

# Patterns of Rapid Weight Loss in Elite Sambo Athletes

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## Research Article

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# Abstract

**Background:** Rapid weight loss (RWL) is commonly practiced in combat sports. Both magnitude and methods used to induce RWL are largely similar between the combat sports, but currently there is no data on RWL methodology used by sambo athletes. Therefore, the aim of this study was to determine RWL procedures sambo athletes apply to lose weight rapidly.

**Methods:** The sample consisted of 199 participants, of which 132 males and 67 females who participated in the World Sambo Championship 2020 held in Novi Sad, Serbia. Each participant received RWL questionnaire that was available in multiple languages, and each participant was instructed how to fill it out.

**Results:** Almost 87% of sambo participants declared to have intentionally cut their weight prior to the competition, whereby 5.27 kg (SD:  $\pm 7.57$ ) was lost. Gradual dieting, sauna use and skipping meals were the most dominant methods used to reduce weight prior to competition while more extreme methods of RWL such as the use of laxatives, diuretics, diet pills and vomiting were also implemented but by much smaller fragment of the participants involved.

**Conclusions:** Findings from our study largely match with previously conducted RWL studies in terms of prevalence, magnitude and methods used by combat sport athletes, especially in judo and wrestling. Knowing the hazardous consequences of RWL, alternative methods of sustainable weight loss should be considered.

## Background

Prior to 1940s the Committee of Sports of Union of Soviet Socialist Republics declared sambo to be the official combat sport of the Soviet Union [1]. In the decades to follow, sambo gained considerable attention in the post World War II Soviet Union states, but also on a global scale. After 80 years of its acknowledgement and development, sambo has recently received temporary recognition from the International Olympic Committee which is a first step towards inclusion in the Olympic Games [2].

Elite athletes are always aiming for a peak performance throughout the year. Sambo athletes are no different. Besides maintaining excellent physical shape and technical skills [3, 4], sambo athletes must maintain their optimal competitive weight for championships, given sambo is a weight-divided sport [2]. Thus, meticulous preparations (efficient training, adequate diet, sufficient sleep and recovery) are critical for every training session but especially for competitions. With regards to competitions and diet, studies reveal that nearly 90% of both male and female judo athletes engage in rapid weight loss (RWL) before the competition [5] to possibly gain competitive advantage over their lighter opponents. Similar trends have been observed in wrestling [6–8]. This approach of weight reduction is defined as a 5% weight loss achieved over 5–7 days [9, 10]. Regardless of the type of combat sport, methods of inducing RWL are very similar and are often initiated by reduced ingestion of fluids, caloric deficiency, increased training levels, plastic suit training, heated room training, and sauna use [7, 11–13]. Nevertheless, RWL procedure

can cause many health complications that can affect the body acutely or chronically [14]. It is even more disturbing that some athletes declared performing RWL 2–5 times annually, although many athletes applied 6–10 times a year [5].

However, thus far no data has been obtained on RWL methods in sambo athletes. Therefore, the aim of this study was to identify the methodology and magnitude of RWL used by sambo athletes prior to the World Sambo Championship 2020 held in Novi Sad, Serbia.

## Methods

### Study design

To determine methods of RWL used by sambo athletes, we adopted RWL questionnaire developed by Artioli et al. [15]. The questionnaire collects personal information, competitive level, weight and diet history, and RWL behaviors, and the authors demonstrated its validity and reliability [5]. Furthermore, to facilitate data collection, this questionnaire has been translated to Russian, French, Serbian, and Spanish language. Athletes were asked to fill out questionnaire in the sports hall where championship was held. In case any questions were unclear, researchers were eager to provide detailed explanation. Also, if any miscommunication was noted, translator speaking all of the abovementioned languages was there to clarify details of the questionnaire.

### Participants

The sample consisted of 199 participants, of which 132 males (66.3%) and 67 females (33.7%). The age of the sample was 22.67 years (SD:  $\pm 5.83$ ), while the average height was 1.71 m (SD:  $\pm 0.11$ ) and the average weight was 71.63 (SD:  $\pm 17.57$ ).

Participants from 23 countries ((Belarus (1.0%), Belgium (1.0%), Bulgaria (2.5%), Cameroon (3.0%), Colombia (1.5%), Croatia (1.0%), France (15.6%), Italy (1.0%), Kyrgyzstan (2.0%), Lithuania (0.5%), Mexico (0.5%), Moldavia (10.6%), Russia (11.1%), Serbia (12.1%), Spain (7.5%), South Africa (0.5%), Tajikistan (0.5%), Ukraine (20.1%), USA (1.0%), Uzbekistan (7.0%)) took part in the study.

The study was conducted according to the Helsinki declaration and ethical approval was obtained from ethics committee of University of Novi Sad, Serbia (Ref. No. 46-06-02/2020-1). All sambo athletes gave written informed consent upon agreement to participate.

### Statistical analysis

Obtained data were analyzed through SPSS statistical software (ver. 23.0). Descriptive statistics were first calculated on all the variables involved, including physical parameters, athletic experience, RWL frequency, RWL methodology, and influence in weight-cutting practices. Gender differences regarding the amount of weight loss and regain were calculated through t-test, while differences in RWL techniques and influences were calculated through the Mann-Whitney Test.

# Results

The average sambo experience of the participants was 11.37 years (SD:  $\pm 6.44$ ). Most participants declared to have won at least one medal at international level (74.4%). The 86.9% (n = 173) of sambo participants declared to have intentionally cut their weight prior to the competition. In addition, the average year declared for the first RWL was performed was 15.77 (SD:  $\pm 3.54$ ). The sample declared to cut around 5.27 kg (SD:  $\pm 7.57$ ) of body weight and usually started doing so 11.87 (SD:  $\pm 9.51$ ) days before the competition [Table 1].

Table 1  
Weight reduction history reported by the sambo competitors

Questions	Mean	SD
What is the most weight you have cut to compete in your career? (kg)	10.37	16.59
How many times did you cut weight to compete last season? (number. of times)	4.14	7.22
How much weight do you usually cut before the competition? (kg)	5.27	7.57
How many days before competition do you usually cut weight? (days)	11.87	9.51
At what age did you start to cut weight before the competition? (yrs.)	15.78	3.54
How much weight do you usually regain after the competition? (kg)	6.79	13.93

Gender differences emerged concerning the amount of weight cut (Males: -7.74%; Females: - 5.11%;  $\Delta$  = 2.63%; Mean<sub>males</sub>: 5.82 kg, Mean<sub>females</sub>: 3.30 kg,  $p = 0.002$ ), where males tend to lose more weight than females. Moreover, females start before males to cut weight before competition (Mean<sub>females</sub>: 14.88 days, Mean<sub>males</sub>: 16.22 days,  $p = 0.015$ ) and tend to regain less weight than the male counterpart (Males: +10.72%; Females: +5.93%;  $\Delta$  = 4.79%; Mean<sub>females</sub>: 3.83 kg, Mean<sub>males</sub>: 8.06 kg,  $p = 0.02$ ) [Figure 1].

Concerning the methods used to rapidly cut their weight, the most common method was gradual dieting (80.5%), followed by sauna (75.9%), skipping meals (70.7%), training with plastic suits (63.8%), not ingesting fluids (62.1%), training in a heated room (60.9%), increased exercise (58.0%), fasting (44.8%) and spitting (44.8%). Less common methods adopted were the use of laxatives (16.1%), diuretics (13.2%), diet pills (10.9%) and vomiting (9.8%) [Table 2].

Table 2  
Frequency distribution for weight loss methods reported by the sambo competitors

Methods	Never used	Rarely	Sometimes	Always
Gradual dieting	6 (3.4%)	11 (6.3%)	17 (9.8%)	140 (80.5%)
Skipping 1 or 2 meals	5 (2.9%)	18 (10.3%)	28 (16.1%)	123 (70.7%)
Fasting	14 (8.0%)	53 (30.5%)	29 (16.7%)	78 (44.8%)
Restricting fluid ingestion	4 (2.3%)	27 (15.5%)	35 (20.1%)	108 (62.1%)
Increased exercise	14 (8.0%)	3 (1.7%)	56 (32.2%)	101 (58.0%)
Training in heated room	1 (0.6%)	28 (16.1%)	39 (22.4%)	106 (60.9%)
Sauna	7 (4.0%)	17 (9.8%)	18 (10.3%)	132 (75.9%)
Training in plastic suits	5 (2.9%)	26 (16.9%)	32 (18.4%)	111 (63.8%)
Use plastic suit all day	5 (2.9%)	70 (40.2%)	34 (19.5%)	65 (37.4%)
Spitting	6 (3.4%)	63 (36.2%)	27 (15.5%)	68 (44.8%)
Laxative	9 (5.2%)	118 (67.8)	19 (10.9)	28 (16.1%)
Diuretic	9 (5.2%)	131 (75.3%)	11 (6.3%)	23 (13.2%)
Diet pill	5 (2.9%)	138 (79.3%)	12 (6.9%)	19 (10.9%)
Vomiting	8 (4.6%)	136 (78.2%)	13 (7.5%)	17 (9.8%)

With respect to gender differences in the methods used for cutting weight, Mann-Whitney test showed non-significant outcomes for all the RWL methods [Figure 2].

Participants declared that they were very influenced or somehow influenced by their coach (60.1%). Physicians and dietitians were not consulted by most athletes (58.4% and 62.6%, respectively) [Table 3]. Concerning the source of influence, Mann-Whitney did not evidence any gender difference among the various figures of influence [Figure 3].

Table 3

Frequency distribution for the persons who are influential on the weight management behaviors reported by the sambo competitors

Source of influence	Not influential	Little influential	Unsure	Some influential	Very influential
Teammate	57 (33.1%)	47 (27.3%)	10 (5.8%)	34 (19.8)	24 (14.0%)
Fellow wrestler	66 (38.2%)	35 (20.2%)	23 (13.3%)	33 (19.1%)	16 (9.2%)
Physician	101 (58.4%)	34 (19.7%)	12 (6.9%)	18 (10.4%)	8 (4.6%)
Personal Trainer	75 (43.4%)	29 (16.8%)	11 (6.4%)	36 (20.8%)	22 (12.7%)
Coach	28 (16.3%)	25 (14.5%)	15 (8.7%)	49 (28.5%)	55 (32.0%)
Parents	72 (41.6%)	33 (19.1%)	11 (6.4%)	28 (16.2%)	29 (16.8%)
Dietitian	109 (62.6%)	23 (13.2%)	14 (8.0%)	17 (9.8%)	11 (6.3%)

Based on the obtained data, males tended to be more influenced to pursue RWL by dietitians and physicians when compared to their female counterparts who were primarily influenced by coaches and personal trainers to undergo RWL, unlike males.

## Discussion

The aim of this study was to determine the methods sambo athletes use to induce RWL. Acquired data shows that gradual dieting, sauna use and skipping meals were the most dominant methods used to reduce weight prior to competition in both males and females. However, more extreme methods of RWL such as the use of laxatives, diuretics, diet pills and vomiting were also detected but by much smaller fragment of the participants involved. The latter is especially worrisome not strictly because diuretics are prohibited by the World Anti-Doping Agency [16] and are responsible for a significant number of doping cases in combat sports [17], but because the devastating effects they can leave on one's health [18]. Overall, males tended to lose more weight during RWL while also regaining more weight after RWL when compared to females. Findings from our study are largely similar to findings discovered by Artioli et al [5] where the most commonly used RWL methods by judoist were gradual dieting, increased exercising, skipping meals and restricted fluid ingestion. In addition, several studies on RWL methodology in high-school and college wrestlers show identical data [7, 19]. In other combat sports such as mixed martial arts, jujitsu, Brazilian jiu jitsu, boxing, taekwondo and kickboxing, prevalence of RWL ranges from 60–80% [11, 13, 20–22]. Therefore, detected RWL trends are not unique to sambo, judo or wrestling athletes but are omnipresent in varied degrees in combat sports in general.

Our study shows that coaches were the most important figure influencing sambo athletes to pursue RWL. Berkovich et al. [23] found identical results in his study on judo and taekwondo coaches and trainers. The same study showed that coaches and trainers encouraged athletes to engage in RWL as early as 12 years old. In our case, athletes reported starting RWL at ~ 16 years of age. This should come as no

surprise since literature showed that even 5 year old wrestlers are pressured to engage in RWL [24]. The American Academy of Pediatrics stresses that this practice needs to be avoided at this age as it interferes with children's and adolescents' normal growth and development and can cause psychological issues [25].

Coming from perspective that prioritizes athlete's health and safety, it is important to outline that RWL practice is not without consequences. Existing literature eloquently describes RWL-induced physical and psychological consequences, which can range from acute to chronic [14], with repetitive RWL offering no protection for athletes from the negative impact of RWL on performance [26]. In fact, ever since 1996 eminent health and fitness organizations such as American College of Sports Medicine, have unambiguously stated that there is a general consensus that RWL has a negative impact on physiological and health-related parameters [27]. Despite these „early“ warnings and some RWL-related regulations implemented in National Collegiate Athletic Association in United States [28], recent studies including ours reveal that tendencies regarding RWL in combat sports have not changed significantly [29]. It is important to outline that RWL is not necessarily associated with competitive success [30] or good performance [31, 32], and therefore the premise that lighter opponent will be likely the one to lose in the competition setting is questionable. However, oftentimes RWL is popularly perceived as mental toughness practice that gives athletes a psychological advantage over their opponents [33]. Contrary to this belief, a recent systematic review on the impact of RWL on judo athletes by Lakicevic et al [14] showed that the feelings of tension, anger, and fatigue significantly increased, while a decrease in vigor was demonstrated among judo athletes who practice RWL. As more and more emerging studies reveal harmful effects of RWL [9, 34–38] which can even lead to lethal consequences [39], scientists suggested that this harmful practice should be banned from combat sports [29]. Moreover, alternative means of weight loss such as gradual weight loss at the rate of about one kilogram per week, elevated carbohydrate intake and emphasis on weight loss from fat depots have been proposed [40]. Accordingly, strict regulations that will emphasize fairness and prioritize athlete's health are needed to bring about much needed change towards alleviation of RWL-induced consequences in combat sport athletes.

The current study has only an explorative purpose, therefore no causal inference has been done on the collected data. Nevertheless, the study covers a topic that has never been addressed previously in sambo athletes and it was administered in people from more than 20 nations from all over the world. Since majority of sambo athletes did not consult physician or dietitian about RWL, the results of the current study pertain primarily to coaches who should upgrade their knowledge about the risks of adopting RWL techniques, whereby athletes' health will be the utmost priority.

## Abbreviations

RWL  
Rapid Weight Loss.

## Declarations

## **Authors' contributions**

PD, ST, SE and AB conceived and designed the study. PD, FF, NL, AG, VS, BR, NV, RR, TT, and AB collected, analyzed, and interpreted the data, and wrote the paper. PD, FF, NL, AG, TT and AB analyzed and interpreted the data and drafted a previous version of the paper. All authors read and approved the final manuscript.

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## **Availability of data and materials**

The dataset used and/or analyzed during the current study are available from the corresponding author in response to a reasonable request.

## **Ethics approval and consent to participate**

The study was conducted according to the Helsinki declaration and ethical approval was obtained from ethics committee of University of Novi Sad, Serbia (Ref. No. 46-06-02/2020-1). All sambo athletes gave written informed consent upon agreement to participate.

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## **Consent for publication**

Not applicable.

## **Competing interests**

The authors declare that they have no competing interests.

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Figures

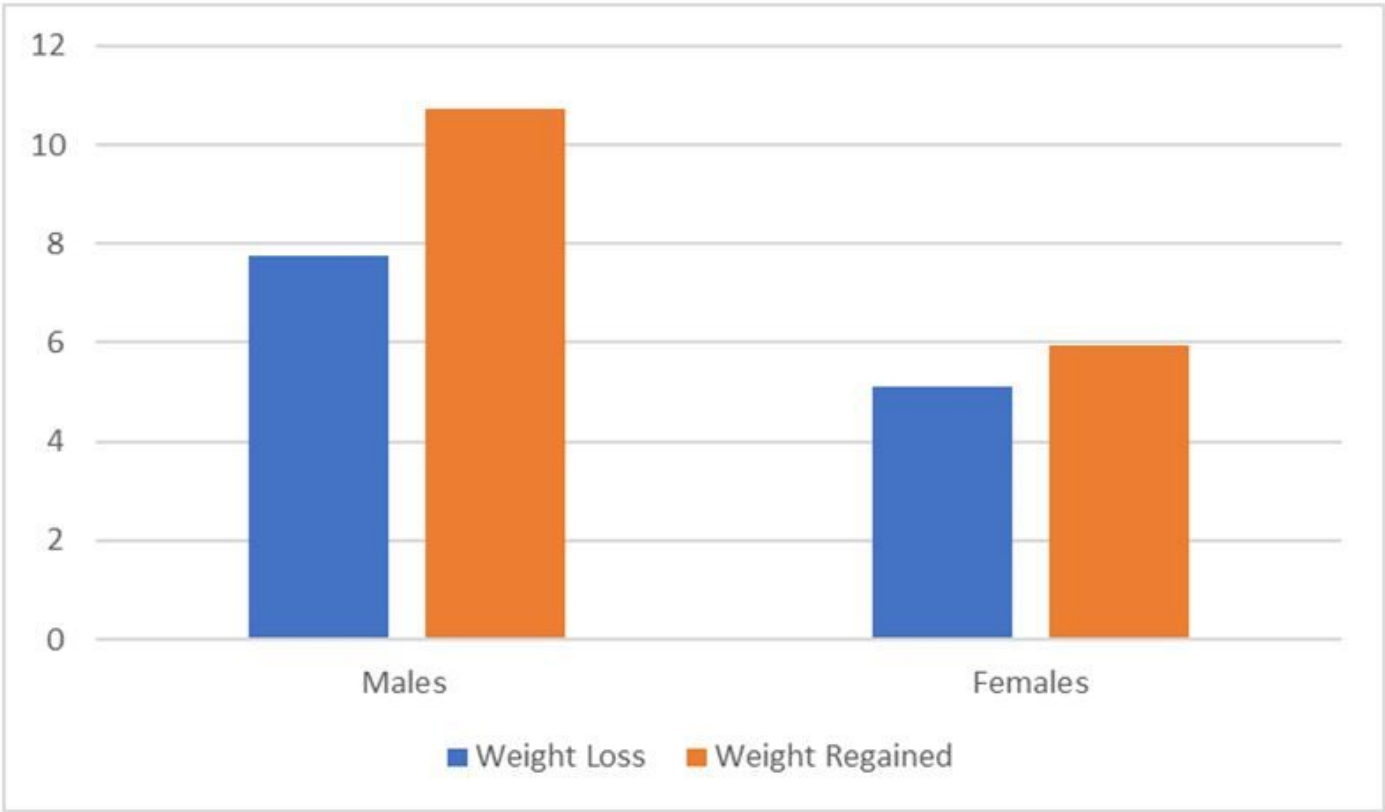
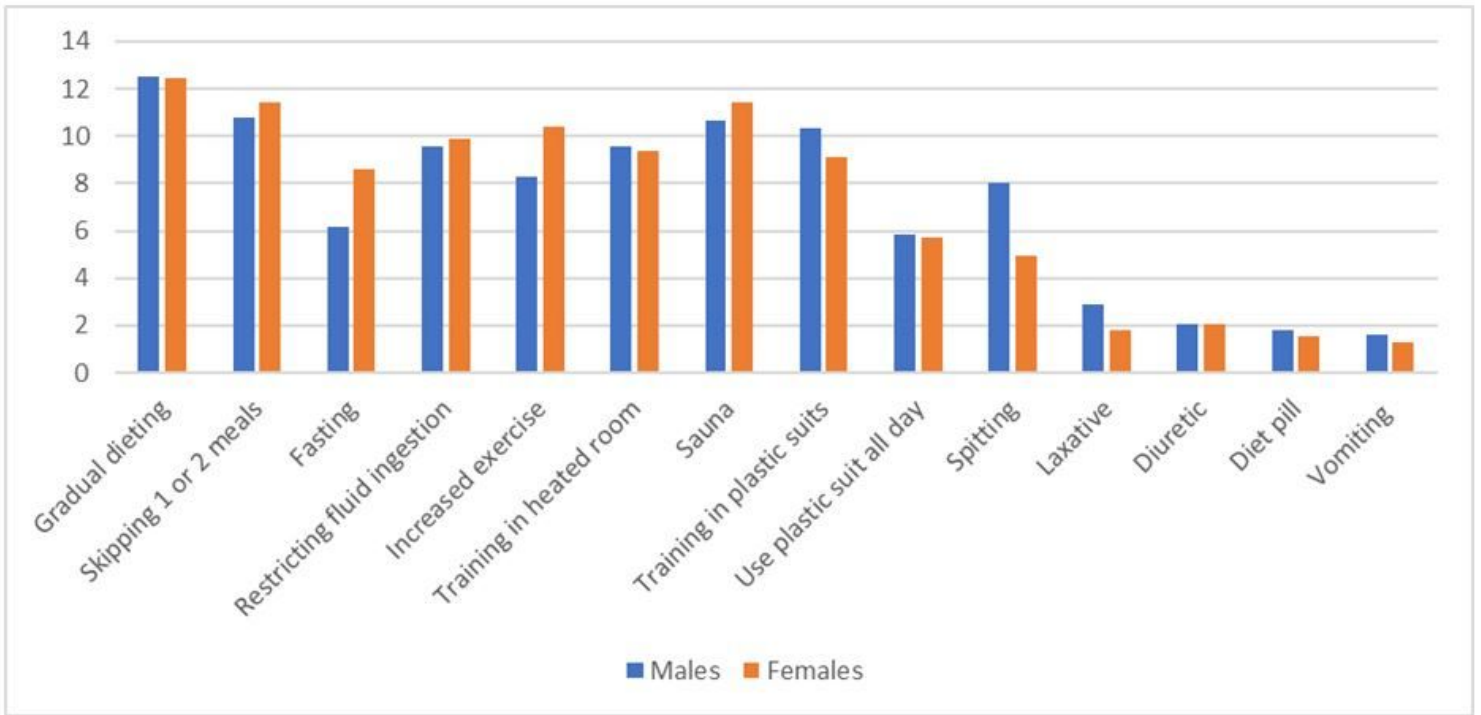


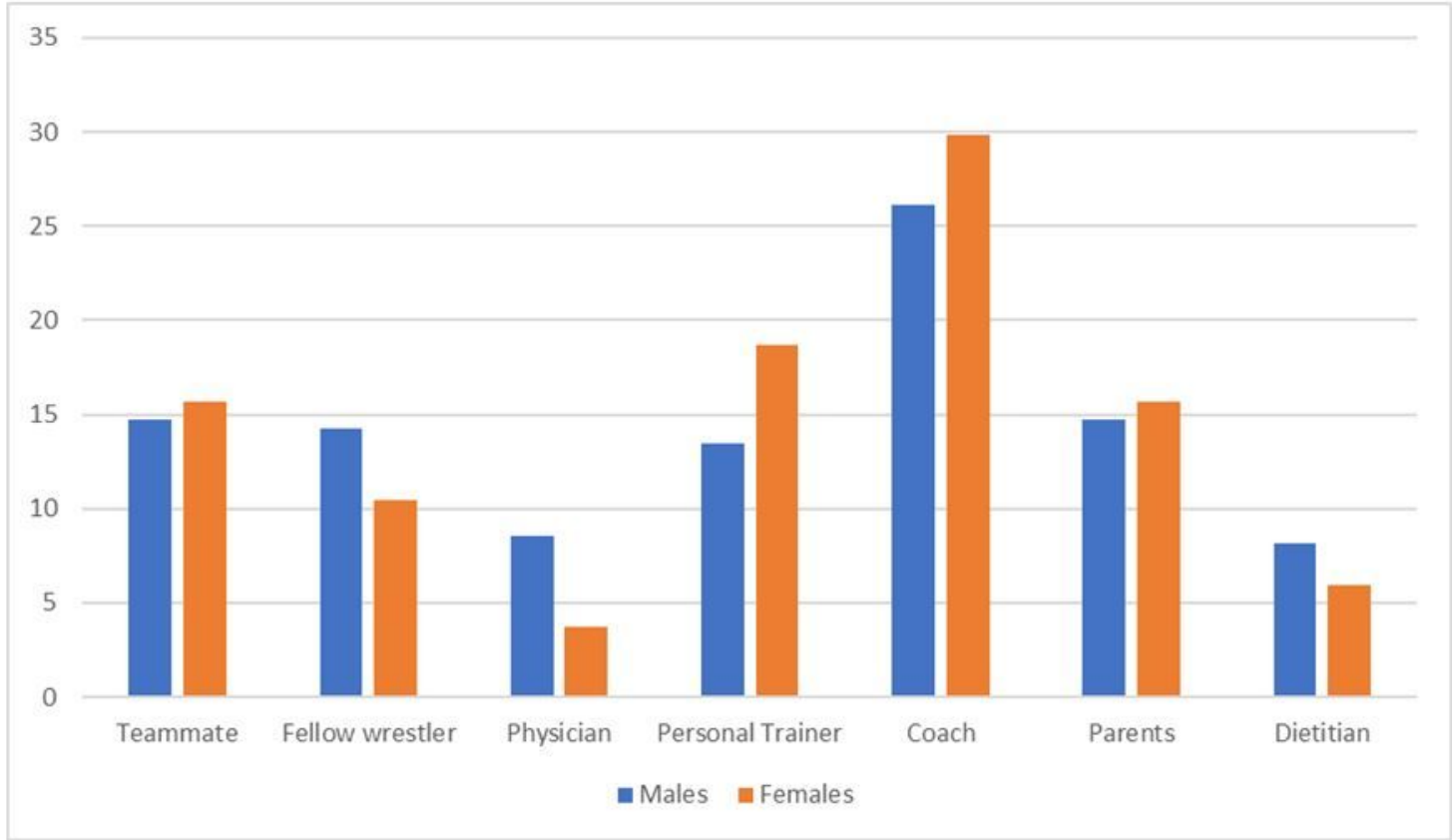
Figure 1

Percentage of weight loss and regained distinguished by gender (kg)



**Figure 2**

Percentages for methods (frequently and occasionally) used for RWL divided by gender



**Figure 3**

Percentages for the influence (moderate and high) on RWL methods divided by gender