

Practices of Weight Regulation Among Elite Athletes in Combat Sports: A Matter of Mental Advantage?

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Context: The combination of extensive weight loss and inadequate nutritional strategies used to lose weight rapidly for competition in weight-category sports may negatively affect athletic performance and health.

Objective: To explore the reasoning of elite combat-sport athletes about rapid weight loss and regaining of weight before competitions.

Design: Qualitative study.

Setting: With grounded theory as a theoretical framework, we employed a cross-examination approach including interviews, observations, and Internet sources. Sports observations were obtained at competitions and statements by combat-sport athletes were collected on the Internet.

Patients or Other Participants: Participants in the interviews were 14 Swedish national team athletes (9 men, 5 women; age range, 18 to 36 years) in 3 Olympic combat sports (wrestling, judo, and taekwondo).

Data Collection and Analysis: Semistructured interviews with 14 athletes from the Swedish national teams in wrestling, judo, and taekwondo were conducted at a location of each participant's choice. The field observations were conducted at European competitions in these 3 sports. In addition, interviews

and statements made by athletes in combat sports were collected on the Internet.

Results: Positive aspects of weight regulation other than gaining physical advantage emerged from the data during the analysis: sport identity, mental diversion, and mental advantage. Together and individually, these categories point toward the positive aspects of weight regulation experienced by the athletes. Practicing weight regulation mediates a self-image of being “a real athlete.” Weight regulation is also considered mentally important as a part of the precompetition preparation, serving as a coping strategy by creating a feeling of increased focus and commitment. Moreover, a mental advantage relative to one's opponents can be gained through the practice of weight regulation.

Conclusions: Weight regulation has mentally important functions extending beyond the common notion that combat-sport athletes reduce their weight merely to gain a physical edge over their opponents.

Key Words: grounded theory, sport identity, self-esteem, sport nutrition, weight loss

Key Points

- Weight regulation has become a key component of the culture of combat sports.
- Athletes practice weight regulation not only to gain a physical advantage over opponents but also for purposes of identity, mental diversion, and mental advantage.
- Health care professionals working with weight-category athletes should be familiar with both the negative and perceived positive aspects of weight regulation.
- Psychological counseling may aid athletes in learning how to gain mental advantages in ways that do not require a focus on weight.

In order to promote fair and interesting matches and to reduce potential injuries caused by large differences in body mass and strength, combat-sport athletes compete in weight classes. As a consequence of the weight-classification rules, it is well recognized that athletes often practice short-term weight regulation to achieve an advantage in one-on-one combat. Combat-sport athletes often compete in weight categories 5% to 10% below their normal body weight.^{1,2} In order to rapidly attain a lower precompetition weight, weight-loss strategies (alone or in combination) may be used. The most common practices include reducing food and fluid intake and pursuing active sweating through increased exercise or other forms of voluntary dehydration (or both), such as passive sweating in a sauna or hot bath.^{3–6} However, these rapid weight-loss

strategies are associated with negative effects. Short-term weight regulation leads to reductions in body water, electrolytes, glycogen, and lean tissue, which alter a number of physiologic functions, such as thermoregulation,^{7,8} cardiovascular function, and metabolism,^{9,10} which are crucial to athletic performance. Furthermore, the food- and fluid-deprived state during the weight-loss period also seems to negatively affect the psychological state of the athlete, increasing tension, anger, fatigue, and confusion and decreasing vigor.^{11,12}

Based on research findings with implications for health and performance, some guidelines regarding rapid weight loss have emerged. Wilmore¹³ proposed that the body can tolerate a short-term body weight loss of less than 4% through dehydration, whereas Burke¹⁴ suggested a maxi-

imum weight reduction of 2% to 3% of total body weight, if undertaken with sufficient sport nutrition and hydration practices. Despite knowledge among athletes¹⁵ and coaches¹⁶ about the potentially adverse effects of rapid weight loss on performance, this practice is widespread and often exceeds the proposed guidelines.^{1,2} Therefore, it is important to examine the athletes' own experiences and opinions of weight regulation.

Although a hypohydrated state leads to reduced strength,^{17,18} power,^{19,20} and high-intensity endurance,^{21,22} the protocols often used when evaluating muscular performance cannot accurately duplicate the "real match" situation in competitive combat sports. This holds true for both physical and mental factors. Most research conducted on combat-sport athletes regarding their psychological state in relation to the practice of weight regulation has used questionnaires mainly highlighting the negative outcomes of weight regulation,^{12,23,24} without taking any positive experiences of the practice into consideration.²⁵ Thus, qualitative approaches are rare, and the perceived benefits of rapid weight loss and regain are poorly understood.

Elite athletes in the capacity of idols symbolize and reinforce the ideals and norms prevailing in society or in a specific group.²⁶ Consequently, it is reasonable to assume that weight-regulation procedures practiced by the elite also influence combat-sport athletes in general, regardless of age or competitive level. To the best of our knowledge, no investigators have studied the perceived physical and mental benefits or disadvantages of short-term weight regulation among elite athletes in combat sports or the athletes' opinions regarding short-term weight regulation. Accordingly, using the qualitative method of grounded theory, our purpose was to improve the understanding of combat-sport elite athletes' reasoning regarding rapid weight loss and regain before competition.

METHODS

The qualitative method we chose for data collection and analysis follows principles adopted from classical grounded theory (GT).²⁷ Grounded theory is an investigative research method with the aim of generating inductively based explanations of psychosocial processes²⁷ or, as one of the theory's founders stated, "to discover what is going on."^{28(p159)} Therefore, GT methods are considered fruitful in previously unexplored research areas. Classical GT is explorative by its nature, so we did not begin from a position of a preconceived theory or predefined concepts.²⁹ Instead, using an iterative approach, the theory emerged through the constant-comparison method, in which the data collection and analysis were concurrent.³⁰ The data used in the analysis derived from 3 sources: interviews, field observations, and data obtained on the Internet. For us, a genuine curiosity about what the participants of the study considered important and what they communicated was considered crucial. This curiosity, together with an interest in producing relevant knowledge for those concerned about the content of the theory, constituted the basis of the present study.

Past experiences and prior knowledge can pose a risk when conducting qualitative research, possibly leading to incorrect conclusions originating from personal beliefs and preconceptions. Being aware of such potential issues, we

viewed prior knowledge of the subject matter as an asset throughout the process, from the planning phase to conducting the interviews, through analyzing and finally writing the present paper. Collaboration of the researchers, each with a different area of interest regarding food and nutrition, increased the objectivity and reduced the likelihood of results based on contingencies and incorrect conclusions. As a registered dietician who frequently conducts nutritional consultations with elite athletes on behalf of the Swedish Olympic Committee as well as an instructor in taekwondo, author Pettersson has significant insight into the nutritional issues and the practice and culture of combat sports in general. In contrast, authors Pipping Ekström and Berg do not have a background in combat sports, nor do they have any prior knowledge of sport-specific routines practiced by this category of athletes. However, Pipping Ekström has been active in qualitative research of the sociology of food, and Berg has conducted research on dietary behavior within nutrition.

Interviews

We asked 23 athletes to participate. In all, 14 athletes (9 men, 5 women; age range, 18 to 36 years) in wrestling ($n = 7$), judo ($n = 3$), and taekwondo ($n = 4$) were interviewed. Initially, we sent out a letter inviting participation in the research study to a total of 19 national team athletes in the Swedish Olympic Committee's high-performance support program in the 4 Olympic combat sports (wrestling, judo, taekwondo, and boxing). To qualify for the support program, the individual athlete had either repeatedly placed highly in international competitions or was considered to have the potential to reach world-class level within 2 Olympic cycles (ie, 4 to 8 years). Nine athletes declined to participate, and due to a limited number of study participants in one of the sports, we performed a convenience sampling of an additional 4 national team athletes. In the letter, the athletes were asked to participate in an interview and contribute their personal views, opinions, and practices regarding different aspects of food and fluid intake and weight regulation before competition. The selection of study participants was at first restricted to athletes who possibly practiced weight regulation. However, because of the concurrent nature of data collection and analysis practiced in grounded theory, it became evident that athletes competing in the respective sports' heavy-weight divisions could also contribute important information. Consequently, we decided to reconsider our initial inclusion criteria and analyzed data from the 3 athletes competing in heavyweight divisions.

Characteristics of the participants are presented in the Table. The data are based on the athletes' self-reported body weight during the competitive season and the calculated relative weight change based on the upper acceptable limit of the participant's weight class. Of the 14 participants, 2 men and 1 woman competed in a weight division that did not require them to practice weight regulation (ie, heavyweight division), but they had previously competed in weight categories that did require such practices. Normally, athletes competing in the heavyweight division do not have to reduce their body weight. Despite this, 2 of the 3 heavyweight-class athletes interviewed stated that they normally change their way of

Table. Characteristics of the Study Participants, Mean (Minimum, Maximum)

Athletes	Men	Women
All	n = 9	n = 5
Age, y	24 (18, 36)	26 (20, 35)
Body weight, kg ^a	86 (65, 115)	67 (54, 78)
Practicing weight regulation	n = 7	n = 4
Weight change (% of initial body weight)	-5 (-1, -8)	-5 (-5, -8)

^a Between competitions.

eating for upcoming competitions during the last week before the competition. Two had recently changed weight class and previously reduced their weight by more than 10% before competition.

The average length of the interviews was 38 minutes (range, 23 to 64 minutes), and all interviews were audio taped and conducted by the first author (S.P.). Before data collection, we constructed and tested an interview guide (see Appendix) in a pilot interview with 1 combat-sport athlete. The reason for performing a pilot interview was to test and adjust the interview guide in order to create a climate that encouraged the participant's own reasoning regarding the substantive area. We concentrated on constructing questions and themes that provided minimal direction to the interviewee, a procedure also in line with GT.^{31(p116)} The questions dealt with specific individual practices, strategies, thoughts, and experiences regarding weight regulation, as well as more general opinions about the phenomenon within the participant's own sport. Both in the letter inviting participation and orally at the start of each interview session, we informed the participants that, as volunteers, they could end their involvement without further explanation at any time. The athletes were also guaranteed full confidentiality. The original spoken language during the interviews was Swedish, and the presented quotes and interview segments in the present paper are approximate English translations. At the time of data collection (December 2007 through March 2008), qualitative interview studies were not included in Swedish institutional review board legislation. Thus, neither the Central Ethical Review Board nor the Regional Ethical Board in Gothenburg, Sweden, monitored interview studies. However, we discussed the project with a representative at the Regional Ethical Board before initiating the data collection.

Participant Observations

Although the primary source of data in the present study consisted of 14 interviews, we considered participant observations in the competitive setting as an important complement to the athletes' statements. Concurrent with the transcript analysis, the first author (S.P.) attended several international and national competitions in the sports of interest between 2008 and 2010. During these events, the athletes' verbal and physical behaviors regarding weight regulation were observed when talking to each other and to the first author. These experiences were later converted into descriptive narratives and discussed during research team meetings.

Data from the Internet

In the later stages of the analysis, we included additional statements by combat-sport athletes posted on the Internet in line with the "all is data" view advocated by the classical GT method.^{31(p8)} The main reason for using Internet data was that these statements were unaffected by the research team. As a result, the Internet data support the systematically generated concepts and categories manifested in our interviews with the 14 national team athletes. The Internet search was conducted using mainly Google and YouTube with the key words *weight cutting* and *combat sports athletes*. The sampling was limited to athletes' expressions and opinions regarding mental factors in relation to weight regulation.

Analysis

All interviews were transcribed verbatim, resulting in 147 pages of single-spaced text. Throughout the analysis, the 3 authors regularly had research team meetings where we discussed, structured, and restructured the material. During the initial (open) coding process, the line-by-line reading, we posed questions to elucidate what was expressed by the athletes and what was described, a process that generated substantive codes. This fractioning of data, initially performed individually by each author, facilitated a more conceptual grouping into attributes and categories carried out by the first author (S.P.) after reading and listening to the transcripts and audio files several times. From the initial interviews and participant observations, proceeding throughout the analytical process, reflections, thoughts, and hypotheses (ie, memos) were written down and later sorted and incorporated into the analysis. The memos functioned as a way of relating the attributes to more concrete categories as well as providing connecting thoughts among the different categories, thus forming a substantive theory.²⁷ The theoretical sampling ended when saturation had been reached: that is, the point at which we considered no additional information could contribute to the development of the categories. Selective coding was performed in the later stages of the analysis by including data originating from statements of combat-sport athletes posted on the Internet. The additional data originated from athletes who practiced other combat sports; coding was then conducted for those represented in the 14 conducted interviews. The Internet data served as an additional indication that theoretical saturation had been reached. In addition, by supplementing the findings from the observations and the 14 interviews, the external statements also added value by showing that conformity existed among data, regardless of the source, thus increasing the trustworthiness of our results. At the same time, we acknowledge that the latter might not be considered in total accordance with the tenets of classical GT.

RESULTS

A short summary of the interviewees' description of how weight reduction normally was achieved is initially given. Subsequently, the analysis based on GT of the conducted interviews, including the supplementary data, is presented.

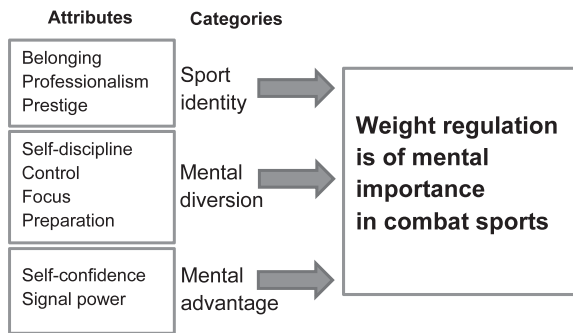


Figure. Attributes and categories substantiating the theory that weight regulation is of mental importance in combat-sport athletes.

The athletes who had to reduce their body weight to an eligible weigh-in weight gave descriptions of decreased food and fluid intake to achieve their target weight. Six of the 14 athletes gradually adjusted their exercise and dietary regimes 2 to 3 weeks before competing in order to lose weight. Between 4 and 5 days before the weigh-in, most of the athletes intensified their dieting behavior by reducing portion sizes and overall food intake, often coupled with increased exercise. In accordance with previous research,^{1,5} the interviewed athletes (n = 10) commonly practiced more extreme weight-loss methods, such as saunas, hot baths, and exercise in sweat suits to achieve their precompetition goal weight. The 10 athletes hardly ate or drank anything in the 24-hour period preceding the official weigh-in. Three of the 10 athletes conducted all their weight loss in the 24 to 48 hours before weigh-in, mainly by means of saunas, hot baths, or sweat suits. If the venue of the competition did not have a sauna available, sometimes the dehydration phase was prolonged to “be on the safe side.”

Mental Importance of Weight Regulation as a Part of Combat Sports

The interviewed athletes expressed the opinion that a larger body mass than their opponent’s results in an advantage regarding leverage, reach, power, and strength. Our qualitative analysis also resulted in 3 categories of additional importance (Figure). These categories together generate the core category. This theory-building conclusion states that for the combat-sport athlete, there is more to weight-regulation practices than just qualifying for a weight class and then regaining body weight in order to physically overpower the opponent. Thus, weight regulation is mentally important as a part of combat sports.

In the remaining part of the “Results” section, each of these categories is presented under its own heading, and the attributes of each category are shown in italics. We selected quotes to illustrate each attribute. Unless otherwise specified, quotes originate from the conducted interviews. Moreover, to avoid identifying the participants, we have used the term *athlete* as much as possible because the term is neutral with regard to sex and sport.

Weight Regulation and Sport Identity

One word frequently used by the athletes when discussing weight regulation from different perspectives is

culture. Athletes believe that weight regulation is so closely linked to the traditions and culture of the sport that the former has itself become a part of the latter:

It is somehow part of the culture within our sport that you should manage to cut like ... you should manage to reduce your weight. You should [by the time of the first match] preferably weigh a couple of kilos over [the upper limit of the weight-class weight]. It’s like an element included in the competition.

In this cultural context, there is a strong feeling of *belonging* (Figure) that is often present in a specific social setting and, in this case, (weight-class) sports. The term *belonging* has been defined in a number of ways in sport psychology. For instance, as summarized by Allen,³² central to all definitions of the term are factors such as a psychological connection with others in the sport setting and a sense of security such that individuals feel they are included and respected for who they are. In this way, one can speculate that athletes may feel obligated to adopt certain behaviors that are considered appropriate in their social setting. During the interview, 1 athlete explained a recollection of the procedures regarding weight reduction in the hours before weigh-in for one of the largest international competitions. The athlete depicted how hundreds of athletes almost collectively, but yet individually, reduced their body weight by exercising in multiple layers of clothing or plastic bags: “Nobody at the venue pays any special attention, because it is all part of the sport. Nobody thinks that it is strange whatsoever.”

According to our analysis, weight regulation is important for the feeling of belonging to the specific sport culture. This affinity also seems to be closely related to being an athlete at the elite level. To excel and be successful, an elite athlete is supposed to be at the top of the game. Apart from some fundamental characteristics such as dedication and a well-balanced training schedule, most of the interviewed athletes also considered optimal nutrition a necessity in striving for competitive success. Our analysis shows that the practice of weight regulation is a significant part of forming a sport identity by influencing one’s own perception and comprehension of oneself as an athlete, as well as how one is perceived by others. Losing a significant amount of weight was openly encouraged by teammates and coaches; otherwise, the athlete’s attitude, devotion and *professionalism* (Figure) could be questioned: “If you didn’t cut at least 7 kilos you were considered ... bad ... you were not considered as a serious athlete.”

The opinions expressed by the athletes show that substantial weight loss defines success, both as a person and as an athlete. Thus, a great deal of *prestige* (Figure) is attained by losing weight:

It is a strange thing within the world of [the sport practiced by the athlete], because it’s almost like ... check out that guy; he’s really good. Now he’s lost a massive amount of weight; he’s really fantastic, that guy. He must have some kind of a secret trick, you know? It is encouraging to lose weight when it is like that, you know.

Diversion of Negative Thoughts and Emotions

To understand why weight regulation is considered important or, as the athletes express it, a necessity, one must relate the practice to what the elite athlete is trying to accomplish: that is, competitive success. In elite competition, the difference between a winner and a runner-up can be extremely small.³³ Thus, how an athlete deals with precompetition stressors³⁴ may affect the outcome of a combat-sport bout. In the interviews, the athletes' statements showed that precompetition weight-regulation practices can play an important role in either triggering feelings of anxiety and self-doubt or avoiding them.

When analyzing the interviews, *self-discipline* and *control* (Figure) surfaced as key attributes regarding whether the practice of weight regulation is mentally helpful or harmful for the athletes. When discussing if feelings of worry or doubt regarding the performance or competitive outcome could arise on the morning of the competition as a result of not adhering strictly to the usual precompetition weight-loss practice, 1 athlete said:

Yes, you often wander around thinking like . . . it is about self-discipline you know. If you fall short in that area, you feel so-so; it's not good so to speak. Mentally, it plays an important part.

The feeling of being in *control* (Figure) was mentioned on several occasions as an important part of the precompetition mental state. If the dietary restraint was violated (by eating too much or consuming foods that were considered wrong from a weight-loss perspective), negative feelings evolved. One athlete gave his recollection of the mental state during a weight-loss phase when he felt out of control regarding his body weight and food intake: "It bothered me, because usually I'm always in control of such things. So I thought it was hard."

As indicated in the last 2 quotes, 1 way for the athletes to influence feelings of uncertainty in a positive direction could be to gain complete control over something that is, in fact, controllable. If control is achieved in an area adjacent to the sport, such as food and fluid intake, or an area that is considered to be of importance to the competitive outcome (eg, body weight), this could have an additive effect on the mental status. One athlete explained:

I think it feels good to lose a couple of kilos before a competition, because I feel that if I did not reduce weight before a competition, then I feel like I'm not going to compete. If I don't lose weight, then I feel insecure, it feels like I don't know where I am at; I just feel lost. But when I reduce weight, then I feel like it's time for the competition now; I'm ready to compete; I am preparing myself for competition. It's hard if I'm not reducing weight, you know, it feels a bit strange.

Moreover, if weight regulation is successful in the week or days leading up to a competition, the practice can act as a coping strategy, buffering precompetition anxiety by diverting negative thoughts in another direction and enhancing the athlete's self-esteem. A highly praised skill during the precompetition phase frequently mentioned by the athletes is the ability to fully concentrate, or *focus*

(Figure), on the upcoming event. One way of achieving this enhanced focus is through weight regulation:

So I can feel it [weight regulation] can have a positive effect as well. That it may . . . it will also get one, or at least me, I think, to like focus even further on the fact that it is soon time [for competition] and I start focusing on what is to come, and in that way it becomes a part of the whole process in some way.

By successfully keeping to one's plan and beliefs (ie, what each individual believes is good or bad regarding weight loss or performance), the sense of competence creates a feeling of being maximally prepared for the competition:

Then one can be satisfied with oneself by knowing that there is no doubt you have done everything, so to speak . . . the fact that you feel maximally prepared. So in that way, you can feel quite good if you are very strict about that part as well, just because you feel better physically somehow, when you trim down things that are unhealthy.

The fact that the weight-regulation practice is regarded as heightening the precompetition *preparations* (Figure) becomes even more evident when discussing the matter with a heavyweight competitor who previously lost weight for upcoming competitions:

It's almost as if you have an edge when you have some weight to reduce, because you have to think about what you put into your body, what you do, and about exercise. And maybe walk every damn night and so on just to get your metabolism going and that sort of thing. Unfortunately, I don't prepare myself as well nowadays.

Moreover, the athlete explained that he did not feel the same kind of nervousness before a competition when he previously had to focus on losing weight. Instead, he experienced an absent state of mind in which commitment and control were considered crucial, something that was also mentioned by other athletes.

The Weight-Regulation Practice as a Mental Advantage

In the world of competitive sports, self-enhancement strategies are often employed to maintain or increase self-esteem and *self-confidence* (Figure) as the time for competition approaches.³⁵ One interviewed athlete described the rewarding effects of precompetition weight reduction on his mental status in the last couple of days before weigh-in by offering a simile:

You feel a bit like that Rocky Balboa character, in the scene when he is running up those stairs. You know, the preparations, because you have to give yourself a decent chance.

The interviewee was referring to the end of a 4-minute sequence from the film *Rocky III*, a movie scene that has become a metaphor for an underdog rising to a challenge. The scene culminates when the boxer, the morning before

the upcoming title fight, fully confident of victory after months of physical preparations and filled with excitement, runs up the 72 front steps of the Philadelphia Museum of Art.

As exemplified in the last and next quotes, the effects of weight regulation may have the most pronounced effect on mental status during the precompetition phase. By resisting 2 of the strongest biological drives, hunger and thirst, an individual's willpower and character are put to the test. When the desired weight is reached (there is no *if*, as stated by the interviewed athletes), a strong feeling of ability and thereby enhanced self-esteem can be achieved:

Previously [before changing to a higher weight class] it was like the weight cut was the first competition, and when you got on the scale and made the weight, it was like, yes! . . . and then came the competition.

One way of enhancing *self-confidence* during the precompetition phase is by means of comparison and congruence with other competitors, which is exemplified in the following quote. The athlete describes thoughts and actions in the time just before the weigh-in at the last international competition before the interview:

In wrestling, you are supposed to lose some weight. That's the way it is. Like now at the weigh-in, all the Russians ran around with caps and sweat suits, while I was just sitting there, watching. Then I felt like, damn. So then I took my bottle and drank to gain some additional weight, so that I weighed just below the upper limit at weigh-in. I didn't want to be like, huh . . . it's a bit like that, you are supposed to weigh spot on, and one's supposed to have some weight to lose. That's the way it is.

The athlete had recently moved up 1 weight class, and thus did not have to practice weight regulation. Nevertheless, the importance of body weight per se was reflected in the desire to weigh as close to the weight-category limit as possible. The quote also shows how the athlete evaluates opponents and their precompetition strategies, making them the point of reference regarding weight regulation. The choice of comparison objects is probably not a coincidence because Russia and the former Soviet Union, according to statistics from the International Federation of Associated Wrestling Styles, are among the most successful nations in 20th- and 21st-century wrestling.³⁶ According to Collins,³⁷ individuals compare themselves with superiors, looking for but also perceiving similarities with them. By doing this, the athlete can exert a positive influence on self-image, or as Collins concluded, regarding the overall effect of upward social comparison, "that they are among the better ones."^{37(p170)} The visual "larger body mass than the actual weight-class weight" was also mentioned as a factor that could influence self-confidence in a negative way in the day, minutes, and seconds before a match when facing a much larger opponent. As the first author (S.P.) noted several times during field observations at competitions, athletes commented on other athletes' body mass or height during weigh-ins or when observing matches, speculating about other athletes' normal body weight in relation to the weight class in which they competed.

Thus, weight-regulation practices might *signal power* (Figure) to the opponent and thereby create a mental advantage. The benefits that the athletes ascribe to such weight-regulating practices even made one of the interviewed athletes question the extent to which competitors actually reduce their body weight or if it is sometimes a part of the mental game to gain the upper hand:

It feels like no matter whether one has a little or a lot [of weight] to lose, so to speak, I have always felt that people come with a bottle with something colorful in it [referring to sports drink] so to speak, and then you get a feeling. I don't know how much others are over [referring to the body weight during match day, ie, postweigh-in body weight], but then it becomes almost like a culture even there. Everybody brings sports drinks just because it looks a bit more professional. So that it looks like you have had a lot to lose and then drink everything. So that's something, that people bring sports drinks with them, and then immediately after the weigh-in they drink everything. Regardless of whether they have a little or a lot to lose, people bring something, kind of.

Summarizing the Theory

In the final part of the "Results" section, we summarize and substantiate our theory by presenting a wider selection of quotes and statements with reference to sport affiliation and competitive level. The data (next 3 quotes) were obtained from the Internet.

The first example of the mentally enhancing effect of weight regulation was given by former National Collegiate Athletic Association Champion Dan Russell³⁸ in a TV interview before the National Championship in 1989. When asked why Russell was competing in a weight category below his normal body weight, he answered:

It's a mental game, and when you walk out there, and you know you have put the time in, you know you have pushed yourself away from the table and you have been committed to your diet, committed to the practice time. You walk out there knowing that you are not going to quit. And when he is pushing it, pushing it, pushing it into the third round and you feel like you are going to die, you can really suck it up within, and continue on with the match. And that's why I think going down to 150 pounds [from 170 pounds] is going to be a good move for me.

When we analyzed the 14 interview transcripts, a description of the mental value of weight regulation as an important part of a culture with a long tradition emerged. Within this culture lies an inherent belief that in order to be a "real athlete," one should try to reduce weight to increase the chances of competitive success. Moreover, by assimilating attributes in the context of weight regulation, identity can be reinforced and the feeling of being a "real athlete" can be further enhanced. One such attribute is the unspoken admiration of opponents. In a YouTube video clip, amateur mixed martial arts fighter Jeremy Mayers³⁹ explained:

A lot of people look down on, like, he cuts weight; he just tries to get an advantage. Yes, he tries to get an advantage, but to me, you should almost respect someone more the more weight they cut. Because you know, if you have done it before you know how hard it is, and it's just that a lot goes into it. It takes a lot. Weight cutting sucks, which is why not everyone does it.

The effect of directing one's efforts toward the upcoming event by refraining from food and fluids during the last few days before the competition was expressed by professional mixed martial arts fighter Ron Faircloth.⁴⁰ In a harsh statement regarding the subject, he ascribed weight regulation to the enhanced ability to focus: "Not eating makes me hate. I hate everyone and everything. I think being hungry keeps a guy sharp. All I think about is the fight."

DISCUSSION

Combat-sport athletes' views about the positive outcomes of weight regulation are not restricted to being only a possible way to success through physical dominance. Wrestler Bob Lefavi once made a statement that illustrates our results clearly: "I remember feeling that I had just won a victory by making the weight for a match, and then I realized that I still had to wrestle."¹²

Even though the physical advantage was considered the most important factor among the interviewed athletes, the sense of belonging and other mentally enhancing effects may contribute to the explanation of why combat-sport athletes continue weight-regulation practices. Some elucidation regarding our results and the presentation of them will be helpful.

We chose to study elite athletes. For younger or lower-level athletes, the elite athlete often holds the position of idol and thus also functions as a role model.²⁶ Nevertheless, the results are not necessarily transferable to lower-level competitors, who might have less aggressive weight-regulation behavior.^{1,41} In our opinion, this does not rule out the possibility of the results being useful for athletes who are not at the elite level. However, by mainly highlighting the positive aspects of what the athletes experience by habitually practicing this potentially health-threatening procedure,⁴² one could consider the presentation of the results as one sided, possibly conveying the impression that weight regulation is unproblematic or even that this kind of behavior should be encouraged.

On the contrary, during the interviews, athletes brought up numerous examples of negative aspects of weight-loss procedures. Short-term weight reduction was considered physically and mentally challenging as well as sometimes having a negative effect.⁴³ Despite the potential downsides to the practice (eg, decrements in physical and mental health and athletic performance), most of the interviewed elite athletes regularly pursued weight regulation as a part of their competitive preparations. According to Nicholls⁴⁴ and the achievement goal theory, people try to demonstrate competence (ie, perceptions of success) and avoid demonstrating incompetence (ie, perceptions of failure) in achievement contexts. As illustrated in this article, combat-sport athletes may

define and attain *success* as receiving recognition and admiration or respect from one's peers (teammates and opponents) or by displaying competence toward themselves and others by being in control and adhering to a weight-loss plan. Moreover, as illustrated in the quotes, simply reaching the weight-category limit defines a successful outcome, reinforcing the conviction of one's competence and creating a feeling of confidence. Confidence has been listed as a key skill possessed by successful athletes.⁴⁵ Our findings indicate that the practice of weight regulation could act as a coping strategy. By focusing on maintaining self-discipline and control over body weight and dietary intake during the precompetition preparations, self-doubt and anxiety may be reduced.

Elite athletes are, for obvious reasons, extremely involved in their sport, which also tends to increase athletic identity.⁴⁶ *Athletic identity* is a multidimensional construct described as the sport-specific component of an individual's self-concept and is the extent to which an athlete identifies with the athletic role.⁴⁷ When Sisjord and Kristiansen⁴⁸ asked what it means to be a wrestler among Norwegian elite athletes, the results showed that the level of respect female wrestlers gained among male wrestlers was based mainly on their toughness and commitment to the sport. If toughness and commitment are the prevailing norms in combat sports when viewing fellow athletes or opponents, they might be contributing factors to the continued existence of weight regulation. According to Coakley and Hughes,^{49(p365)} a special kind of fraternity is common in sports groups when athletes are perceived by others or themselves as unique because they endure extreme challenges and risks. Taking part in a behavior that fuels a feeling of superiority also boosts confidence and creates a perception of being a real athlete.

Another mental advantage might be the readiness to display superiority toward one's opponents. According to our analysis, this can be accomplished by athletes showing others that they have endured the physical and mental distress that comes with a major weight loss before a competition by reducing weight significantly. By mediating this to one's surroundings, the behavior also displays some of the characteristics included in the concept of mental toughness and the associated benefits. Mentally tough people have been described as possessing an increased ability to focus, greater determination, and more self-confidence.⁵⁰ Clough et al suggested that mentally tough athletes have "a high sense of self-belief and an unshakable faith that they control their own destiny" and that "these individuals can remain relatively unaffected by competition and adversity."^{51(p38)} Possibly, weight regulation, among other factors, helps athletes to increase their self-confidence.

We interviewed wrestling, judo, and taekwondo athletes but were unsuccessful in recruiting any boxers due to the limited number included in the Swedish Olympic Committee's high-performance support program at the time of data collection. Although the interviewed athletes gave a uniform picture of weight-regulation practices, some cultural differences specific to the sport of Olympic boxing may exist. Another limitation is linked to the interview questions. We did not include questions on the topic of nutrition knowledge: that is, if the athletes had

been educated about proper nutrition and the risks associated with rapid weight loss. However, athletes in combat sports at this level are given nutritional education and support and are likely to have at least basic knowledge concerning the implications of improper, aggressive weight regulation for health and performance. Another more serious limitation is the potential risk that respondents might have been influenced by the fact that the first author (S.P.) also serves as a nutritional advisor to athletes in the sports in question. Although he had not conducted consultations with any of the participants before the study, there is always a possibility that the person conducting the interviews and the characteristics of the interviewer influenced the information elicited from the respondents. Therefore, including supplementary data (Internet quotes) in which athletes expressed opinions in line with our results is a strength because the speakers were not influenced by a professional who normally advises against extreme dietary practices such as rapid weight loss.

CONCLUSIONS

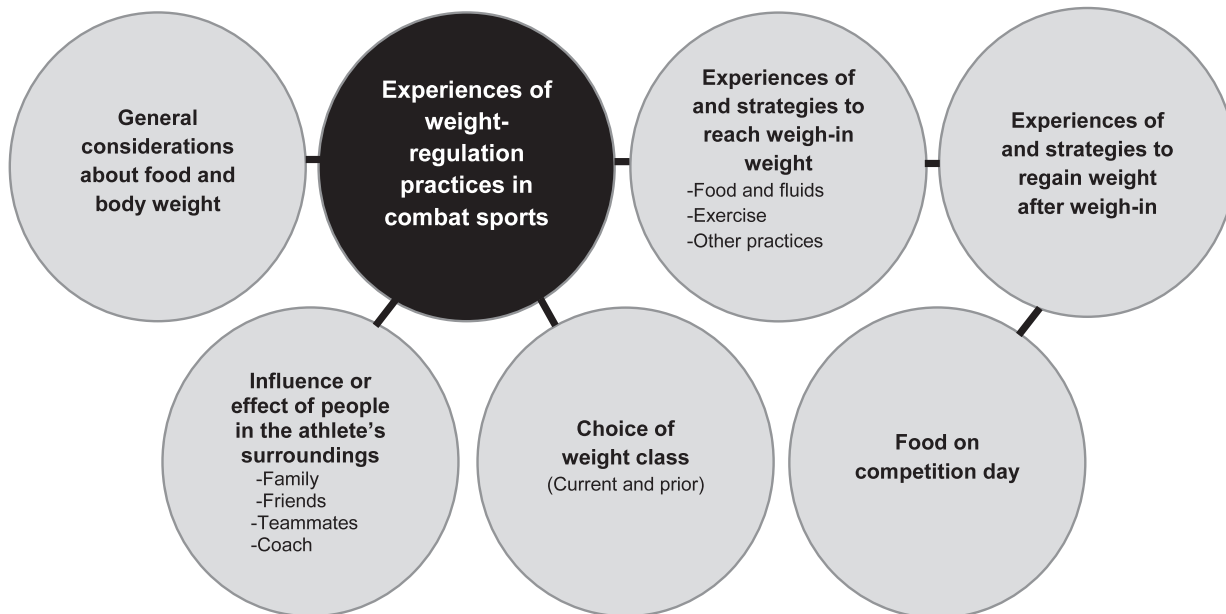
Our results can be important and useful for both health care professionals and people involved in sports with weight classes, such as athletes, coaches, mental health advisors, nutritional experts, and sport governing bodies. A broader understanding of the phenomenon is beneficial, especially with most competitive events worldwide in senior (and junior) combat sports being unregulated with respect to rapid weight loss and regain. If the intent is to reduce potentially harmful excessive weight-control practices as recommended by medical⁵¹ and sport governing bodies,⁵³ international sport federations must strive to create an environment that encourages athletes to prepare themselves for competitions and tournaments without restricting their food and fluid intake or practicing dehydration techniques to an excessive degree. We should also pay attention to the fact that weight regulation has become a key component of the culture of combat sports, as illustrated by a quote from one of the interviewed athletes: "I mean, if I wouldn't cut weight and everyone else does it, then I would be in trouble. As for now, it's almost like a policy; everyone does it."

One way of restricting intensive, rapid weight loss could be to make use of (and further develop) rule systems and nutritional education. This has been accomplished at the collegiate and scholastic levels of wrestling in the United States,^{54,55} and similar rules and programs have recently been proposed for other combat sports.⁵⁶ Although such programs are both sound and commendable, rules and education are probably not enough to come to terms with the deeply rooted belief of the positive effects of weight regulation. In any case, if the negative effects of weight regulations are addressed through changes in rule systems or intensified nutrition counseling (or both), the perceived positive mental aspects of weight regulation in the precompetition phase must also be acknowledged. Psychological training and counseling directed at these athletes might be an alternative way to attain the desired effect related to sport identity, mental diversion, and mental advantage currently achieved by the practice of rapid weight loss.

REFERENCES

1. Artioli GG, Gualano B, Franchini E, et al. Prevalence, magnitude, and methods of rapid weight loss among judo competitors. *Med Sci Sports Exerc.* 2010;42(3):436–442.
2. Filaire E, Sagnol M, Ferrand C, Maso F, Lac G. Psychophysiological stress in judo athletes during competition. *J Sports Med Phys Fitness.* 2001;41(2):263–268.
3. Boisseau N, Vera-Perez S, Poortmans J. Food and fluid intake in adolescent female judo athletes before competition. *Pediatr Exerc Sci.* 2005;17(1):62–67.
4. Kazemi M, Shearer H, Choung YS. Pre-competition habits and injuries in Taekwondo athletes. *BMC Musculoskelet Disord.* 2005;6:26.
5. Oppliger RA, Steen SA, Scott JR. Weight loss practices of college wrestlers. *Int J Sport Nutr Exerc Metab.* 2003;13(1):29–46.
6. Kinningham RB, Gorenflo DW. Weight loss methods of high school wrestlers. *Med Sci Sports Exerc.* 2001;33(5):810–813.
7. Casa DJ, Armstrong LE, Hillman SK, et al. National Athletic Trainers' Association position statement: fluid replacement for athletes. *J Athl Train.* 2000;35(2):212–224.
8. Sawka MN, Latzka WA, Matott RP, Montain SJ. Hydration effects on temperature regulation. *Int J Sports Med.* 1998;19(suppl 2):S108–S110.
9. Fogelholm M. Effects of bodyweight reduction on sports performance. *Sports Med.* 1994;18(4):249–267.
10. Allen ET, Smith DP, Miller DK. Hemodynamic response to submaximal exercise after dehydration and rehydration in high school wrestlers. *Med Sci Sports.* 1977;9(3):159–163.
11. Filaire E, Maso F, Degoutte F, Jouanel P, Lac G. Food restriction, performance, psychological state and lipid values in judo athletes. *Int J Sports Med.* 2001;22(6):454–459.
12. Hall CJ, Lane AM. Effects of rapid weight loss on mood and performance among amateur boxers. *Br J Sports Med.* 2001;35(6):390–395.
13. Wilmore JH. Weight category sports. In: Maughan RJ, ed. *Nutrition in Sport.* Oxford, UK: Blackwell Science Ltd; 2000;637–645.
14. Burke L. Weight-Making sports. In: *Practical Sports Nutrition.* Champaign, IL: Human Kinetics; 2007:289–312.
15. Marquart LF, Sobal J. Weight loss beliefs, practices and support systems for high school wrestlers. *J Adolesc Health.* 1994;15(5):410–415.
16. Sossin K, Gizis F, Marquart LF, Sobal J. Nutrition beliefs, attitudes, and resource use of high school wrestling coaches. *Int J Sport Nutr.* 1997;7(3):219–228.
17. Webster S, Rutt R, Weltman A. Physiological effects of a weight loss regimen practiced by college wrestlers. *Med Sci Sports Exerc.* 1990;22(2):229–234.
18. Judelson DA, Maresh CM, Farrell MJ, et al. Effect of hydration state on strength, power, and resistance exercise performance. *Med Sci Sports Exerc.* 2007;39(10):1817–1824.
19. Walsh RM, Noakes TD, Hawley JA, Dennis SC. Impaired high-intensity cycling performance time at low levels of dehydration. *Int J Sports Med.* 1994;15(7):392–398.
20. Viitasalo JT, Kyrolainen H, Bosco C, Alen M. Effects of rapid weight reduction on force production and vertical jumping height. *Int J Sports Med.* 1987;8(4):281–285.
21. Bigard AX, Sanchez H, Claveyrolas G, Martin S, Thimonier B, Arnaud MJ. Effects of dehydration and rehydration on EMG changes during fatiguing contractions. *Med Sci Sports Exerc.* 2001;33(10):1694–1700.
22. Torranin C, Smith DP, Byrd RJ. The effect of acute thermal dehydration and rapid rehydration on isometric and isonic endurance. *J Sports Med Phys Fitness.* 1979;19(1):1–9.
23. Choma CW, Sforzo GA, Keller BA. Impact of rapid weight loss on cognitive function in collegiate wrestlers. *Med Sci Sports Exerc.* 1998;30(5):746–749.

24. Koral J, Dosseville F. Combination of gradual and rapid weight loss: effects on physical performance and psychological state of elite judo athletes. *J Sports Sci.* 2009;27(2):115–120.
25. LeUnes A, Burger J. Profile of mood states research in sport and exercise psychology: past, present, and future. *J Appl Sport Psychol.* 2000;12(1):5–15.
26. Biskup C, Pfister G. I would like to be like her/him: are athletes role-models for boys and girls? *Eur Phys Educ Rev.* 1999;5(3):199–218.
27. Glaser BG, Strauss AL. *The Discovery of Grounded Theory: Strategies for Qualitative Research.* New York, NY: Aldine de Gruyter; 1967.
28. Glaser BG. *Theoretical Sensitivity: Advances in the Methodology of Grounded Theory.* Mill Valley, CA: Sociology Press; 1978.
29. Schreiber RS, Stern PN. *Using Grounded Theory in Nursing.* New York, NY: Springer Publishing; 2001.
30. Glaser BG. *Basics of Grounded Theory Analysis: Emergence vs Forcing.* Mill Valley, CA: Sociology Press; 1992.
31. Glaser BG. *Doing Grounded Theory: Issues and Discussions.* Mill Valley, CA: Sociology Press; 1998.
32. Allen JB. The perceived belonging in sport scale: examining validity. *Psychol Sport Exerc.* 2006;7(4):387–405.
33. Hopkins WG, Hawley JA, Burke LM. Design and analysis of research on sport performance enhancement. *Med Sci Sports Exerc.* 1999;31(3):472–485.
34. Gould D, Horn TS, Spreemann J. Sources of stress in junior elite wrestlers. *J Sport Psychol.* 1983;5(2):159–171.
35. Dosil J. *The Sport Psychologist's Handbook : A Guide for Sport-Specific Performance Enhancement.* Chichester, UK: John Wiley; 2006.
36. Wikipedia contributors. FILA wrestling world championships. http://en.wikipedia.org/wiki/FILA_Wrestling_World_Championships. Accessed November 7, 2011.
37. Collins RL. Among the better ones: upward assimilation in social comparison. In: Suls J, Wheeler L, eds. *Handbook of Social Comparison.* New York, NY: Kluwer Academic/Plenum; 2000: 159–172.
38. Russell D. Weight cutting “the old school” wrestling way. <http://www.youtube.com/watch?v=LUnn7ky5Hp8>. 1989. Accessed January 29, 2010.
39. Mayers J. Weight cutting response video. <http://www.youtube.com/watch?v=YUmbwqmSbco>. Published January 2009. Accessed February 5, 2010.
40. Faircloth R. Ron's blog: cutting weight. http://uscombatsports.com/index.php?option=com_flexicontent&view=items&cid=111&id=3583. Accessed February 8, 2010.
41. Artioli GG, Iglesias RT, Franchini E, et al. Rapid weight loss followed by recovery time does not affect judo-related performance. *J Sports Sci.* 2010;28(1):21–32.
42. 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):824–825.
43. Pettersson S, Pipping Ekström M, Berg CM. The food and weight combat. A problematic fight for the elite combat sports athlete. *Appetite.* 2012;59(2):234–242.
44. Nicholls JG. *The Competitive Ethos and Democratic Education.* Cambridge, MA: Harvard University Press; 1989.
45. Vealey RS. Confidence in sport. In: Brewer BW, ed. *Sport Psychology.* Oxford, UK: Wiley-Blackwell; 2009:43–52.
46. Good AJ, Brewer BW, Petitpas AJ, Van Raalte JL, Mahar MT. Identity foreclosure, athletic identity, and college sport participation. *Acad Athl J.* 1993;8:1–12.
47. Brewer BW, Van Raalte JL, Linder DE. Athletic identity: hercules' muscles or achilles heel? *Int J Sport Psychol.* 1993;24(2):237.
48. Sisjord MK, Kristiansen E. Elite women wrestlers' muscles: physical strength and a social burden. *Int Rev Sociol Sport.* 2009;44(2–3):231–246.
49. Coakley J, Hughes R. Positive deviance among athletes: the implications of overconformity to the sport ethic. In: Yiannakis A, Melnick MJ, eds. *Contemporary Issues in Sociology of Sport.* Champaign, IL: Human Kinetics; 2001:361–374.
50. Jones G. What is this thing called mental toughness? An investigation of elite sport performers. *J Appl Sport Psychol.* 2002;14(3):205–218.
51. Clough K, Earle DS, Swell D. Mental toughness: the concept and its measurement. In: Cockerill IM, ed. *Solutions in Sport Psychology.* London, UK; 2002:32–45.
52. American Academy of Pediatrics Committee on Sports Medicine and Fitness. Promotion of healthy weight-control practices in young athletes. *Pediatrics.* 2005;116(6):1557–1564.
53. 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.
54. Utter AC. The new National Collegiate Athletic Association wrestling weight certification program and sport-seasonal changes in body composition of college wrestlers. *J Strength Cond Res.* 2001;15(3):296–301.
55. Oppliger RA, Harms RD, Herrmann DE, Streich CM, Clark RR. The Wisconsin wrestling minimum weight project: a model for weight control among high school wrestlers. *Med Sci Sports Exerc.* 1995;27(8):1220–1224.
56. Artioli G, Franchini E, Nicastro H, Sterkowicz S, Solis MY, Lancha AH Jr. The need of a weight management control program in judo: a proposal based on the successful case of wrestling. *J Int Soc Sports Nutr.* 2010;7(1):15.



Appendix. The interview guide arranged by themes. The questions were asked with the following time periods in mind: last weeks or days before competition weigh-in, after weigh-in on a competition day, and preseason and between competitions.

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