

## A survey on losing weight in Japanese professional boxers

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Published online: March 31, 2022

(Accepted for publication March 15, 2022)

DOI:10.7752/jpes.2022.03100

### Abstract:

The deprivation of Boxing titles and match cancellation due to being overweight have often occurred in recent professional boxing competitions. This study examined the effects of weight loss on professional boxers' psychological conditions. The subjects were 122 professional boxers (mean age= 24.95±4.4 years old) having a Japan Boxing Commission license. We conducted an online or postal self-administered questionnaire survey. The survey inquired about basic information, including age, height, usual weight, class, and competition history, and about (1) positive and (2) adverse effects of weight loss on psychological conditions. We extracted text data of participants' descriptions and categorized and subcategorized them based on discussions between the author and co-researchers to ensure objectivity. We used Steps for Coding and Theorization (SCAT; Oya, 2008), a qualitative data analysis method, to analyze weight loss's positive and negative effects on psychological conditions. This study concludes that we organized free descriptions, indicating two categories of negative effect: [reduced mental energy] and [evoking negative emotions] and three categories of positive effect: [improving competitive motivation], [improving self-confidence], and [improving concentration]. However, the positive results might have been produced by pre-match conditions rather than by weight loss, and it isn't easy to distinguish between them. Although 71% of the participants described positive effects, they might have confused their pre-match changes in their condition with the effects of weight loss. Consequently, weight loss might have had only adverse psychological effects, such as [reduced psychic energy] and [evoking negative emotions]. Furthermore, providing psychological support to pro boxers' motivations, emotions, and cognition would be helpful when losing weight.

**Key word: Boxing, Questionnaire, Psychological aspect, Losing weight, Professional boxer**

### Introduction

The deprivation of Boxing titles and match cancellation due to being overweight have often occurred in recent professional boxing competitions. Therefore, the Japan Boxing Commission (JBC) revised rules related to weight and imposed heavier penalties and punishments than previously (JBC, 2018). Boxing is a weight-class competition, and boxers often reduce their weight by dietary restrictions or water intake reduction to gain an advantage over opponents in the body types, which places a physical and psychological burden on boxers. Mountjoy et al. (2014) indicated that Relative Energy Deficiency in Sport (RED-S) causes various adverse effects, such as growth and development, psychology, immunity, and metabolism, among others, in addition to performance. Moreover, it also affects future health.

Several researchers have reported on weight loss conditions in competitive sports, such as wrestling (Hwang et al., 2012), judo (Fujimoto et al., 2015), Olympic weight class athletes (Garthe et al., 2005). However, there are few reports on professional boxing. Professional boxing does not have successive matches, and a weight check is held the day before a fight, which is different from amateur boxing, which results in excessive attempts at weight loss. Therefore, the effect of weight loss might differ between professional and amateur boxing. Moreover, weight classes in boxing are divided into smaller categories than judo or wrestling, and boxers often try to reduce weight significantly to compete in a lower weight class than their ideal class.

Filaire et al. (2001) and Durguerian et al. (2015) reported psychological effects of weight loss in weight-class competitive sports such as a decline in vigor and an increase in stress and fatigue in the Profile of Mood States (POMS). In addition, present study was to examine the effects of a combination of gradual and rapid body mass loss on the physical performance and psychological state of elite judo athletes. Participants were divided into two groups (diet vs control) and POMS were assessed at 4 weeks before a championship and again one day before the same championship. Therefore, the experimental group showed a significant increase in scores for confusion ( $-14.6 \pm 7.9, P < 0.05$ ) and tension ( $-10.1 \pm 12.5, P < 0.05$ ), but a decrease in vigor ( $11.3 \pm 8.5, P < 0.05$ ), one day before the championship (Koral & Dosseville, 2009). On the other hand, through interviews, Stefan et al. (2013) qualitatively analyzed the psychological effects of weight loss in judo, wrestling, and taekwondo players. He reported its positive results, including sport identity, belonging, professionalism, mental diversion such as preparation, and mental advantages such as self-confidence. Therefore, previous studies

have reported negative and positive psychological effects of weight loss in combat sports, including amateur boxing.

Alejandro et al. (2019) reported effect of diet management on anxiety in combat sports such as judo, karate and taekwondo competitors from both genders following a free diet vs those that followed a diet plan in the Competitive State Anxiety Inventory-2Revised (CSAI-2R). Results indicated that the intensity for somatic and cognitive anxiety in the pre-weight event was lower in male and female competitors following a controlled diet. Fujimoto et al. (2015) indicated effect of Autogenic Training (AT) is in providing psychological support during weight loss in 27 male university judo players. As a result of this study of the psychological support using AT at the time of weight loss, the displeasure before a competition and the degradation of coaching contents were alleviated, and the psychological state during a competition was improved. Conversely, the so-called “never-give-up spirit” still exists in Japanese athletic settings, and athletes often believe that hard work will reinforce their minds. Professional boxers also tend to have a positive image of weight loss, which is a challenging experience. A gap might exist in recognizing the psychological effects of weight loss between researchers and athletes or coaches.

Sport psychology studies have investigated psychological conditions before games in different sports (Nishino, 2012; Hashiguchi and Hashiguchi, 2010; Fukamachi et al., 2016). Suzuki and Suzuki (2004) indicated increased anxiety before matches in weight-class competitive sports. Moreover, Hall and Lane (2001) examined the psychological effects of weight loss on amateur boxers using POMS. They reported significantly higher scores for Anger-Hostility, Fatigue, and Tension-Anxiety, whereas considerably lower scores were reported for Vigor during matches compared to training. However, they did not indicate whether the above psychological states resulted from weight loss or the game.

Moreover, weight loss methods, guidance, and recognition might differ depending on the gym where a boxer trained. This study conducted a questionnaire survey and compared different gyms that did not conduct follow-up surveys. JBC has been holding medical seminars since 2006 to communicate the findings of sports science to professional boxing gyms. We conducted this study through the cooperation of the JBC because sports science approaches were introduced after 2000, and professional boxers have rarely been subjects of research. This study was designed to understand the situation regarding professional boxers’ weight loss and examine its psychological effects for developing effective support methods for improving their performance.

## Material & methods

### *Participants*

Professional boxers having a JBC license (N=122) participated in this study (mean age= 24.95±4.4 years old). They were enrolled in 30 professional boxing gyms of the East Japan Boxing Association. Their mean professional career was 2.5±3.2 years, and 37% were A-class boxers, 17% B-class boxers, and 46% C-class boxers. Their ideal weight classes included minimumweight=7%, light flyweight=7%, flyweight=4%, super flyweight=6%, bantamweight=11%, super bantamweight=10%, featherweight=11%, super featherweight=19%, lightweight=12%, super lightweight=2%, welterweight=7%, super welterweight=2%, and middleweight=2%.

This study was conducted after obtaining the approval of the ethics committee of the \*\*\*\*\*. After receiving the JBC's permission, we administered the questionnaire only to professional boxers who consented to respond to the study's questionnaire.

### *Survey methods and question items*

We conducted an online or postal self-administered questionnaire survey. The survey inquired about basic information, including age, height, usual weight, class, and competition history, and about (1) positive and (2) adverse effects of weight loss on psychological conditions.

### *Analysis*

We extracted text data of participants' descriptions and categorized and subcategorized them based on discussions between the author and co-researchers to ensure objectivity.

We used Steps for Coding and Theorization (SCAT; Oya, 2008), a qualitative data analysis method, to analyze weight loss's positive and negative effects on psychological conditions. Moreover, we categorized the data based on five factors (competitive motivation, psychological stability or concentration, self-confidence, strategic thinking ability, and cooperativeness); 12 subscales (patience, fighting spirit, motivation for self-actualization, motivation to win, self-control ability, ability to relax, concentration, self-confidence, decision-making ability, prediction ability, judgment, and cooperativeness) of the Diagnostic Inventory of Psychological-Competitive Ability for Athletes (DIPCA.3; Tokunaga, 2001). The “xx” below indicates text data, <xx> indicates subcategorized paraphrases, and [xx] indicates categories.

## Results

### *Negative effects of weight loss on psychological aspects*

We organized free descriptions, indicating two categories: [reduced mental energy] and [evoking negative emotions]. Forty-eight percent of the participants mentioned reduced mental energy, and 43%

mentioned mental stability or concentration. Forty-nine percent of the participants described adverse effects of weight loss, i.e., reduced mental energy or evoking negative emotions (Table 1).

Subcategories of [reduced mental energy] included, <reduced patience> such as “losing energy,” “getting tired easily,” or “feeling weak,” and <reduced fighting spirit> including “losing motivation,” “feeling like doing nothing,” or “not wanting to play matches.” Patience and fighting spirit are subscales of competitive motivation. On the other hand, weight loss had physiological effects on physical aspects. Marton (1991) coined “mental energy” to express mental and physical motivation, vitality, and arousal. Therefore, we named this category [reduced mental energy].

The negative effects of weight loss on psychological conditions included many descriptions related to emotions. We analyzed these emotions by referring to Bradberry and Greaves (2019). Consequently, we categorized “feeling anxious” and “feeling scared” into <fear>, “feeling stress” and “feeling increasing tension” into <anger>, and “negative thinking” and “not enjoyable” into <sorrow>. Fear, anger, and sorrow are subscales of mental stability or concentration. However, the descriptions we collected were mainly about emotions. Therefore, we named this category [evoking negative emotions].

Table 1. Adverse effects of weight loss on psychological aspects

Categories	Subcategories	Percentage	Typical text data
Reduced mental energy	Reduced patience	35%	Losing vigor, feeling down, exhausted, etc.
	Reduced fighting spirit	13%	Not wanting to play matches, losing motivation, not wanting to do anything, etc.
Evoking negative emotions	fear	11%	Feeling anxious, scared, unstable, etc.
	anger	18%	Feeling pressure, stress, and increasing tension, etc.
	sorrow	13%	Negative thinking, not enjoyable, etc.

*Positive effects of weight loss on the psychological condition*

Seventy-one percent of the participants described positive effects of weight loss, classified into three categories; [improving competitive motivation], [improving self-confidence], and [improving concentration]. Sixty-three percent of the participants described improving competitive motivation, 22% described improving self-confidence, and 21% described improving concentration (Table 2).

“Increasingly want to win,” “Made up my mind,” and “Braced me up” were related to motivation to win and subcategorized into <improving motivation to win>. “Highly motivated” and “Got excited” were related to fighting spirit and subcategorized into <improving fighting spirit>. Motivation to win and fighting spirit are subscales of competitive motivation. Therefore, we named this category [improving competitive motivation].

“Self-confidence improved,” “Feeling invincible,” and “Having a clear image of winning” correspond to self-confidence, subcategorized into <improving self-confidence>. “Mentally prepared” and “Having an awareness as a professional boxer” correspond to decision-making ability and were subcategorized into <improving decisiveness>. Self-confidence and decision-making ability are subscales of self-confidence. Therefore, we named the category [increasing self-confidence].

“Improved concentration,” “Clear spirit,” and “Sharper senses” correspond to concentration, subcategorized into <improving concentration>. Although no items of DIPCA.3 corresponded to “Empty mind” or “Fear disappeared,” Weinberg (1992) listed four issues as inappropriate concentration, which correspond to distractions in competitive settings. Therefore, we named this subcategory <excluding distractions> and the category [improving concentration].

Table 2. Positive effects of weight loss on psychological aspects

Categories	Subcategories	Percentage	Typical text data
Improving competitive motivation	Improving motivation to win	32%	Increasingly want to win, definitely win, competitive spirit, etc.
	Improving fighting spirit	31%	Feeling uplifted, excited, increasing fighting spirit, etc.
Improving self-confidence	Improving self-confidence	18%	Self-confidence improved, having an advantage over the opponent, having a clear image of win, etc.
	Improving decisiveness	4%	Having an awareness as a professional boxer, fully prepared, etc.
Improving concentration	Improving concentration	15%	Being able to concentrate, having a clear spirit, etc.
	Excluding distractions	6%	Empty mind, no fear, etc.

## Discussion

The results indicated that weight loss had positive and negative effects on professional boxers' psychological condition. Adverse effects were (1) reduced mental energy (e.g., losing energy or motivation) and (2) evoking negative emotions (e.g., fear or anger). The positive effects were improving competitive motivation, improving self-confidence, and improving concentration. The above results were similar to previous findings, which confirmed the reliability and validity of the present study.

### *Negative effects of weight loss on psychological conditions*

We classified the adverse psychological effects of weight loss into two categories: [reduced mental energy] and [evoking negative emotions]. It is unclear whether these effects were produced by weight loss or pre-match psychological conditions, and it is difficult to distinguish these two effects because boxers usually reduce their weight before a match. Nevertheless, we tried to examine the psychological impact of weight loss based on previous studies.

#### *Reduced mental energy*

The present study confirmed [reduced mental energy]. Physiological effects of dietary restrictions might have promoted <reduced patience> and <reduced fighting spirit>. Andrade et al. (2019) reported that Vigor in POMS increased, and Fatigue decreased before a match in judo athletes. Moreover, Silva et al. (2020) reported that professional dancers' motivation significantly improved than usual before a contest. These studies suggest that athletes' motivation improves before competitions regardless of weight loss.

Mifune et al. (2020) reported from a physiological perspective that ghrelin, a hormone produced in gastric endocrine cells, affects reward systems in the brain, which increases motivation to exercise. Ghrelin is secreted when we are hungry and increases exercise motivation. Therefore, motivation to exercise might increase by maintaining well-regulated eating habits, which adjusts ghrelin secretion rhythms, whereas motivation might decrease when the rhythm is disturbed. Fasting and reducing water intake, which negatively affects physiological conditions, might promote <reduced resilience>, leading to [reduced mental energy] in professional boxers. However, further discussions are required about whether weight loss might generally decrease competitive motivation.

#### *Evoking negative emotions*

This study identified fear, anger, and sorrow. Previous studies on psychological changes just before competitions indicated the negative emotion of increased anxiety. For example, Hanton, Thomas, and Maynard (2004) using the Competitive State Anxiety Inventory-2, reported increased somatic anxiety frequency and increased cognitive anxiety intensity in rugby, football, and field hockey players from one week to two days before and from two hours to 30 minutes before a game. Thus, anxiety is inextricably connected with psychological conditions before competitions. Guilhem et al. (2015) reported using POMS that depression decreased during competition compared to before the competition in high-performance track and field athletes (N=24), suggesting that depression and sorrow might not appear before competitions.

On the other hand, previous studies did not indicate <sorrow> just before competitions, suggesting that <sorrow> might be affected by weight loss. Michael and Costas (2008) examined the psychological effects of weight loss on professional jockeys using POMS. They compared three groups (minimum, optimal, and relaxed weight) and reported that depression was significantly higher in the minimum weight group compared to the other two groups. This result might be valid because among negative emotions, depression corresponds to <sorrow>.

Generally, serotonin decomposition advances when stress facilitates serotonin activities, and the decomposition exceeds synthesis when stress continues, reducing the supply of neurotransmitters, leading to a decline in mood and motivation. A lack of tryptophan, a serotonin precursor, occurs when healthy people are in a depressed mood or before being depressed (Smith et al., 1987; Young et al., 1985; Heninger et al., 1996). Tryptophan, an essential amino acid, cannot be produced within the body and must be taken as a food or supplement. On the other hand, Heather et al. (2019) conducted a three-week follow-up survey by randomly dividing 17~35-year-old participants into a diet program intervention group and a control group and reported that depressive tendencies in the intervention group decreased significantly. In other words, <sorrow> might be an emotional characteristic of competition settings. Although usual diet programs set weight goals, the pressure of achieving the goal is relatively low, and the weight loss degree is limited. Conversely, professional boxers experience much psychological pressure because they cannot compete without reducing weight. Moreover, a lack of tryptophan caused by massive weight loss decreases serotonin, which might evoke <sorrow> in professional boxers.

#### *Positive effects of weight loss on psychological conditions*

We classified the positive psychological effects of weight loss into three categories: [improving competitive motivation], [improving self-confidence], and [improving concentration]. As with the negative effects described above, positive effects might be produced by weight loss and psychological changes before a match.

#### *Improving competitive motivation*

Gutman, Pollock, Foster, and Schmidt (1984) assessed training stress in elite speed skaters using POMS, which indicated that skaters tend to show high vigor after succeeded in trials, suggestive of

psychological changes before competitions. Over 60% of the participants in the present study described [improving competitive motivation], which might be affected by the psychological conditions before a match, rather than weight loss. Therefore, careful research is required regarding this issue.

*Improving self-confidence*

Nassib et al. (2014) reported that gymnasts' self-confidence at competitions was significantly higher than training. Moreover, Hala (2012) compared karate players' psychological conditions between three weeks and one hour before a match and reported a significant decline in self-confidence just before the match. Although both boxing and karate are combat sports, the degree of weight loss and the timing of weight measurements differ between them; the previous day in boxing and the day of the match in karate. Therefore, it is unclear whether the result of the present study, i.e., 22% of the participants describing [improving self-confidence], might be affected by weight loss. Conversely, Bandura (1977) tried to comprehensively explain the process of behavioral changes by using the concept of self-efficacy, which is the personal recognition of "how well one can deal with a certain situation." He listed four crucial sources of developing self-efficacy: mastery experiences, vicarious experiences, social persuasion, and emotional and physiological states. Although 22% of the participants in this study described [improving self-confidence], weight loss might not be the leading cause. Mastery experience (i.e., achieving the goal weight) and improved self-efficacy might have indirectly enhanced self-confidence.

*Improving concentration*

Nassib et al. (2014) reported that gymnasts' concentration at competitions was significantly lower than training. Moreover, Andrade et al. (2019) indicated that Brazilian jiu-jitsu players' Confusion in POMS was considerably higher at matches than training. The above results indicate a decline in concentration before competitions in combat and non-combat sports, suggesting that pre-match conditions might reduce concentration.

Ghrelin, the "hunger hormone," is secreted when hungry to raise the blood glucose level and regulate energy metabolism such as enhancing ingestion, weight gain, and regulation of gastrointestinal functions (Kodama, 2011). Ghrelin has positive effects on short-term memory, whereas it does not affect long-term memory (Kunath et al., 2016). Therefore, the sense of hunger might have a short-term positive effect on concentration, whereas its long-term positive effects are currently unclear. Although the present study indicated [improving concentration], it might be a temporary condition because hunger continues intermittently when pro boxers reduce weight, and there might be individual cognitive differences.

*Psychological intervention strategies for weight loss*

The present study indicated the adverse effects of [evoking negative emotions] caused by weight loss on psychological conditions. Vallerand et al. (2000) listed cognitions, evaluations, and motivations as antecedents of emotions. Moreover, Degoutte (2006) reported a large amount of saliva cortisol in judo athletes when reducing weight. Cortisol affects cognitive functions such as decision making, mediated by the glucocorticoid receptors (Yamakawa & Oohira, 2018). Differences in recognition of weight loss might determine whether positive or negative emotions are evoked. Therefore, providing psychological support for cognitions and emotions during the weight-loss period would be a helpful method. Emotional regulation (Gross, 1998, 2001) programs are helpful for emotional support. Moreover, Mindfulness training (Kabat-Zinn, 2013) using Self-talk, Acceptance, and Commitment Therapy (Hayes and Strosahl, 2004), based on Cognitive behavior therapy (Beck, 1995), might provide cognitive support. Moreover, motivational approaches could suppress [evoking negative emotions] because motivation is also an antecedent of emotions.

The present study indicated the negative effects of [reduced mental energy] caused by weight loss on psychological conditions. Psychological skills such as Goal setting (Locke and Latham, 2002) and Self-talk (Van Rattle, Vincent, and Brewer, 2016) are generally used to improve motivation in sport psychology. However, these approaches to competitive motivation might be inadequate for psychologically managing [reduced mental energy]. In other words, we should consider the psychological effects of reduced physiological functions due to malnutrition on athletes of weight-class sports. Goal setting for gradual weight loss and losing weight for matches would be essential in these sports. Moreover, it is crucial to select a weight class that does not need excessive weight loss because that would enable boxers to maintain the necessary intake of nutrients.

The current study suggested a cognitive gap regarding the psychological effects of weight loss because boxers tend to perceive weight loss has positive effects on their psychological conditions. In contrast, previous studies have indicated both positive and negative effects. Professional boxers should carefully examine their physical and mental conditions by self-monitoring (i.e., self-observation and self-control of one's expressive behaviors when reducing weight; Snyder, 1974). Training diaries and conditioning sheets are used to promote self-monitoring in sports mental training. Professional boxers should understand their daily condition and observe differences in their mental and physical conditions between regular and weight-loss periods. Supporters providing psychological support for professional boxers should encourage boxers to self-monitor daily, record their psychological and physical conditions, and develop a database. It is necessary to create an environment where experts in diversified fields, including nutritionists and physicians, can cooperate and provide advice in preparing for matches because boxers tend to estimate their condition during the weight-losing period positively.

This study qualitatively analyzed the effects of weight loss on the psychological conditions of professional boxers and identified positive and negative psychological effects. It is unclear whether similar results can be observed in other sports requiring weight control, including amateur boxing, because the degree of weight loss and measurement timing is different. Moreover, all the participants might not have experienced identical positive or negative effects. Furthermore, we did not assess the strength of this effect. Therefore, further research is needed on the strength of the psychological effects caused by losing weight and its impact on other weight-control-type sports. There is also a need to increase the number of participants and conduct longitudinal follow-up surveys to examine the efficacy of the intervention in athletic settings to improve the psychological support for professional boxers who are losing weight and prevent or reduce failures. We should also apply the results to other weight-class sports.

## Conclusion

This study examined the effects of weight loss on professional boxers' psychological conditions, which indicated negative effects, including [reduced mental energy] and [evoking negative emotions], as well as positive effects such as [improving motivation], [improving self-confidence], and [improving concentration]. However, the positive results might have been produced by pre-match conditions rather than by weight loss, and it isn't easy to distinguish between them. Although 71% of the participants described positive effects, they might have confused their pre-match changes in their condition with the effects of weight loss. Consequently, weight loss might have had only adverse psychological effects, such as [reduced mental energy] and [evoking negative emotions]. Furthermore, providing psychological support to pro boxers' motivations, emotions, and cognition would be helpful when losing weight. Thus, coaches and sports psychology practitioner should support psychological strategies to motivation, emotional and cognitive preparation. Therefore, mental training programs are an effective approach for pro boxer to weight loss. In addition, pro boxer ought to contact scientific specialist such as nutritionist, doctor, physiologist, sports psychologist during weight loss. Since various factors influence weight loss, it is important to support based on multifaceted sports science including psychological aspects.

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