results of dynamic strength of the shoulder tests (throwing a medicine ball).

The results of force trial of lower limbs were characterized by bigger variation. Most of the contestants 64% achieved a worse result in the fifth trial than in the first one. The smallest difference (statistically insignificant) was noted for the massaged group. Contestants applying cryotherapy procedures jumped worse (in average for 3 cm) for one day before the championships – validity on the level of $p < 0.05$. Bigger percent deterioration of results was observed at women. Contestants not applying any of the procedures featured considerable differences between the first and the fifth measurement (validity on the level of $p < 0.01$), (Figure 4).

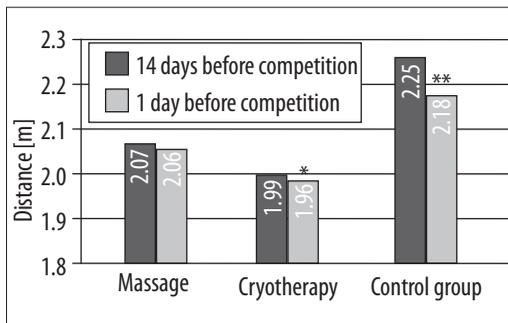


Figure 4. Results of explosive strength of lower limbs tests (long jump).

In the group, 68% executed result assumptions (75% of women and 65% of men). In the group applying cryotherapy, these were 69%, and in the massaged group – 67%. Contestants not applying any of the procedures, in majority, did not execute their training assumptions (Figure 5).

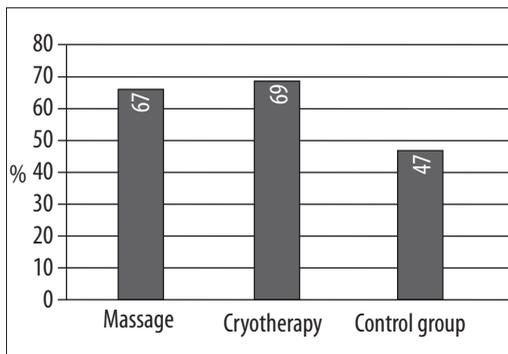


Figure 5. Executing of result assumptions.

DISCUSSION

Reducing body weight is an integral part of disciplined, in which competition is performed with division into weight categories (boxing, kickboxing, wrestling, judo, weightlifting), but also of those, in which there are no formal limitations, but where the weight of the contestant is a factor influencing sports result (ski jumping, rock climbing, some athletic competitions). This issue concerns the majority of professional sportsmen of these disciplines. In the group of kickboxers, 2/3 admitted, that they regularly reduce their body weight before championships. To compare, according to research by Kinigham and Gorenflo, 77% of young American wrestlers reduced their body weight by over 2.27 kg [12], and British wrestlers and boxers in average for 5–10% [13]. There are also cases, where a contestant reduced their body weight by 18% in one week [14]. The rate of weight change varies, e.g. at judo contestants, according to Japanese research, it is 2.8 kg per day [15], and at Australian bodybuilders – 1.4 kg per day [16]. Other research point to a loss of body weight by approximately

1 kg per week, by means of reducing the energy delivered by food up to 100 kJ/kg/day [17].

Alarming data concerns the reduction of body weight by very young sportsmen. Smith and co., by diagnosing young boxers in the age of 14–16 proved that the average percent value of reduced body weight was: 2.8% for women and 2.7% for men [18].

Various aspects of body weight reduction were considered in scientific research all around the world. Hall and co., examining boxers, divided the process of reducing body weight into three stages: natural weight, training weight and the lowest weight achieved during the most important sports event [19]. Fogelholm proved, that, if the time between the weighing and starting in championships is shorter than 5 hours, it is not recommended to reduce body weight by more than 4%, if this time is longer, it is allowed to reduce body weight by 8% [17].

The main method of reducing body weight is limiting the consumption of food [20] or limiting or eliminating from diet some energetic substrates [21]. The next most popular methods include limiting the consumption of liquids, increased physical activity or exercise in warmer, not passing air clothes. This concerned judokas, karate fighters, weightlifter [22] as well as kickboxers. Women practicing kickboxing pointed to the use of pharmacological methods as ways of supporting body weight reduction. It was not specified, whether this concerns diuretics, which, as a matter of fact, may lead to faster weight reduction, minimizing negative effects [23], however, they may lead to serious dehydration. Moreover, the majority of such medicines is not admitted to use by the Anti-doping Code of the World Anti-doping Organization [10].

Negative effects of sudden, pre-start body weight reduction appear at nearly a half of examined contestants. This fact is confirmed by reports in literature, in which the main cause of this state of affairs is the reduction of glycogen supply in muscles, buffer capacity of blood, plasma volume, concentration of plasma proteins and tracylglycerols, vitamin B6 and magnesium, and increase in the concentration of free fatty acids and cholesterol in plasma [5,17,21,24,25]. In comparison, during gradual reduction of body weight, the anaerobic efficiency does not decrease, however, decelerated re-synthesis of glycogen and loss of protein from muscles may influence the sports result [26].

Ziemiański proves, that sudden reduction of 5% of body weight decreases physical efficiency even to 30%, irrespective of the body weight reduction method applied [26]. Physical activity combined with dietetic restrictions

increases plasma activity of keratin kinesis, which points to muscle damage, and this, in turn, increases the risk of injury [22]. It was also proven, that body weight reduction has negative effect on physical disposition of contestants [5].

Bearing in mind the health of contestants, practitioners and theoreticians of sports seek methods of minimizing negative side effects of body weight reduction. It was proven, that dehydration stemming from effort is less harmful than dehydration stemming from thermal factors (sauna, special clothes), in the case of which, together with sweat, contestants lose minerals, that is sodium or potassium, whereas they are used to dehydration stemming from physical activity [10]. Using sauna (popular among male contestants) 24 hours before weighing is far more harmful for a sportsman than a visit to the sauna 48 hours before weighing [27], and the most popular variant practiced by sportsmen is 24 hours before weighing.

A continually bigger role in preparing sportsmen to sports activity is fulfilled by medical staffs, including physiotherapists. Applying physiotherapeutic methods, one may influence the disposition of sportsmen at start. This refers to both mental preparation, and motor preparation. It was proven, that classic massage positively influenced the explosive force of lower limbs at contestants reducing body weight and not reducing body weight. Local cryotherapy, on the other hand, allowed to maintain explosive force at the level from before the weight reduction process. It influences dynamic force at every stage of body weight reduction. Moreover, massage is beneficial to the level of fear measured during championships, compared to the unrest during training, which, in the face if research conducted by Borek [28], may bear great significance for the sports result.

Research over the use of physiotherapeutic methods in preparations of sportsmen should be continued and

conducted on a larger scale. The importance of physical procedures in biological regeneration, rehabilitation and sports training is not to be underestimated.

CONCLUSIONS

1. The main methods of pre-start body weight reduction applied by kickboxers include: reducing the consumption of food and liquids and increased physical activity.
2. A great part of contestants experience negative effects of body weight reduction in the form of bad mood, smaller strength and endurance and headaches. A small number of contestants (less than a half) make any attempts in order to minimize negative effects of body weight reduction; these usually assume diet supplements or longer sleep. Hence, this issue should be acknowledged when constructing plans of direct pre-start preparation for particular contestants.
3. A large group of sportsmen reducing their body weight achieve results below their expectations. Therefore, they particularly should be covered by medical care (medical doctor, physiotherapist, or sports psychologist).
4. Both massage and local cryotherapy caused an improvement of the results of functional trials at contestants reducing their body weight. Despite gradual regression connected with the process of weight reduction, the procedures helped the contestants to maintain strength at a level close to the pre-reduction level.
5. Physical procedures influenced the physical disposition of the majority of contestants; hence research over the use of physiotherapeutic methods should be continued on a wider scale.

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