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Original Article

Weight cutting is widespread among adolescent judoka regardless of experience level: the need of weight control and educational programs

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Abstract:
Problem statement Weight reduction cycles are used by judo athletes to make a weight category. However, the use of rapid weight loss methods can be harmful, especially during adolescence.
Purpose This study aimed to assess and compare weight loss practices and the methods used by novice and experienced adolescent judo athletes Methods One hundred and eight six athletes (age: 13.31 ± 0.6 years) were recruited from an under-15 national competition and completed a validated questionnaire regarding weight loss practices. The athletes were divided into novices (<2 years of competition experience) and experienced athletes Results Weight loss was practiced by 77% of the athletes, beginning at an median age of 12 years (Interquartile range:11-12). There were no significant differences in the rate of medal winning between the participants who had already reported weight loss in order to compete and those who have never lost weight before competitions. Participants of both groups reported to lose about 1kg in the seven days preceding a championship and to regain the same amount during the week after the competition. Weight loss was mainly achieved by increased exercise, training with rubber/plastic suits or in heated rooms.Coaches were considered the most influential source of information for body-mass-control methods. Conclusion Weight cutting is common among adolescent athletes regardless of competitive experience and it has no association with the rate of medal winning. The coach is consideredthe main source of information for body-mass-control-methods, which are based on hypohydration.
KeyWords:**Athletes; judo; adolescence; weight loss**

Introduction

Judo is an Olympic sport practiced worldwide (Artioli et al., 2010c). As in most combat sports, judo athletes are categorized into weight classes that are intended to promote fair competition by matching opponents of similar body size (Langan-Evans, Close, & Morton, 2011). However, many athletes use rapid weight loss (RWL) procedures with the objective of competing against smaller and weaker athletes (Brito et al., 2012;Marquet et al., 2013). The most common weight loss strategies are food restriction , dehydration by prolonged and extenuating physical exercises, saunas, plastic clothing, as well as fluid restrictions (Brito et al., 2012). The adoption of these strategies may lead to negative consequences for the athlete, such as impaired immune functions, psychological and hormonal changes, hyperthermia and an electrolytic imbalance(Artioli et al., 2010c;Fabrini et al., 2010; Kowatari et al., 2001). Studies have reported that the prevalence of weight loss strategies among judo athletes ranges from 69% to 89% and is influenced mainly by athlete´s experience and competitive level (Artioli et al., 2010c;Artioli, Scagliuse, Polacow, Gualano, & Lancha Junior, 2007). Artioli et al. (2010c) found that more experienced or with higher competitive level had a more aggressive weight management behavior. Similar results were also found byEscobar-Molina, Rodríguez-Ruiz, Gutiérrez-García, & Franchini (2015). Although high-level adult athletes have been the focus of most research studies on Judo, it should be noted that these judoka have reported beginning cutting weight still during adolescence (Artioli et al., 2010c; Langan-Evans, Close, & Morton, 2011). The use of these methods would be harmful to athletes in this younger age, as it may impair physical maturation and development and may also improve the risk of developing eating disorders as a consequence of being overly concerned with weight control in weight class sports (Sundgot-Borgen et al., 2013). Only few studies analyzed the weight loss methods used by adolescent judoka (Escobar-Molina, Rodríguez-Ruiz, Gutiérrez-García, & Franchini, 2015;Berkovich, Eliakim, Nemet, Stark, & Sinai, 2016;Mazzoccante, de Sousa, Mendes, Mendes, & Asano, 2016). There is also a lack of knowledge about how judo level of experience may affect these practices in adolescents, as in this population, many individuals' physical characteristics can increase significantly (Sundgot-Borgen et al., 2013), which may stimulate , regardless of experience or competitive level, the use of RWL methods to remain in the same weight category. From an assessment of the methods used for RWL, it is possible to plan educational strategies, in order to aid coaches and dietitians to promote progressive body mass reductions, with no impairment on performance

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or health. Besides, strategies like these could be used as a base for the development of new modality rules in order to promote health during competitive phases. With this in mind, the current study has aimed to assess and compare weight loss practices and the methods used by novice and experienced adolescent judo athletes.

Materials and Methods

Adolescent judo athletes, who participated of the 2011 Under-15 Brazilian Judo Championship in the city of Aracaju (State of Sergipe),were approached randomly and invited to participate in the study. According to the Brazilian Judo Confederation, approximately 300 athletes from all 27 Brazilian states registered for the championship competition. The inclusion criterion was to be registered in the competition, with no restrictions on age or gender. The participants were approached during the competition. They answered a questionnaire concerning their personal identification, weight loss practice and methods. During all procedures, we guaranteed the anonymity of participants, and to maintain the athletes' confidentiality, we required the coaches, parents, and friends to not interfere with the answering of questions and to not observe or comment on the answers.

This study was conducted according to the guidelines laid down in the declaration of Helsinki and all procedures involving human subjects were approved by the Research Ethics Committee of the University Hospital UFS (CAAE – 0032.0.107.000-10).

Weight Loss Practices and Methods - The survey tool used was the Portuguese version of the Rapid Weight Loss Questionnaire (RWLQ), which was previously validated in a sample of Brazilian judo competitors (Artioli et al., 2010a). The Weight Loss Questionnaire is composed of questions regarding participation in judo competitions, athletic achievements, weight history, weight loss methods used, the magnitude of weight loss and individuals (parents, teammates, coaches,experienced athletes, health professionals) that guided/ influenced the weight loss process.

Statistics - All analyzes were performed using SPSS 20.0. Normality was assessed using the Kolmogorov-Smirnov test. The normally distributed variables are presented as mean and standard deviation (SD), whereas the non-normally distributed variables are presented as median and interquartile range (IQR). The categorical variables are presented as relative frequencies. The participants were divided into novices athletes (adolescents with less than two years of competition experience) and experienced athletes (participants with a competition experience of more than two years) (Welch & Tschampl, 2012). Student's t-tests and Pearson's chi-square test were used to compare numerical and categorical variables between groups, respectively. Non-parametric continuous variables were compared using the Mann-Whitney test. The significance level was set at $p<0.05$.

Results

One hundred eighty six athletes from 27 of the 26 Brazilian states participated of the study, who represents a response rate of 62 %. One hundred nine athletes (58.6%) were males. Fourty seven athletes were novices (25,2%), while one hundred thirty nine were experienced (74,8%). There were no significant differences in the prevalence of females between groups (Novices: 48%, Experienced: 38.8%). The demographical characteristics and the competitive level of the athletes are described in Table 1.

Table 1. Characteristics of the judo athletes participating in a Brazilian Under-15 Championship.

Variables	Novices (n=47)	Experienced (n= 139)	All (n=186)
	Mean ± SD	Mean ± SD	Mean ± SD
Weight (Kg)	54.4 ± 17	53.4 ± 14	53.64 ± 14.85
Age (years)	13.15 ± 0.7	13.4 ± 0.6	13.31 ± 0.6
Age began Judo training (years)	9.9 ± 2.3*	6.7 ± 2.2	7.57 ± 2.67
Age began Judo competitions (years)	11.7 ± 1*	8.14 ± 2	9.03 ± 2.34
Time competing (years)	1.46±0.7	5.2±2*	4.3±2.3
Competitions during the past year (number)	8.6 ± 5.8	11.2 ± 6.3*	10.56 ± 6.27
Medals during previous year (number)	7.5 ± 5.5	10 ± 6*	9.35± 6.03
Competitions with medals (%)	82 ± 29	88± 23	86.05 ± 24.97
Competitive level	n (%)	n (%)	n (%)
First time in a national competition	26 (55.3)#	32 (23.2)	58 (31.4)
Won a medal in a national competition	6 (12.8)	61 (43.9)#	67 (36)
Participated of a regional level competition	44 (93.6)	129 (93.5)	173 (93.5)
Won a medal in a regional level competition	38 (80.9)	122 (88.4)	160 (86.5)
Participated of a state level competition	43 (91.5)	137 (99.3)#	180 (97.3)
Won a medal in a state level competition	43 (91.5)	135 (97.8)	178 (96.2)

* Independent samples *t* test - $p<0.05$; # Pearson's χ^2 test - $p<0.05$; Novices: adolescents with less than two years of competition experience; Experienced: adolescents with more than two years of competition experience.

The experienced athletes began to compete and train judo at a younger age than the novices ($p<0,05$). The novices had less competition experience and won a lower number of medals during the previous year ($p<0,05$), however, there was no difference in the percentages of competitions in which medals were won.

The novices showed a higher prevalence of athletes who were participating of a national competition for the first time, while experienced athletes showed a higher percentage of individuals who won a medal in a national competition and participated of state level competitions ($p<0.05$).

One hundred forty-four athletes (77.4%) have already lost weight to compete (72.3% in the novice group and 79.1% in the experienced group). There were no significant differences in the rate of medal winning between the participants who had already reported weight loss in order to compete and those who have never lost weight before competitions (Lost weight : 90±32%, had never lost weight : 86±22%, $p>0,05$). Table 2 shows the athletes' weight loss history.

Table 2. Athletes' weight loss history.

Variables	Novices (n=34)	Experients (n= 110)
	Median (IQR)	Median (IQR)
Age began losing weight (years)	12.00 (12-13)	12.00 (11-12)
Highest amount of weight lost (kg)	2.00 (1.9-3)	3.0 (1.8-4.)
Usual amount of weight loss (Kg)	1.00 (0.5-2)	1.00 (0.5-2)
Usual time of weight loss (days)	7.00 (1-7)	7.00 (1-14)
Weight gain post-competition (Kg)	1.00 (0.5-2)	1.00 (1-2)

*Mann Whitney test ($p<0.05$ Statistical difference in group comparison);
IQR= Interquartile Range
Novices: adolescents with less than two years of competition experience; Experienced: adolescents with more than two years of competition experience.
*Note.*Only athletes who reported to lose weight before competitions were analyzed.

Experienced athletes started weight loss practices at a younger age ($p<0.05$). Participants of both groups reported to lose about 1kg in the seven days preceding a championship and to regain the same amount during the week after the competition. There was no difference between groups in the maximum amount of weight loss ever achieved. Coaches were considered the most influential source of information for body-mass-control methods by both groups. The health practitioners, such as the physician and the dietitian, were often reported to be a little or not influential (Table 3).

Table 3. Frequency analysis of the persons who are influential on the weight management behaviors reported by the judo competitors.

Influences	Novices(n=50)		Experienced (n=94)	
	None/Little influence (%)	Strong/Moderate influence (%)	None/Little influence (%)	Strong/Moderate influence (%)
Team Mate	29.4	70.6	45.4	54.6
Experienced athletes	67.6	32.4	49.1	50.9
Physician	70.6	29.4	83.3	16.7
Physical Trainer	47.1	52.9	41.7	58.3
Coaches/ Sensei	8.8	88.2	22.2	76.9
Parents	29.4	70.6	37	63
Dietitian	73.5	26.5	74.8	25.2

Novices: adolescents with less than two years of competition experience; Experienced: adolescents with more than two years of competition experience

There was no significant difference between groups in the frequency of the weight loss methods used, therefore, data were pooled (Figure 1). Athletes reported to use a combination of hypohydration inducing methods (e.g., restricted fluid ingestion, training with plastic or rubberized suits under the judo uniform, and spitting) increased exercise and decreased food intake. Less than 40% of the participants reported to have lost weight by gradual dieting.

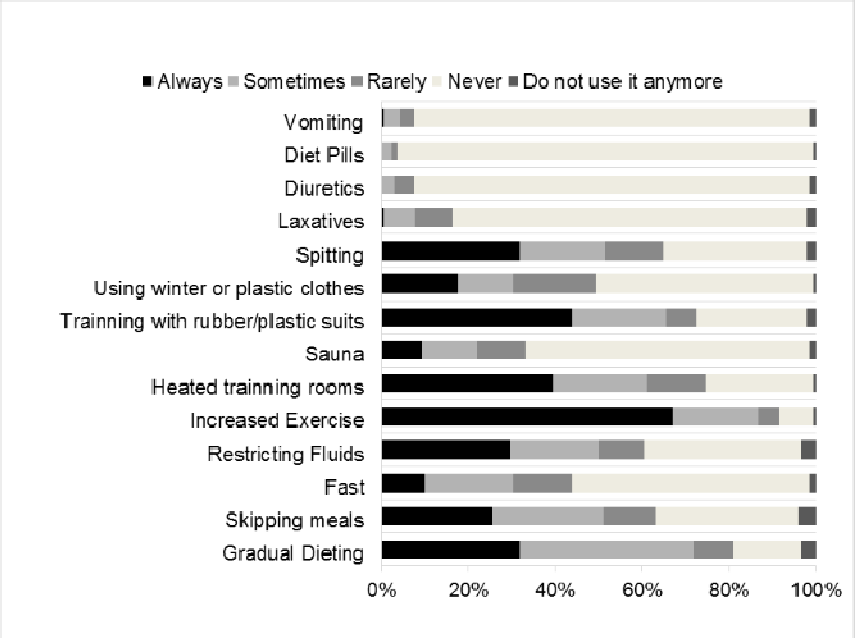

Figure 1. Frequency analysis of methods used for weight loss by judo athletes. Novices: adolescents with less than two years of competition experience; Experienced: adolescents with more than two years of competition experience.

Discussion

Rapid weight loss can affect fighter's health (Brito et al., 2012), so it is important to know the prevalence and create strategies that restrict the practice of weight loss in adolescent judokas. This study investigated and compare weight loss methods used by novice and experienced adolescent judo athletes. The main results indicated that, approximately 77% of all participants reported having reduced their weight at least once in their competitive career. The prevalence and magnitude of the weight loss was similar to that reported in the few other studies performed in adolescent judo athletes (Escobar-Molina et al.,2015;Berkovich, Eliakim, Nemet, Stark, & Sinai, 2016;Mazzoccante, de Sousa, Mendes, Mendes, & Asano, 2016). Studies on combat sports have demonstrated that adult athletes begin these practices at an early age (Brito et al., 2012; da Silva Santos, Takito, Artioli, & Franchini, 2016). However, they often report a higher prevalence and also a higher magnitude of weight loss. Brito et al. (2012) found that adult judokas reported losing approximately 5.2 kg in a week. These results suggest that competitive judo athletes may begin to use weight loss methods during adolescence and these practices may become more agressive during adulthood.

To our knowledge, this is the first study that compared the prevalence and the weight loss methods used by novices and experienced adolescent judokas. Athletes´ competition experience and/or competitive level have been described as some of the factors that may influence the use of weight loss strategies in adult athletes. Artioli et al. (2010c) found that adult national-level athletes had a more aggressive weight loss behavior than regional-level competitors. Escobar-Molina et al. (2015) found that Senior judokas reported higher use of weight loss methods one week prior competition compared to Junior athletes. It appears that highly competitive/experienced athletes may suffer greater pressure to lose weight to remain in the same category, or feel that more extreme behaviors are natural as they started practicing them earlier in life (Artioli et al., 2010c).

Although the novice athletes reported having only two years of competition and a lower competitive level, there was no difference in the prevalence of weight loss practices or in the weight loss methods used between groups. Our hypothesis is that, differently from adult judoists, young athletes will face more difficulties in remaining in the same weight category for a long time due to increased physical growth. Teenagers are also easily influenced by the environment, which may increase the risk of using the weight loss methods recommended by their coaches and other judo athletes instead of consulting a health professional (National Research Council, 2011).

It should be noted that risk taking behaviors appear greater during adolescence relative to childhood and adulthood and is associated with subcortical systems known to be involved in cognitive control and emotional regulation. Casey, Jones & Hare (2008) suggest an exaggerated increase in adolescents´subcortical activation (accumbens and amygdala) when making risky choices and processing emotions. Therefore, when faced with an immediate personal decision, adolescents will rely less on intellectual capabilities and more on feelings. In other words, when a poor decision is made in an emotional context (e.g. anxiety for competing or fear of losing or not fitting into the weight category) , the adolescent may know better, but the salience of the emotional context

biases his or her behavior in opposite direction of the optimal action (eg. the use of rapid weight loss strategies) (Casey, Jones, & Hare, 2008).All these issues (physical growth, personality and greater emotional reactivity) may estimulate the use weight loss methods in adolescent judokas regardless of competition experience or competitive level.

Most methods used by the athletes were based on dehydration, which can be harmful, especially during adolescence. The loss of body fluids from exercise in hot environments and the use of plastic clothing, laxatives, and diuretics can compromise the thermoregulatory process and the electrolytic equilibrium, especially for calcium, which can result in lower bone mineralization and cause stress fractures (Brito et al., 2012). Cyclic changes in body mass may also cause an hormonal imbalance, loss of fat-free mass and increased risk of eating disorders (Marquet et al., 2013,Rankin, 2002).

A few studies investigated the association between RWL and competitive success in judo. In the present study, there was no significant difference in the rate of medal winning between the participants participants who had already reported weight loss in order to compete and those who have never lost weight before competitions. Similar results were found by Artioli et al. (2010c). On the other hand, Reale et al. (2016) observed, in real life judo competition, that the more successful athletes recorded the greatest amount of weight regain compared with their less successful counterparts. While studies are scarce and inconclusive, the impact of RWL on competitive success remains elusive, especially when considered the great number of variables defining wins and losses (Franchini, Brito, & Artioli, 2012). Adolescent athletes should be advised that it´s possible to achieve success in combat sports without using rapid weight loss strategies, as success in judo is determined by multiple factors which are negatively affected by the use of RWL strategies, including aerobic and anaerobic fitness, strength, power, psychological state, skill and technical proficiency (Reale, Slater, & Burke, 2017).

In 1997, after the death of three athletes by dehydration, the American National Collegiate Athletic Association (NCAA) changed the wrestling competition rules in order to reduce weight loss practices, with much success having been achieved on this approach (Davis et al., 2002). Researches suggest the need of a change in the rules concerning weight loss practices in judo (Artioli et al., 2010b). Some authors have tested height as a method of categorizing combat sport athletes in competitions, in order to reduce concerns about dropping body mass, but further research is still needed (Dubnov-Raz, Mashiach-Arazi, Nouriel, Raz, & Constantini, 2015). Small changes such as establishing the weigh-in immediately before the matches and monitoring the hydration status during the weigh-in and throughout the season are feasible and these might reduce the prevalence of these methods (Artioli et al., 2010b). The development of educational programs in order to increase awareness among parents and coaches, as well as the inclusion of dietitians in the training team may also be effective.

Despite the relevance of the results of this study, some methodological limitations must be taken into consideration. As the data collection was performed during a competition, it was not possible to measure the athlete´s body weight because some changes may have occurred in the athlete´s usual body mass between the preparation phase, the weigh-in and the fights. The use of self-reported measures is also another limitation, however, the questionnaire applied was validated in Brazilian judokas (Artioli et al., 2010a), and therefore, considered an appropriate tool for the present study.

Conclusions

The present study shows that weight cutting is common among adolescent athletes, regardless of competitive experience, and it has no association with the rate of medal winning . The coach is considered the main source of information for body-mass-control-methods such as increased exercise, training with rubber/plastic suits or in heated rooms.

Conflicts of interest

We wish to confirm that there are no known conflicts of interest associated with this publication.

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