

Change of Physical, Psychological Status through Rapid Weight Loss in National Judo Athletes

The present study aimed to investigate rapid weight loss (RWL) and consequent physical and psychological challenges among judo athletes at the national athlete training center in 2017. The following results were obtained. Judo athletes used weight loss methods such as “gradually reduce meal portion,” “skip meals,” “limit water intake,” “wear sweat suit for training,” and “use sauna,” and had physical and mental distress from such unhealthy weight management practices. Information about weight loss was obtained from “colleagues or senior athletes,” “Internet,” and “head coach or coach,” and not experts such as nutritionists or physicians. Thus, athletes are recommended to employ healthy weight control methods based on advice from experts, such as nutritionists and physicians

Key words: Judo players, Rapid Weight Loss(RWL), Physical and mental complaints, Weight management

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INTRODUCTION

Recent society places more value on external, as opposed to internal, qualities and tends to be sensitive toward sociocultural influence ¹. As a result, numerous people attempt to lose weight for health and aesthetic purposes. These people employ various methods of weight loss, such as exercise, dietary strategies, and drugs, and sometimes, people pose a threat to their health by using methods such as a one-food diet, fasting, diuretics, and purgatives ². Neumark et al. ³ suggested that such health-threatening forms of weight loss are associated with physical and psychological problems. Such unhealthy weight control causes harm to people's health. However, there are people who try to lose weight for occupational reasons and not for health or aesthetic purposes. These are elite judo athletes who compete according to their weight divisions ⁴. Judo athletes must meet the weight requirements for their corresponding weight division in an official weigh-in

before the match to ensure fairness in power, agility, and performance ⁵. However, several studies have suggested that athletes engage in rapid weight loss (RWL) for a few days before their match to gain an advantage by meeting the weight requirements for a lower weight division to compete with relatively smaller and lighter athletes ^{6, 7, 8}. The RWL is possible because athletes have a minimum of three hours to a maximum of 24 hours of time after weigh-in until the match to recover ⁵. However, some athletes take extreme measures for RWL (e.g., purgatives, vomiting, fasting, sauna) ^{9, 10} and some even take prohibited drugs such as diuretics ^{11, 12}. RWL has caused death in many athletes in the history of sports. There was an incident in which three college athletes of the National Collegiate Athletic Association (NCAA) died from RWL ⁹. Since then, the NCAA has strived to ensure safety for athletes by implementing new regulations for RWL ^{13, 14}. With the significance of RWL rises, many studies have investigated relevant topics, but there has not been any Korean study investigating

RWL among elite athletes. Therefore, this study aims to investigate RWL and consequent physical and psychological challenges among judo athletes who have trained at the national training center in 2017.

SUBJECTS AND METHODS

Subjects

Elite judo athletes who were selected for the national team in 2017 and trained at the Jincheon National Athlete Training Center were enrolled in this study. From among national athletes who have competed in domestic and overseas matches, under-aged athletes were excluded, resulting in a total of 25 (7 male and 18 female athletes) included in the study.

Method and data collection

The participants were provided a thorough explanation of the purpose of this study from the resident family doctor at the training center, and only those who provided a written consent form were enrolled and completed the questionnaire. The Rapid Weight Loss Questionnaire (RWLQ) used for the study was developed by re-interpreting and adapting the Portuguese version¹⁵⁾ for Korean national athletes. The questionnaire consisted of items about gender, sports career, duration of weight loss, amount of weight lost, weight loss method, physical and mental changes that occurred during weight loss, and source of information about weight loss. The RWLQ contents were validated by 10 experts and all items showed a high reproducibility index¹⁵⁾. To ensure confidentiality and anonymity throughout the process, colleagues, coaches, and the head coach were prohibited from interfering with the responses, and the participants were instructed not to share the contents of the questionnaire with one another.

Data analysis

The general characteristics of the RWL among elite judo athletes were presented with descriptive statistics, and with logistic regression analysis odds ratios (OR) and 95% CIs were obtained for each item. When one athlete gave multiple answers for a weight loss method, physical and mental challenges, and source of information, all of the responses were taken and classified. Statistical significance was set at $p < .05$, and data were processed using SPSS ver 23 (IBM Corp, Armonk, New York, USA) software.

RESULTS

General characteristic of subjects

The mean duration of weight loss among elite judo athletes was 4.44 (± 2.86) days. The mean duration of weight loss for male was 5 (± 4.32) days and that for female were 4.22 (± 2.18) days. The mean amount of weight loss was 3.28 (± 1.43) kg, with 3.71 (± 1.8) kg for male and 2.58 (± 1.28) kg for female.

Weight loss method

The most popular method of weight loss used by national judo athletes was "gradually reduce meal portion," followed by "skip meals," "limit water intake," "wear sweat suit for training," and "use sauna." As shown by OR 95% CI, the comparison of "gradually reduce meal portion" and "limit water intake," "wear sweat suit for training," and "use sauna" was not statistically significant. However, there was a statistically significant difference between "gradually reduce meal portion" and other items (Table 1). Male and female athletes had similar results in terms of weight loss methods used, and there was no statistically significant difference according to gender ($p=0.802$).

Physical and mental challenges during weight loss

The most frequent physical challenge experienced during weight loss by national judo athletes was "having no energy," followed by "dizziness" and "muscle spasm." As shown by OR 95% CI, there were significant differences between "having no energy" and all other items (Table 2).

Male and female athletes were similar in terms of physical challenges incurred during weight loss, and there was no statistically significant difference according to gender ($p=0.441$). The most frequent mental challenge experienced during weight loss was "frustration," followed by "reduced concentration," "depression," and "anxiety." As shown by OR 95% CI, there were no significant differences between "frustration" and "reduced concentration" OR=3.25, 95% CI 0.81~13.03 ($p=0.176$), but there were significant differences between "frustration" and other items (Table 3). Male and female athletes were similar in terms of mental challenges incurred during weight loss, and there was no statistically significant difference according to gender ($p=0.868$).

Table 1. Weight loss method

	Weight loss method	OR 95% CI	P value
	Gradually reduce meal portion	21 (Male=6, Female=15)	reference
	Skip meals	16 (Male=6, Female=15)	1.40 (0.68–2.90)
	Limit water intake	13 (Male=2, Female=11)	1.79 (0.84–3.84)
	Wear sweat suit for training	13 (Male=4, Female=9)	1.79 (0.84–3.84)
	Use sauna	12 (Male=2, Female=10)	1.97 (0.91–4.28)
	Increase the amount of exercise	7 (Male=2, Female=5)	3.58 (1.44–8.91)
	Fast	5 (Male=1, Female=4)	5.13 (1.84–14.29)
	Work out in the training room	3 (Male=1, Female=2)	8.75 (2.51–30.50)
	Use a laxative	2 (Male=0, Female=2)	13.27 (3.01–58.47)
	Cause vomiting	1 (Male=0, Female=1)	26.83 (3.53–204.25)
	Use diuretic, etc.	0	–

Table 2. Physical challenges during weight loss

	Physical challenges during weight loss	OR 95% CI	P value
	No energy	18 (Male=3, Female=15)	reference
	Dizziness	4 (Male=1, Female=3)	10.80 (2.91–40.06)
	Muscle spasm	2 (Male=0, Female=2)	23.40 (4.57–119.77)
	Heat	1 (Male=0, Female=1)	48.60 (5.27–413.25)
	Nosebleed	1 (Male=0, Female=1)	48.60 (5.27–413.25)
	Facial glow	1 (Male=0, Female=1)	48.60 (5.27–413.25)
	Headache	1 (Male=1, Female=0)	48.60 (5.27–413.25)
	Throbbing fit	0	–
	Cold sweat	0	–

Table 3. Mental challenges during weight loss

	Mental challenges during weight loss	OR 95% CI	P value
	frustration	10 (Male=2, Female=8)	reference
	Reduced concentration	5 (Male=1, Female=4)	3.25 (0.81–13.03)
	Depression	2 (Male=0, Female=2)	10.00 (1.76–56.94)
	Anxiety	1 (Male=0, Female=1)	21.25 (2.31–195.81)
	etc.	0	–

Source of information about weight loss

The most popular source of information about weight loss among national judo athletes was “colleague or senior athletes,” followed by “Internet” and “head coach or coach.” As shown by OR 95% CI, there were significant differences between “colleague or

senior athletes,” the most popular source of information among judo athletes, with all other items (Table 4). There were differences regarding the source of information about weight loss between male and female athletes, but the difference was not statistically significant ($p=0.06$).

Table 4. Source of information about weight loss

	Source of information about weight loss	OR 95% CI	P value
Colleagues or senior athletes	16 (Male=3, Female=13)	reference	
Internet	5 (Male=1, Female=4)	6.13 (1.81–20.84)	0.006
Head coach or coach	4 (Male=0, Female=4)	8.00 (2.19–29.25)	0.002
etc.	2 (Male=2, Female=0)	17.33 (3.43–87.71)	<0.001
Trainer	1 (Male=0, Female=1)	36.00 (4.27–303.45)	<0.001
Doctor	0	–	–
Dietitian	0	–	–
Book	0	–	–

DISCUSSION

There has been no study investigating rapid weight loss (RWL) and consequent physical and mental difficulties among national judo athletes. Our data confirm that elite judo athletes do engage in RWL before a match. According to Kininghanm & Gorenflo¹⁶, potentially harmful weight control is prevalent among combat sports athletes. On average, national judo athletes lost about 4.2% of their body weight, but some athletes lost as much as 10% of their weight in a short period. The mean duration of weight loss was 4.44 days, with an average of 3.28kg lost. In a study on judo athletes competing in international matches, Artioli et al.¹⁷ suggested that they go on a weight loss routine for fewer than seven days, with about 2.5% of weight lost on average. Our results may suggest that Korean athletes lost more weight in a shorter period, but it is difficult to directly compare our results to that of Artioli et al.¹⁷, as their study was performed several years ago and the study design differed.

Weight loss method

The most popular weight loss method among national judo athletes was “gradually reduce meal portion,” followed by “skip meals,” “limit water

intake,” “wear sweat suit for training,” and “use sauna.” This result was similar with that found by Artioli et al.¹⁷, but none of Korean judo athletes took diuretics or laxatives. This difference may have resulted from the amelioration of weight control regulations by the NCAA¹⁰. However, judo athletes still frequently utilize methods such as limiting food intake or facilitating sweat release. These behaviors may induce eating disorders and dehydration^{18, 19, 20} suggested that prolonging such an inappropriate dietary pattern causes eating disturbance and bulimia, and inadequate supply of carbohydrates due to limited food intake leads to reduced glycogen synthesis, thereby lowering muscle strength and endurance^{21, 22, 23}. Controlling weight by facilitating perspiration may cause dehydration symptoms. Tipton et al.²⁴ and Ekblom et al.²⁵ report that weight loss from dehydration increases the risk of pain due to a failure of body temperature regulation caused by disturbance of perspiration and that it also induces muscle injuries. In fact, there was a case in Korea in which a female junior high judo athlete died while using a sauna to lose weight²⁶, and controlling weight through fasting and dehydration may have adverse effects on cardiovascular functions, renal functions, and electrolyte balance²⁷. Even though RWL by limiting food intake or facilitating perspiration has been associated with serious risks in multiple studies, athletes

continue to engage in such weight control methods. Kinigham & Gorenflo¹⁶⁾ suggested that this is attributable to the fact that athletes' aspiration to win a match outweighs their concern for health.

Physical and mental challenges during weight loss

The most frequent physical difficulty national judo athletes experience during weight loss was "lack of energy," followed by "dizziness" and "muscle spasm." These results seem to be due to their use of food-limiting strategies. When food intake is limited, the body increases ketone acid production to prevent acidification, which in turn has a detrimental impact on muscles and bones²⁸⁾. Furthermore, limiting food intake may result in complications, such as dizziness, headache, muscle spasm, fatigue, and hypoglycemia²⁹⁾. Although limiting food intake may be effective to lose weight³⁰⁾, it is clearly associated with cardiovascular diseases and long-term side effects³¹⁾. The most frequent mental distress was "frustration," followed by "reduced concentration," "depression," and "anxiety." These also seem to be a result of limited food intake. Limiting food intake induces hypoglycemic symptoms, and its neurologic symptoms include frustration, lethargy, reduced concentration, weakness, ataxia, and reduced consciousness³²⁾. Furthermore, when carbohydrate intake is limited, the resulting reduction of complex carbohydrate intake decreases the amount of glucose supply to the brain, thereby weakening concentration²⁸⁾. Heo et al.³³⁾ reported that fasting and one-food diets increase depression symptoms, while Rose et al.³⁴⁾ reported that short-term weight loss leads to reduced self-esteem and emotional instability as well as mental diseases such as depression and eating disorders.

Source of information about weight loss

The most popular source of information about weight loss among national judo athletes was "colleague or senior athletes," followed by "Internet" and "head coach or coach." Marquart & Sobla³⁵⁾ suggested that head coaches or coaches strategically intervene in athletes' "weight management" because of their special relationships with the athletes. None of the judo athletes sought information from experts such as nutritionists or physicians. Tipton²⁴⁾ suggested that advice on weight loss should be taken from physicians because they provide accurate and reliable information, and Holler & Hilliker³⁶⁾ pointed out that although coaches and athletes are educated about safe weight loss methods, they do not necessarily

employ safe weight loss methods.

CONCLUSION

The present study found that national judo athletes engage in RWL prior to a match. They usually try to lose weight by "gradually reducing meal portion," "skipping meals," "limiting water intake," "wearing sweat suit for training," and "using sauna," and they have physical and mental difficulties due to such unhealthy weight control. Information about weight loss was mostly taken from a "colleague or senior athlete," "Internet," and "head coach or coach" and not from experts, such as nutritionists and physicians. Thus, athletes are recommended to employ healthy weight control methods based on advice from experts, such as nutritionists or physicians.

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