

# Prevalence, Magnitude, and Methods of Rapid Weight Loss among Judo Competitors

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FERNANDA BAEZA SCAGLIUSI<sup>3</sup>, MARIANE TAKESIAN<sup>1</sup>, MARINA FUCHS<sup>1</sup>,  
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## ABSTRACT

ARTIOLI, G. G., B. GUALANO, E. FRANCHINI, F. B. SCAGLIUSI, M. TAKESIAN, M. FUCHS, and A. H. LANCHA. Prevalence, Magnitude, and Methods of Rapid Weight Loss among Judo Competitors. *Med. Sci. Sports Exerc.*, Vol. 42, No. 3, pp. 436–442, 2010. **Purpose:** To identify the prevalence, magnitude, and methods of rapid weight loss among judo competitors. **Methods:** Athletes (607 males and 215 females; age =  $19.3 \pm 5.3$  yr, weight =  $70 \pm 7.5$  kg, height =  $170.6 \pm 9.8$  cm) completed a previously validated questionnaire developed to evaluate rapid weight loss in judo athletes, which provides a score. The higher the score obtained, the more aggressive the weight loss behaviors. Data were analyzed using descriptive statistics and frequency analyses. Mean scores obtained in the questionnaire were used to compare specific groups of athletes using, when appropriate, Mann–Whitney *U*-test or general linear model one-way ANOVA followed by Tamhane *post hoc* test. **Results:** Eighty-six percent of athletes reported that have already lost weight to compete. When heavyweights are excluded, this percentage rises to 89%. Most athletes reported reductions of up to 5% of body weight (mean  $\pm$  SD:  $2.5 \pm 2.3\%$ ). The most weight ever lost was 2%–5%, whereas a great part of athletes reported reductions of 5%–10% (mean  $\pm$  SD:  $6 \pm 4\%$ ). The number of reductions underwent in a season was  $3 \pm 5$ . The reductions usually occurred within  $7 \pm 7$  d. Athletes began cutting weight at  $12.6 \pm 6.1$  yr. No significant differences were found in the score obtained by male versus female athletes as well as by athletes from different weight classes. Elite athletes scored significantly higher in the questionnaire than nonelite. Athletes who began cutting weight earlier also scored higher than those who began later. **Conclusions:** Rapid weight loss is highly prevalent in judo competitors. The level of aggressiveness in weight management behaviors seems to not be influenced by the gender or by the weight class, but it seems to be influenced by competitive level and by the age at which athletes began cutting weight. **Key Words:** WEIGHT CONTROL, WEIGHT CLASSES, SURVEY, ATHLETES, MARTIAL ARTS

Judo is an Olympic sport practiced worldwide. Judo competitions sort competitors into weight classes, as in wrestling and other combat sports. The purpose of the classification is to ensure equitable matches in strength, agility, and leverage. Despite this effort, several studies with wrestlers have shown that a large number of athletes significantly reduce their body weight a few days before competitions in an attempt to gain an advantage against lighter, smaller, and weaker opponents (2,12,17,19). To qualify in a lighter weight division, these athletes use a combination of several potentially harmful weight loss methods such as severe restriction of food and fluid intake, exercising in

rubber or plastic suits, using saunas, taking diet pills, and even vomiting (2,8,17,19,21,22). Throughout a season, these athletes regularly participate in many competitions and are therefore causing their body weight to fluctuate (19).

Since 1970, several surveys have characterized harmful rapid weight loss behaviors among wrestlers (2,8,12,13, 15–19,21,22). However, to the best of our knowledge, only a few studies have addressed weight management patterns in judo competitors and female athletes (6,9). In these studies, only a small number of athletes were evaluated (i.e., 20–30 athletes), and all of them were elite competitors. Therefore, the information available regarding rapid weight loss behaviors among this population is limited, and a large survey including athletes from a broad range of ages and competitive levels, and of both genders, has yet to be conducted.

Despite a position stand by the American Medical Association (3) and two by the American College of Sports Medicine (1,14) clearly rejecting the unhealthy weight management practices adopted by wrestlers, a large number of athletes persist in constantly undergoing rapid weight reduction. In 1997, the deaths of three young athletes preparing for wrestling competitions were related to severe acute dehydration and hyperthermia, which are both adverse

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effects associated with rapid weight loss (4). After these tragic events, certain rules were changed by the National Collegiate Athletic Association (NCAA) in the USA (e.g., a minimum competitive weight was established for each athlete on the basis of the preseason weight and body composition; the time between weigh-ins and first matches was reduced; harmful weight loss methods were prohibited). As a result, rapid weight loss behaviors among wrestlers have become less harmful and aggressive (2,8,18).

Indeed, the effectiveness of rule changes in NCAA wrestling competitions was only possible because they were based on scientific evidence provided by many surveys on rapid weight loss. Despite some similarities between judo and wrestling, the main factors that drive weight loss behaviors are quite different (e.g., the weight classification system, the number of competitions per year, the scheduling and organization patterns for competitions). For example, collegiate wrestling competitors are divided into 10 weight classes and interscholastic into 14 weight classes, whereas judo comprises only 7 weight classes. The smaller number of weight classes results in a greater weight interval between them, which may lead athletes to adopt more severe weight loss behaviors. Furthermore, judo competitions also include women athletes, which are believed to be more prone to aggressive weight management behaviors (10). Consequently, findings from studies of wrestling athletes cannot be strictly extended to judo athletes.

Considering the popularity of judo around the world, the number of athletes at risk for health injuries due to rapid weight loss has become a concern in the sports medicine field. Thus, further studies should be conducted to characterize the patterns of rapid weight loss in judo. In view of this, the aim of the present study was to evaluate the patterns of rapid weight loss in a large sample of competitive judo athletes.

## METHODS

**Participants.** Eight hundred twenty-two athletes (607 males and 215 females) were sampled between 2006 and 2008. To be included, participants had to be older than 12 yr and be active judo competitors. The athletes were required to answer a questionnaire considering the last or the current competitive season, if the data were collected at the beginning or at the end of the season, respectively.

The survey was conducted during minor local open tournaments as well as major regional (São Paulo city and São Paulo state tournaments), national (Brazilian national tournaments, and international competitions (Pan-American Games and World Judo Championship—both occurred in Rio de

TABLE 1. Main characteristics of the judo competitors (all athletes were included in the analysis).

Variable	Question	Mean ± SD	Range
Age (yr)	1	19.3 ± 5.3	12–46
Weight (kg)	5	70 ± 17.5	29–150
Height (cm)	6	170.6 ± 9.8	138–197
Age began practicing judo (yr)	3	9.1 ± 4.5	3–42
Age began competing in judo (yr)	4	10.7 ± 4.2	4–42

TABLE 2. Weight history reported by the judo competitors (all athletes were included in the analysis).

Variable	Question	Mean ± SD	Range
Off-season weight (kg)	12	71.1 ± 19.4	30–168
Most weight lost (kg)	14	4.0 ± 3.1	0–26
Most weight lost (%)	14	6.0 ± 4.0	0–20
No. weight reductions in the last year	15	3 ± 5	0–30
Average weight usually lost (kg)	16	1.6 ± 1.6	0–12
Average weight usually lost (%)	16	2.5 ± 2.3	0–16
No. days in which weight is usually lost	17	7 ± 7	1–60
Age began cutting weight (yr)	18	12.6 ± 6.1	9–42
Weight usually regained in the week after competitions (kg)	19	1.6 ± 1.4	0–8

Janeiro), so a great number of athletes from different regions, ages, and weight classes could be found. In addition, we also invited seven major judo clubs in São Paulo and Recife State to take part in the survey. Therefore, the sample consisted of athletes from a broad range of regions of Brazil, competitive levels, ages, and weight classes.

During the competitions, the participants were approached randomly and invited to participate in the study. All researchers recorded the number of athletes who refused to fill out the questionnaire. During competitions, the average percentage of athletes who responded to the questionnaire was ~90%. The main reason for refusal to participate was a desire to keep focused on competition. During judo club visits, the average percentage of refusal was ~25%, with the main reason for refusal being a lack of time and the rush to go back home after training. All athletes received a complete explanation of the study's objectives, and if the athlete agreed to participate, he/she signed the written informed consent term and then filled out the questionnaire. In the case of minors, the parents or the legal guardian were also provided with the explanations and they signed the written informed consent term. 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. All the procedures received the approval of the university's ethics committee.

**Survey tool.** The survey tool used was the Portuguese version of the Rapid Weight Loss Questionnaire (RWLQ), which was previously validated in a sample of Brazilian

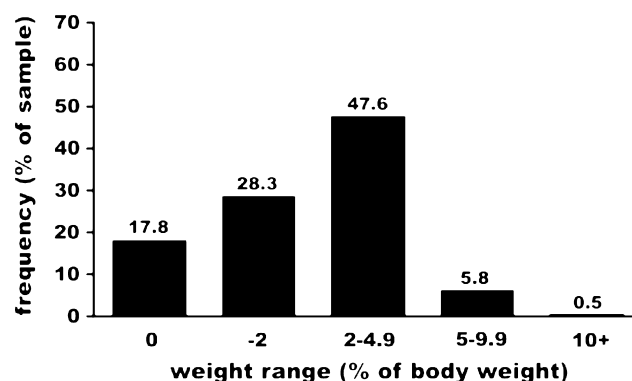


FIGURE 1—Frequency and range of weight usually lost as reported by athletes. (Heavyweights were excluded from analysis;  $n = 773$ .)

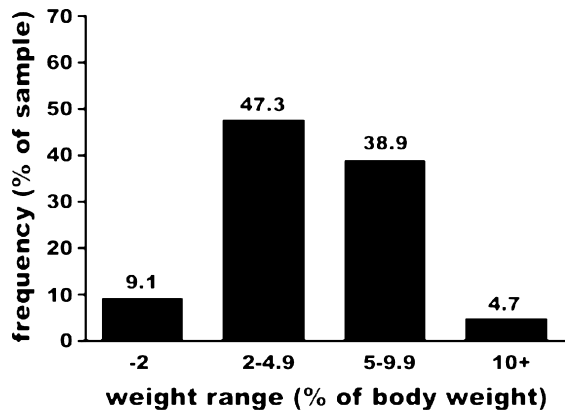


FIGURE 2—Frequency and range of the most weight ever lost as reported by athletes. (Heavyweights were excluded from analysis;  $n = 773$ .)

judo competitors (5). In short, the RWLQ was developed on the basis of questionnaires used in previous studies of wrestlers (2,12,17,19), and it includes questions regarding personal information, competitive level, weight and diet history, and rapid weight loss behaviors. Furthermore, the RWLQ has a scoring system in which the higher the score obtained by an athlete, the more aggressive his/her weight management behavior is. The RWLQ was tested on the basis of its content and its discriminant and convergent validity, as well as its test-retest reliability. The questionnaire was considered valid for content by 10 experts; it was able to clearly differentiate two groups of athletes with known differences in weight management behaviors, and its correlation with an external validated questionnaire (Restraint Scale) was 0.62. Item-by-item reliability analysis showed excellent reproducibility indexes for all items of the questionnaire. Therefore, the survey tool used in the present study is valid and can be accurately answered by a heterogeneous sample of judo athletes (5).

**Statistical analysis.** Descriptive statistics (i.e., mean, SD, range, and frequency analysis) were provided for all variables. To compare the overall severity of weight management behaviors between males and females, we performed a Mann-Whitney  $U$ -test with the scores obtained by both genders. The same test was used to compare the scores obtained by the athletes who had recently changed to a heavier weight class to the scores of those whose weight class had not changed. We performed a general linear model one-way ANOVA to compare the scores obtained by the four following groups: regional-, state-, national-, and international-level competitors; the Tamhane *post hoc* test for unequal variances was used for pairwise comparisons. The same procedure was used to compare scores between athletes who began cutting weight at different ages and between weight classes. All analyses were performed using SPSS 14.0. The alpha level was set previously at 5%. To provide a comprehensive view of weight loss prevalence among judo competitors, heavyweights were included in the descriptive analysis. However, in all other frequency analyses, they were excluded because they do not engage in weight loss procedures.

## RESULTS

Table 1 shows the main characteristics of the subjects. According to their self-reported level of competition, the athletes competed  $10 \pm 7$  times and won medals  $8 \pm 6$  times in the season. The rate of medal winning was  $73 \pm 44\%$ . In addition, 17% of athletes reported that the highest level at which they had competed was regional; 38% had competed at the state level, 24% at the national level, and 21% at the international level.

Including athletes in the heavyweight class, 86% have already lost weight to compete. When heavyweight competitors are excluded from analysis, the prevalence of rapid weight loss rises to 89%. The prevalence was very similar between genders (85.8% among male vs 85.9% among

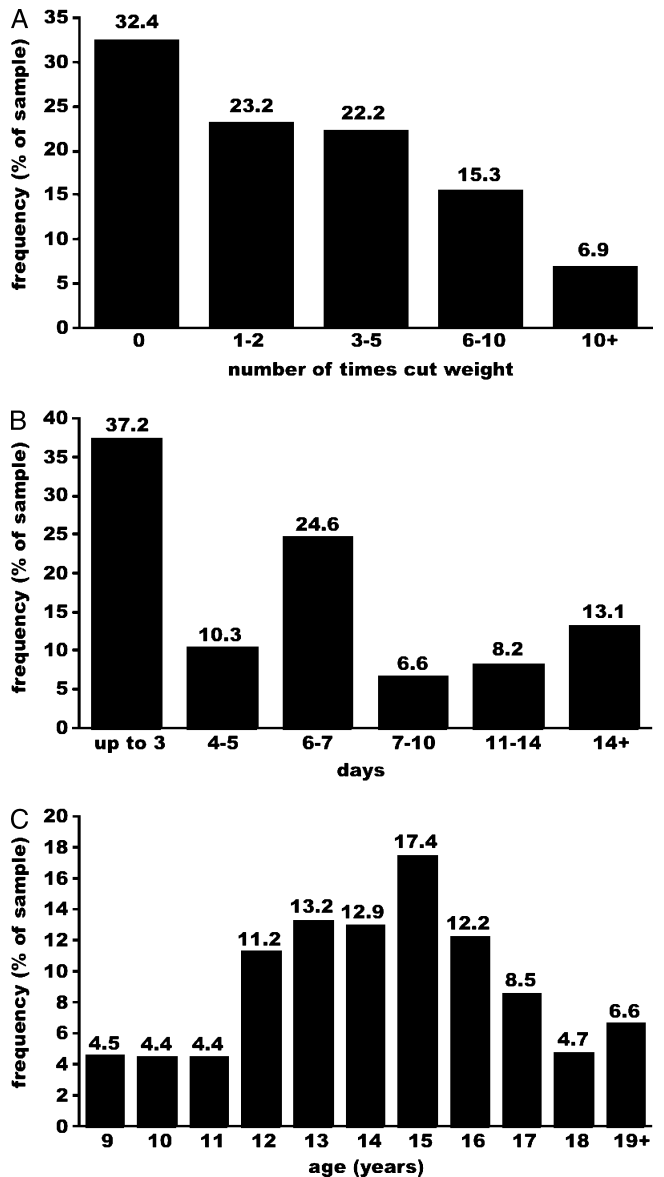


FIGURE 3—Frequency analysis for questions: (A) How many times did you cut weight to compete last season? (B) In how many days do you usually cut weight to compete? (C) At what age did you begin to cut weight? (Heavyweights were excluded from analysis;  $n = 773$ .)

TABLE 3. Frequency analysis of the weight loss methods reported by the judo competitors (heavyweights were excluded from analysis).

Method	Always (%)	Sometimes (%)	Almost Never (%)	Never (%)	Do Not Use Anymore (%)
Gradual dieting	18.4	34.8	16.0	21.5	9.2
Skipping one or two meals	19.3	40.6	13.5	16.6	10.0
Fasting	12.2	23.9	14.7	34.9	14.3
Restricting fluids	20.5	30.3	16.0	22.4	10.8
Increased exercise	61.7	25.0	5.3	3.3	4.7
Heated training rooms	25.5	29.8	15.0	24.3	5.5
Sauna	3.9	11.8	15.9	59.4	9.0
Training with rubber/plastic suits	18.1	21.8	10.9	35.8	13.4
Using winter or plastic suits	12.1	18.2	12.4	47.5	9.7
Spitting	18.9	27.9	17.5	27.6	8.2
Laxatives	3.0	8.3	9.3	66.5	12.9
Diuretics	2.0	6.0	8.2	71.7	12.1
Diet pills	0.9	2.2	3.8	90.1	3.0
Vomiting	0.2	3.1	3.1	90.4	3.1

female athletes). The details of weight history are depicted in Table 2. Frequency analysis revealed that most athletes usually lose up to 5% of their body weight (Fig. 1). Considering the most weight ever lost, most athletes reported reductions of 2%–5%, whereas a high percentage of athletes lost 5%–10% of their body weight or even more than 10% (Fig. 2). Approximately 50% of athletes usually regained up to 1.5 kg in the week after a competition, ~40% regained up to 3 kg, and ~10% regained more than 3 kg.

As shown in Figure 3, most athletes cut their weight up to five times a year to compete, but a significant percentage reduced their weight up to 10 times a year or more. In general, the reductions occurred within a few days before competitions, and the majority of athletes began cutting weight very early in their lives. Table 3 shows the frequency analysis of the weight loss methods used by the participants. Athletes reported that using 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. According to the data presented in Table 4, the persons bearing the most influence on athletes' weight management behavior were the judo coach (sensei), training colleagues, and fellow judokas, whereas dietitians, physicians, and parents were often reported to be a little or not influential at all.

Inferential analysis revealed that athletes who had already switched to a heavier weight class obtained a significantly higher score on the RWLQ compared with those who had stayed in the same weight class (Fig. 4). Surprisingly, male and female athletes showed no difference in their weight management behaviors according to the scores obtained on the RWLQ (Fig. 5). When athletes were separated by level of competition, a significant group interaction was

found ( $P < 0.001$ ); pairwise comparison revealed that state-, national-, and international-level competitors obtained a higher score than regional-level competitors; moreover, international-level competitors obtained significantly higher scores than state-level competitors (Fig. 6). The age at which athletes began to reduce their weight significantly influenced the severity of their weight management behaviors, with higher scores among athletes who started cutting weight earlier (Fig. 7). In contrast, no significant differences were found between different weight classes (Fig. 8).

## DISCUSSION

To the best of our knowledge, this is the first large survey exploring the prevalence and the patterns of rapid weight loss among male and female judo competitors. Overall, our data show that most athletes usually lose weight rapidly before competitions. When heavyweights are not considered, 89% of athletes reported having reduced their weight at least once in their competitive career, whereas 82% were regularly engaged in weight loss practices. The average magnitude of weight reductions was around 5% of body weight, but some athletes underwent even larger reductions in a short period (normally <5 d). Athletes usually reduced their weight roughly 2–5 times a year, although many athletes reduced their weight 6–10 times a year. They had begun to cut weight very early, generally before 15 yr of age. The methods most frequently used were increased exercising, skipping meals, restricted fluid ingestion, and gradual dieting.

The prevalence of rapid weight loss among judo players sampled in this study was very similar to that reported in college wrestlers (89%) (19) and slightly higher than

TABLE 4. Frequency analysis of the persons who are influential on the weight management behaviors reported by the judo competitors (heavyweights were excluded from analysis).

Person	Not Influential (%)	A Little Influential (%)	Unsure (%)	Somewhat Influential (%)	Very Influential (%)
Another judoka	29.3	22.7	3.7	23.8	20.6
Former judoka	35.7	22.4	5.0	21.3	15.6
Physician	75.4	11.0	4.9	5.2	3.6
Physical trainer	53.4	16.5	5.8	14.6	9.7
Judo coach/sensei	29.5	17.5	3.7	25.5	23.7
Parents	51.2	16.0	2.6	14.1	16.2
Dietitian	61.6	13.5	6.0	11.7	7.3



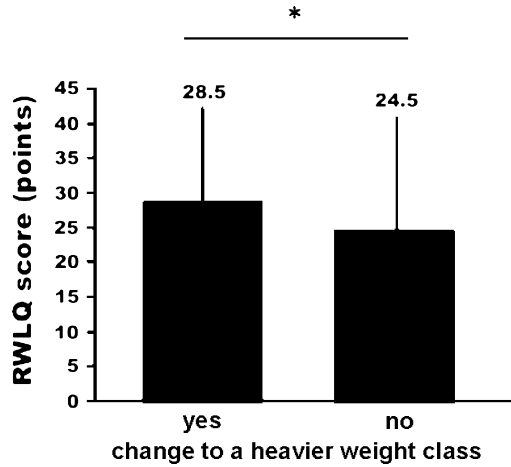


FIGURE 4—Scores obtained in the questionnaire by athletes who had already changed to a heavier weight class and those who had not changed weight class. \* $P < 0.001$ .

reported in high school wrestlers (68%–70%) (12,19). The magnitude of weight reductions found in the present survey (most weight lost ~6% of body weight; weight usually lost ~2%–5% of body weight) was lower than that found in college wrestlers (most weight lost ~10%; weight usually lost ~7%–13%) (19) but in line with that found in high school wrestlers (weight usually lost ~3%–5% of body weight) (12,16) and international-style wrestlers (~5% of body weight) (2). The most frequent methods used by judo players were increased exercise, restricted food ingestion, training in heated rooms, gradual dieting, and fluid restriction, which are in accordance with previous studies conducted among wrestlers (12,17). Although increased exercise and gradual dieting can be considered appropriate methods to achieve weight reduction, a considerable proportion of athletes reported the use of food restriction and hypohydration-inducing methods. Of great concern is that more extreme methods was reported to be used with some frequency (i.e., laxatives = ~20%, diuretics = ~16%, diet pills = ~7%, vomiting = ~6.5%). It is worth noting

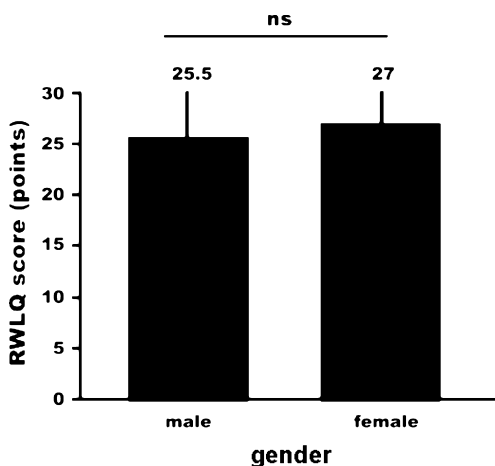


FIGURE 5—Scores obtained in the questionnaire by male and female athletes. ns indicates no significant differences were found.

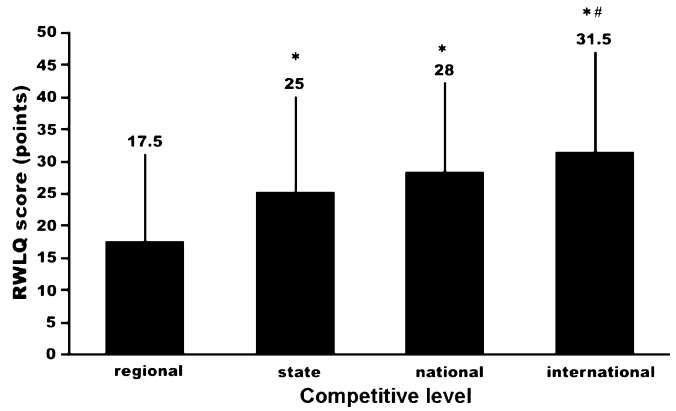


FIGURE 6—Scores obtained in the questionnaire by regional-, state-, national-, and international-level athletes. \*Score significantly higher than that of regional-level competitors,  $P < 0.001$ . ##Score significantly higher than that of state-level competitors,  $P < 0.001$ .

that the frequency of these harmful methods was greater than that found in wrestlers (~2%–5% of athletes engaged in extreme methods such as vomiting, laxatives, and diuretics) (12,17).

Some authors have suggested that women are more susceptible to eating disorders than men (10). Furthermore, eating disorders are often a concern among female athletes, in particular among those engaged in sports in which body weight regulation is a determinant (20). In view of this, we compared the scores obtained on the questionnaire by males and females. Surprisingly, we did not find any significant difference between genders, neither considering prevalence nor level of aggressiveness. This likely occurred because the weight management behaviors in judo are much more related to the immediate needs of individual athletes to reach a given weight than to any eating disorder. In fact, some authors have shown that the apparent bulimic behaviors presented by wrestlers are transient (i.e., athletes are only concerned with body weight during the season) and related to the demands of competition (7). This idea is supported by the higher off-season body weight reported by

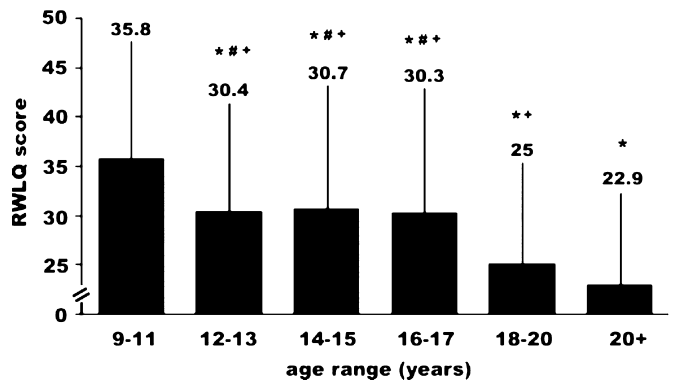


FIGURE 7—RWLQ score obtained by athletes from different age ranges. \*Significantly different from the score for the 9- to 11-yr age range,  $P < 0.05$ . #Significantly different from the score for the 18- to 20-yr age range,  $P < 0.05$ . +Significantly different from the score for the >20-yr age range,  $P < 0.05$ . Note: Only male junior and senior athletes were analyzed.

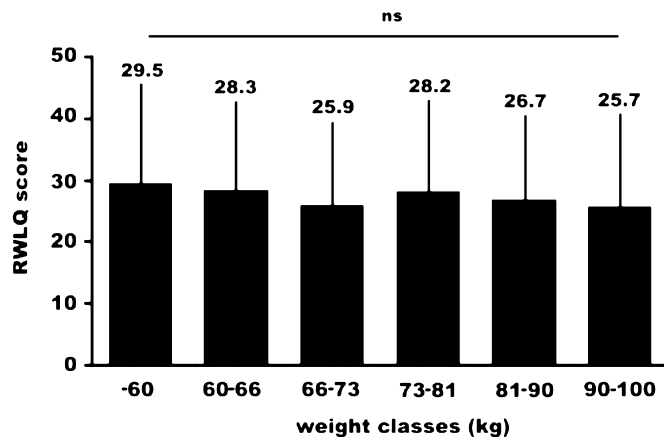


FIGURE 8—RWLQ score obtained by athletes from different weight classes. Note: Only male junior and senior athletes were analyzed.

the athletes in this and other studies (12,17,19). Accordingly, the wrestlers studied by Dale and Landers (7) did not meet the severity level required for a diagnosis of bulimia nervosa. Nevertheless, the possibility of developing eating disorders as a consequence of being overly concerned with weight control in weight class sports cannot be ruled out and needs to be further investigated.

Kinningham and Gorenflo (12) verified an association between the age at which wrestlers began cutting weight and more extreme weight management behavior. The same pattern was found in our study: judo athletes who began cutting weight at earlier ages obtained a higher score on the questionnaire. Although we cannot provide a full explanation for this, we can speculate that the pressure and influence exerted by former athletes, coaches, and other judo players lead certain athletes to more extreme and improper weight management behavior, which includes starting at earlier ages. Alternatively, these athletes may feel that more extreme behaviors are natural as they started practicing them earlier in life.

Surveys of rapid weight loss have found equivocal data on the relationship between competitive level and weight loss behaviors. Oppliger et al. (17) found no difference in weight management behaviors between athletes with different winning percentages (i.e., more than 75% wins, from 50% to 74%, or less than 50% wins). Furthermore, Kinningham and Gorenflo (12) found an association between the frequency of rapid weight loss and the number of matches, which in turn, was not related to the win/loss percentage. These authors concluded that harmful weight loss practices are common at all levels of competition and not limited to elite athletes. In contrast, data from Alderman et al. (2) indicated that successful athletes (i.e., those who place in international-style wrestling competitions) regained more weight after weigh-in than did their less successful counterparts (i.e., nonplacers). Our data show a marked tendency for higher-level athletes to be more aggressive in their weight loss behaviors. Although we do not believe that reducing weight is a requirement to achieve high-level performance in

judo, which was also previously demonstrated in wrestling (11), it is likely that a high competition level in judo assumes a long-term career built in a single weight class. Changing to a different weight class would imply facing new opponents and, therefore, changing all tactical preparations. Likewise, a new weight class would cause problems in strength, leverage, and agility adaptations. This probably leads athletes to compete as long as they can in the same weight class, which might explain why they showed a worse weight loss profile in this study.

Another interesting finding of the present study is that the athletes who had already switched to a heavier weight class presented more aggressive weight management behavior than those who never changed weight class. Switching to a heavier weight class generally implies smaller needs in weight reduction. However, these athletes probably decided to change their weight class because the competitive advantages of weight reduction were no longer compensating for the sacrifices necessary to qualify in a lighter weight class. Considering that the scoring system does not only evaluate current weight management behaviors but also the history of weight loss, it is expected that athletes with a previous history of extreme behaviors (as could be the case for those who gave up competing in a given weight class) obtain a higher score than athletes who never presented extreme weight management behavior.

The persons who were most influential in leading athletes to reduce their weight were the judo coach/sensei, training colleagues, and former athletes, which is in accordance with reports from wrestlers (12,17). Interestingly, physicians, dietitians, and parents, who obviously could provide the best advice for weight management, were often reported as not being strong influences. This is important for the development of educational programs aiming to reduce the weight-cutting problem among judo competitors. Because they are the most frequent source of information for athletes, educational programs should focus on providing them with full explanations of how to properly advise athletes about healthy weight management procedures.

In addition to the intrinsic limitations to any self-report, the major limitation of this study was the use of a non-probability convenience sample. Considering the continental dimensions of the country in which the survey was conducted, a design allowing an equal probability of athletes' selection from all over the country would be impractical. Therefore, we cannot entirely ensure that the population sampled in the present study is representative of Brazilian-wide judo competitors, and caution should be exercised to extrapolate the present findings to other judo populations. However, we collected the present data during different competitions where a large number of athletes from different regions, ages, and competitive levels could be found. Moreover, the athletes were randomly invited to participate in the study, and the rate of acceptance was relatively high. Finally, general data (e.g., weight and height) were found to be normally distributed, and a great part of the data obtained are

in accordance with previous studies that used different sampling methods (16,17,19). Altogether, these facts suggest good internal control and absence of any important bias, therefore minimizing the impact of the nonprobability sample used in this study.

In conclusion, this survey provides a comprehensive overview of the prevalence, magnitude, and patterns of rapid weight loss among judo players. We demonstrate that rapid weight loss patterns among judo competitors have some similarities to those reported in college wrestlers and that gender does not influence them. In particular, the prevalence of athletes engaged in weight loss procedures and the magnitude of the weight reductions are similar, especially considering the studies performed after the NCAA rule changes. However, we observed a larger number of athletes undergoing extreme methods of weight reduction, possibly because judo competitions do not include any type of regulation for controlling weight cutting as the NCAA does. According to data from Alderman et al. (2), the same wrestlers who had improved their weight management behaviors during the NCAA collegiate season showed an unhealthy profile of ag-

gressive weight control when competing in international-style wrestling, which does not have any programs against weight cutting. This finding reinforces the importance of rules aiming to prevent rapid weight reduction. Several studies have clearly shown the positive impact of the NCAA program on the weight management behaviors of athletes (8,16,18). Therefore, the International Judo Federation, in association with other international, national, and regional institutions regulating judo all over the world, should consider the adoption of a program similar to the NCAA's. This could reduce the risk to which athletes are exposed and even avoid tragic events such as those that occurred in 1997 with North American wrestlers.

None of the authors have any conflict of interest regarding this article.

The results of this study do not constitute endorsement by the American College of Sports Medicine.

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## REFERENCES

1. ACSM. Position Stand: weight loss in wrestlers. *Med Sci Sports*. 1976;8(2):xi–xiii.
2. Alderman BL, Landers DM, Carlson J, Scott JR. Factors related to rapid weight loss practices among international-style wrestlers. *Med Sci Sports Exerc*. 2004;36(2):249–52.
3. AMA. Wrestling and weight control. *JAMA*. 1967;201(7):131–3.
4. AMA. From the Centers for Disease Control and Prevention. Hyperthermia and dehydration-related deaths associated with intentional rapid weight loss in three collegiate wrestlers—North Carolina, Wisconsin, and Michigan, November–December 1997. *JAMA*. 1998;279(11):824–5.
5. Artioli GG, Scagliusi FB, Kashiwagura DB, Franchini E, Gualano B, Lancha Junior AH. Development, validity and reliability of a questionnaire designed to evaluate rapid weight loss patterns in judo players. *Scand J Med Sci Sports*. 2009 Sep 28. [Epub ahead of print].
6. Artioli GG, Scagliusi FB, Polacow VO, Gualano B, Lancha Junior AH. Magnitude and methods of rapid weight loss in elite judo athletes (in Portuguese). *Braz J Nutr*. 2007;20(3):307–15.
7. Dale KS, Landers DM. Weight control in wrestling: eating disorders or disordered eating? *Med Sci Sports Exerc*. 1999;31(10):1382–9.
8. Davis SE, Dwyer GB, Reed K, Bopp C, Stosic J, Shepanski M. Preliminary investigation: the impact of the NCAA Wrestling Weight Certification Program on weight cutting. *J Strength Cond Res*. 2002;16(2):305–7.
9. Filaire E, Rouveix M, Pannafieux C, Ferrand C. Eating attitudes, perfectionism and body-esteem of male judoists and cyclists. *J Sports Sci Med*. 2007;6:50–7.
10. Hoek HW, van Hoeken D. Review of the prevalence and incidence of eating disorders. *Int J Eat Disord*. 2003;34(4):383–96.
11. Horswill CA, Scott JR, Dick RW, Hayes J. Influence of rapid weight gain after the weigh-in on success in collegiate wrestlers. *Med Sci Sports Exerc*. 1994;26(10):1290–4.
12. Kiningham RB, Gorenflo DW. Weight loss methods of high school wrestlers. *Med Sci Sports Exerc*. 2001;33(5):810–3.
13. Lakin JA, Steen SN, Oppliger RA. Eating behaviors, weight loss methods, and nutrition practices among high school wrestlers. *J Community Health Nurs*. 1990;7(4):223–34.
14. Oppliger RA, Case HS, Horswill CA, Landry GL, Shelter AC. American College of Sports Medicine position stand. Weight loss in wrestlers. *Med Sci Sports Exerc*. 1996;28(6):ix–xii.
15. Oppliger RA, Landry GL, Foster SW, Lambrecht AC. Bulimic behaviors among interscholastic wrestlers: a statewide survey. *Pediatrics*. 1993;91(4):826–31.
16. Oppliger RA, Landry GL, Foster SW, Lambrecht AC. Wisconsin minimum weight program reduces weight-cutting practices of high school wrestlers. *Clin J Sport Med*. 1998;8(1):26–31.
17. Oppliger RA, Steen SA, Scott JR. Weight loss practices of college wrestlers. *Int J Sport Nutr Exerc Metab*. 2003;13(1):29–46.
18. Oppliger RA, Utter AC, Scott JR, Dick RW, Klossner D. NCAA rule change improves weight loss among national championship wrestlers. *Med Sci Sports Exerc*. 2006;38(5):963–70.
19. Steen SN, Brownell KD. Patterns of weight loss and regain in wrestlers: has the tradition changed? *Med Sci Sports Exerc*. 1990;22(6):762–8.
20. Sundgot-Borgen J. Eating disorders in female athletes. *Sports Med*. 1994;17(3):176–88.
21. Tipton CM, Tchong TK. Iowa wrestling study. Weight loss in high school students. *JAMA*. 1970;214(7):1269–74.
22. Woods ER, Wilson CD, Masland RP Jr. Weight control methods in high school wrestlers. *J Adolesc Health Care*. 1988;9(5):394–7.