Weight-regulation in karate athletes: prevalence, magnitude, and methods of weight loss, mood profiles, and eating attitudes

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Abstract

Aim: This study examined the prevalence and methods of weight loss and explored associations between self-regulation of eating in sport, mood, and eating attitudes in a sample of competitive karate athletes using self-report methods.

Methods: Fifty-eight karate athletes were recruited from amateur karate clubs in England. Participants were grouped as lightweight (Female: <57 kg, *n* = 8; Male: <67 kg, *n* = 10), middleweight (Female: <61 kg, *n* = 9; Male: 75 kg, *n* = 6), or heavyweight (Female: >61 kg, *n* = 16; Male: >75 kg, *n* = 9) competitors. Participants completed a cross-sectional self-report online questionnaire survey regarding weight-loss practices, mood, self-regulation of eating in sport, and eating attitudes, measured with the Brunel Mood Scale (BRUMS), Self-Regulation of Eating Attitudes in Sports Scale (SREASS), and Eating Attitudes Test-26 (EAT-26). **Results:** 43.1% of the athletes surveyed were trying to lose weight to compete. The most common weight loss methods were food restriction (65.5%), intense exercise/increased training (56.9%), and drink restriction/dehydration (37.9%). 48.2% reported always practicing their preferred weight-loss methods (WLMs) before competition. 63.8% of athletes either agreed or highly agreed that WLMs were effective, yet only 25.9% agreed or highly agreed that they were safe. 20.7% either agreed or highly agreed that WLMs provided them with a competitive advantage, while 46.6% reported that WLMs negatively impacted performance. The most common sources of weight-cutting advice were other athletes (44.8%), coaches (41.4%,) and teammates (34.5%). Collectively, for males, trying to lose weight before competition was characterised by a positive iceberg mood profile with high vigour; whilst females self-reported a negative mood profile characterised by higher scores for all negative mood dimensions, although mood states differed for male lightweight and female heavyweight athletes. Findings showed that depression and fatigue correlated significantly with dieting, bulimia and food preoccupation, and oral control. Anger,

confusion, and tension showed significant positive correlations with dieting and bulimia, and food preoccupation, but showed no significant correlation with oral control. Vigour showed a significant negative correlation with dieting and bulimia and food preoccupation but showed no significant negative correlation with oral control. Female athletes reported higher Global EAT-26 scores than males. Eleven females and one male reported EAT-26 scores $\geq$20.

Conclusions: Collectively, these findings suggest that weight loss and use of weight loss methods is prevalent in karate. Such practices appear to be influenced by the club training environment and appear to be associated with negative mood responses and attitudes towards eating among female karate athletes. Gender and weight-classification differences for mood and eating attitudes warrant further investigation.

Keywords: combat sports, weight-making, mood, eating attitudes, self-regulation

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Chapter One: Introduction

Background and Rationale

Combat sports consist of the traditional martial arts, such as karate and taekwondo, and the more sport-based disciplines, such as mixed martial arts (MMA), judo and boxing. These sports impose physical (e.g., strength, speed, power) and psycho-perceptual demands (e.g., anticipation and decision-making) on athletes and require the execution of motor skills under time pressure (Franchini et al., 2014; Williams et al., 2011). Combat sports performance is characterised by a combination of takedowns, throws, locks, kicks, punches, blocks, and strikes (Silva et al., 2011), although the sequence of motor skills differs by sport; for example, taekwondo is predominately characterised by kicking (Bridge et al., 2014), boxing by punching (Chaabène et al., 2015), and judo by throwing and holding (Franchini et al., 2013). MMA uses a combination of fighting styles, striking, and submission techniques (Kirk et al., 2020), and karate consists of punching, leg kicking, and striking (Chaabène et al., 2015). Research has found that successful combat sports athletes display faster reaction times and decision-making under pressure, which enables them to prevent attacks from their opponent, or perform earlier attacks (Milazzo et al., 2016; Mori et al., 2002, Müller & Abernethy, 2012).

Combat sports are categorised into divisions, which are classified by weight (for an overview, see Langan-Evans et al., 2020). The number of, and rule limits for, different weight classes vary between sports, and between competitions (e.g., Olympic versus professional competition). For example, professional boxing has 17 weight classes (Dutta, 2020) compared to Olympic boxing which comprises eight weight classes for men and five for

women. In contrast, the *Kumite* speciality for karate at the Olympics comprises three weight categories for men: <67kg, <75kg, >75kg; and women: <55kg, <61kg, >61kg. These classes are namely lightweight, middleweight, and heavyweight (International Olympic Committee [IOC], 2020).

The weight-class system is designed to ensure safe and fair competition by matching opponents of equal size. However, it is common for athletes to manipulate their body weight prior to competition to gain a size and strength advantage over their opponents (Barley et al., 2019). This process, which commonly involves rapid weight loss (RWL) prior to the weigh-in, is known colloquially as "making weight" and can be extremely dangerous. Here, the aim is to drop as much weight as possible (i.e., "cut" weight) to be able to compete in a specific weight class, sometimes in weight categories 5-10% below their natural weight (Artioli et al., 2016). Following the weigh-in, athletes will then look to regain their previous weight (i.e., "rapid weight gain"; RWG) via rehydration and refuelling. The result is that these athletes will compete heavier than their weight-class limit, i.e., in a lower weight class lower than their day-to-day/habitual weight (Matthews et al., 2019). This behaviour remains popular, most likely because it is entrenched into the culture of combat sports, yet it is highly controversial on both ethical and health grounds (Artioli et al., 2016; Crighton et al., 2016; Fletcher et al., 2014).

To prepare for competition, athletes will often perform structured training in the weeks/months beforehand. These periods of training preceding and including competition are referred to as "training camps" (Morehen et al., 2021) and may range in duration from 4 to 12 weeks (Kasper et al., 2019; Morton et al., 2010). It is during these periods that athletes will seek to reduce their body mass and will thus complete much of this specialised training with reduced energy availability (Burke et al., 2021; Kasper et al., 2019).

Weight loss can be achieved via a combination of acute (AWL) and chronic (CWL) strategies in the lead up to competition. Chronic strategies largely comprise “active” methods, such as a reduced energy intake and dietary manipulations (e.g., reduced carbohydrate and fat intake), and increased energy expenditure via intensified training over longer periods (Brito et al., 2012). Following weeks of practicing these methods, athletes may resort to “passive” methods, such as saunas and sweatsuits to reduce the water weight in an individual’s body in the final hours and day(s) before weighing in (Franchini et al., 2012). More dramatic strategies include self-induced vomiting, laxatives and diuretics which pose severe health risks, including death (Brito et al., 2012; Crighton et al., 2016; Fletcher et al., 2014; Reale et al., 2018).

The type of methods used are thought to be influenced by the type of sport (e.g., grappling [judo] versus striking [boxing]), level of competition (amateur versus professional) and structure (single bout versus multi-round), weigh-in regulations (such as recovery duration permitted), and culture (Barley et al., 2019; Reale et al., 2017). Athletes will tend to start losing weight a week or two before weigh-in, although this is often highly individualised and depends on how much weight they need to lose, their prior experience of weight cutting routines, sporting rules and regulations (e.g., weight class divisions, and timing of weigh-in before competition) and the level of competition (Reale et al., 2017; Matthews et al., 2019). For example, if athletes have more than a week to prepare for competition, they may seek to gradually decrease their energy intake through dieting and increased exercise training (Barley et al., 2018). However, if the athlete is still struggling to make weight, then they might increase the intensity of these RWL practices in the final week before weigh-in by using more aggressive weight-loss methods, such as sweat-suits, saunas, laxatives, and increasing their exercise training. These aggressive methods are mostly used in the 24-48 hours before weigh-in. As an example, some athletes will “hypo-hydrate” through a method known as water

loading (Crighton et al., 2015; Naulleau & Goulet, 2020; Reale et al., 2017). This method involves drinking copious amounts of water to trigger a “flushing mode” which causes an individual to urinate more (and thus lose water). Then, in the final 24 hours before weigh-in, they will limit liquid intake.

There are many reported health side-effects of weight cutting, with research indicating that weight-cutting techniques, such as RWL and dehydration, negatively impact physiological function and, in consequence, impair performance (Barley et al., 2018). For example, research has shown that athletes suffer numerous physiological side-effects of weight cutting such as nausea, fatigue, dizziness, brittle bones, and an increased risk of injury, and in more serious cases have suffered from hormonal imbalances, acute kidney injury and passing out (Kasper et al., 2019).

The biggest concern is for athletes who engage in RWL, which is defined as a weight loss >5% of body mass over 5-7 days (Khodaee et al., 2015). Multiple studies have shown that RWL impairs athletic performance, especially in terms of power, speed, and concentration (see Martinez-Aranda et al., 2023, for a review). However, it has been argued that, if an athlete can refuel and rehydrate appropriately between weigh-in and competition, then prior weight loss <5% may not affect performance (Castor-Praga et al., 2021).

Making weight is clearly a major physical and psychological challenge for combat athletes. In terms of psychological variables that should be investigated, research findings from other weight-category sports (e.g., rowing and horse racing), suggest that mood is predictive of performance and is also associated with eating disorders in sport (Caulfield & Karageorghis, 2008; Terry & Galambos, 2004; Wilson et al., 2014). In non-sports participants, Chaput (2005) reported that weight loss is typically associated with depression, whilst Lane (2003) found that depressed mood was associated with disordered eating attitudes in student athletes from a British University.

Mood has been described as "a set of feelings, ephemeral in natural, varying in intensity and duration, and usually involving more than one emotion" (Lane & Terry, 2000, p.17). Mood measurement uses self-report scales to assess transient emotions (Terry et al., 1999). The idiosyncratic nature of individual moods and emotions means that responses from these measures elicit valuable information about their relationships with mood regulation strategies for performance (Parsons-Smith et al., 2017). Both the 65-item Profile of Mood States (POMS; McNair et al., 1971) and abbreviated 24-item Brunel Mood Scale (BRUMS; Terry et al., 1999, 2003), in the context of sport and exercise, has traditionally been used to assess pre-competition mood states from which researchers can distinguish mood differences between athletes and non-athletes and predict performance outcomes (Robazza et al., 2004; Ruiz & Hanin, 2004). Morgan's (1985) Mental Health Model first identified that athletes exhibit *iceberg* profiles (lower than average anger, confusion, depression, fatigue, tension and higher than average vigour) when compared to the general population.

Whilst it is generally accepted that athletes experience more positive moods and less negative moods than non-athletes and that positive emotional health is associated with athletic success, research now suggests that athletic performance is closely related to mood for some but not others (e.g., Lane & Chappell, 2001). Parsons-Smith et al. (2017) identified six clusters of mood profiles referred to as the *iceberg*, *inverse iceberg*, *inverse Everest*, *submerged*, *shark fin*, and *surface* profiles. The inverse iceberg is characterised by below average score for vigour and above average scores for tension, depression, anger, fatigue, and confusion, and typically impairs performance efforts (Terry, 1995). Everest is characterised by low vigour, together with high tension and fatigue, and very high depression, anger, and confusion. The profile inverse Everest is characterised by low vigour, together with high tension and fatigue, and very high depression, anger, and confusion. The shark fin profile is characterised by low tension, depression, anger, vigour, and confusion together with high

fatigue. A final mood profile termed submerged is characterised by low scores for tension, depression, anger, vigour, fatigue, and confusion. Among these mood dimensions, depressed mood is the most important due to its de-motivating nature (Lane & Terry, 2000; Lane, 2001; Lane et al., 2001).

In addition to the negative mood-related responses to making weight, the literature in social psychology and sport psychology suggest that athletes in weight-category sports are particularly vulnerable to developing eating disorders (EDs) because they are under social and cultural pressure to "make weight" (Bratland-Sanda & Sundgot-Borgen, 2013). The prevalence of EDs in athletic populations is debated, but estimates range from 1% to 62% depending on the type of population studied and methods used (Byrne & McLean, 2001; Warren et al., 1990). Eating disorders develop from a complex interaction between personal (e.g., self-regulation, personality, self-esteem, mood) and contextual (e.g., coaches, sports friends, and parents) factors (Scoffier et al., 2009, 2010). For example, Terry (1999a) found that depressed mood scores predicted 9% of the variance in Eating Attitude Test (EAT) scores among a sample of rowers, whereby high scores on the EAT were associated with depressed mood. Furthermore, depressed mood has been used to screen for risk of eating disorders with 91% negative predictive utility (Terry & Galambos, 2004).

With regard to psychosocial factors, Scoffier et al. (2010) observed that key social agents, such as coaches, parents and sports friends, can influence the self-regulation of eating attitudes, and thus the development of disordered eating. Negative mood states associated with making weight (Hall & Lane, 2001), the cultural practice of weight making in combat sports (Pettersson et al., 2013), and the concern about making weight for competition (Pettersson et al., 2012) all represent self-regulation challenges for the combat sport athlete. Therefore, in line with the work of Scoffier et al. (2010), it would seem prudent to investigate

the self-regulation of eating attitudes in the context of negative affect, social interaction, and lack of anticipation of consequences on performance.

Chapter Two: Review of Literature

Overview

The purpose of this literature review is to identify key psychosocial factors associated with weight cutting in combat sports. Although there is a substantial amount of evidence concerning weight-making practices in combat sports, to the author's knowledge, no literature reviews have systematically identified and interpreted the research on psychological factors associated with weight-making in combat sports. Barley et al. (2019) called for more interpretation of the psychological influence of weight-cutting, as well as its sociology within combat sports cultures so that best practice guidelines can be developed.

The review will focus on qualitative (e.g., focus groups, diaries, interviews) and quantitative (e.g., experimental, and correlational) studies that have examined psychosocial responses during and after a period of weight-making. To help researchers and practitioners develop safe and effective interventions and inform policy, it is important to identify significant risk factors that influence weight-loss behaviours and the likelihood of developing disordered eating attitudes and unhealthy beliefs about weight-loss. The findings from the literature review will highlight gaps and limitations and open new avenues for research inquiry.

Eligibility Criteria

Eligibility criteria were informed using the Sample, Phenomenon of Interest, Design, Evaluation, and Research (SPIDER) concept (Cooke et al., 2012). To be eligible, studies had to meet the following criteria:

Sample: Inclusion criteria: Adolescent (i.e., high school) and adult combat sport athletes at collegiate, national, and international level. Combat sports included: boxing, karate, kickboxing, jiu-jitsu, wrestling, mixed martial arts, Muay-Thai, judo, and taekwondo.

Phenomenon of Interest: weight-making experiences or periods of weight-making, which included self-reported responses (e.g., mood, eating attitudes, stress, and coping) or outcomes (e.g., cognitive function). Each study had to include at least one psychosocial factor/response.

Design: All types of study designs were included. Studies were included if they were available as a full-text in the English language or as a full-text translation prior to the end of the data collection period. Only published scientific articles were included. Book chapters, reviews, commentaries, and unpublished abstracts were excluded.

Evaluation: Any reported psychological responses and experiences of weight-making were explored.

Research type: Mixed-methods (i.e., quantitative, qualitative, and mixed) research

Search Strategy

An extensive search of the literature was conducted (July 2021) using a wide range of online databases, including PubMed, EBSCO Academic Search Complete, CINAHL, PsycARTICLES, PsycINFO, SPORTDiscus, and Web of Science. The main keywords included: “combat* sport*” OR “combat* athlet*” AND (“factors, psychosocial” [MeSH terms] OR “psychology” [all fields]) AND “weight loss [MeSH terms]” OR (“eating” [MeSH terms] OR “feeding behaviour” [MeSH terms] OR “Feeding and Eating Disorders” [MeSH terms]. Combat sports were karate, judo, jiu-jitsu, taekwondo, boxing, mixed martial arts, Muay-Thai, and wrestling (both freestyle and Roman-Graeco).

Study Selection and Data Extraction

Papers were evaluated by title, abstract, and full text. At each stage, studies were excluded if the inclusion criteria were not satisfied. For each study included, the following

data were extracted: country and year of publication, age and sex of participants, sample size, type of study, sport practised by participants, measured variables and instruments/methodology and explored themes, weight-regulation intervention characteristics.

Review Structure

This review is divided into six sections. Section one provides a brief introduction and rationale for the review. Section two reviews studies focusing on knowledge of weight-loss methods and strategies. Section three reviews studies that focused on attitudes and beliefs concerning weight-loss for competition. Section four reviews studies that focused on mood responses associated with weight-regulation during a period of weight-making. Section five briefly reviews the science of self-regulation. Finally, section six provides recommendations for future research.

Table 1

Overview of Data Extracted from Included Studies Examining Psychological Factors Associated with Weight-Regulation in Combat Sports

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
Brandt et al. (2018)	Brazil	12 professional male MMA athletes Age range: 16-42 years Separated in RWL group (9 fighters: 25.6±4.5 years, body mass = 77.8±7.1 kg) and NWL group (3 fighters: 30.7±13.3 years, body mass = 80.0±5.2 kg,) National level competition experience, ranked top 30 Training 2x/day and 10x/week during the evaluation period	QT CS: 1) 30 days before competition, 2) at weigh-in, 3) 10 min before competition, and 4) 10 min post competition QUES: BRUMS	RWL associated with feeling more confused at 30 days TMD greater for TMD at all time points No relationship between mood and performance
Camarço et al. (2016)	Brazil	2 professional male MMA fighters	QT CS: Three time points: 1) 7 days before competition, 2) 36 hours before competition, 3) competition day	Athlete 1 lost 7.2kg (9.1% of BM) 5 days of water load, 2 days of fasting, water, and sodium restriction. Athlete 2 lost 4 kg (5.3% of BM) water loading during 6 days of RWL 1 day of fasting and water restriction but not sodium.

Table 1. Continued.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
			EXP: two magnitudes of RWL before a simulated competition period. COG	Athlete 2 recorded fewer mistakes on Stroop than Athlete 1. Also showed improved recovery (faster time to respond) across 3 tasks.
Castor-Praga et al. (2021)	Mexico	160 combat sport athletes (48 wrestling and 112 TKD) 96 male and 64 female; age range: 7-24 years Weight divisions: 39 to 125 kg in wrestling and 27 to 68 kg in TKD. Mean training history: 13.34 ± 2.89 years; at least 1 year of competitive experience	QT CS QUES: BRUMS and perception of performance. Pre-competition period	1. A significant difference was found for the intensity of use of training with plastic or thick clothes in the mood state category of fatigue (U = 1080.00, Z = −1.97, p = 0.04). 2. The group reporting the presence of fatigue used more RWL strategies in comparison with the group not-reporting that mood state category. On the other hand, the group reporting the presence of vigour showed lower amount of RWL strategies in comparison with the group not reporting this category of mood state. 3. No differences in the proportion of presence/absence of the mood states were found between sport disciplines nor between female and male athletes.
Choma, Sforzo, & Keller (1998)	USA	Collegiate male wrestlers (n = 14) and controls (n = 15; off-season athletes)	QT CS QUES: POMS	Greater mood negativity after RWL Cognitive impairments

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
		Years of competitive experience: 3 Training: 5 days/week	COG: Visual attention and visuomotor skills, Digit symbol and digit span, Attention and short-term memory, TMT A and B, and Story recall (subtest of Wechsler Memory Scale)	
Coswig et al. (2019)	Brazil	18 professional male MMA athletes Winners (*n* = 8, mean age: 25.4±6.1 years, habitual body mass (BM): 89.9±17.3kg) Losers (*n* = 7, mean age: 24.4 ± 6.8 years, habitual BM: 90.8±19.5 kg).	QT Naturalistic observational: between-groups design. On the first day, 24 hr before the event, the weigh-ins occurred, and the official BM was recorded from each athlete. QUES: POMS at weigh-in and before fight; competition completed on second day—repeated 30 min prior to the combats	No significant differences between winners and loser at each time point
Dale & Landers (1999)	USA	85 male wrestlers 75 non-wrestlers	MULTI-M QUES and INT EDI once during the season, and once off-season. Interviews also.	Significant differences were revealed, however, between in-season wrestlers and non-wrestlers, and between in-season wrestlers and off-season wrestlers, on the Drive for Thinness subscale. In both cases, significantly more in-season wrestlers scored above the “at risk” cut-off. These results indicate that although in-season wrestlers are more

Table 1. Continued.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
			EDI and EDE-Q	weight conscious than non-wrestlers, these feelings and attitudes are transient. Interviews: concerns with weight only due to making weight. Losing weight not enjoyable.
de Bruin & Oudejans (2018)	Netherlands	Elite female Judo (*n* = 2)	QL (ET)	1. Body-related experiences: Attitudes towards weight related to behaviours and remarks of others (coaches, peers, others) —coach has positive influence to avoid unhealthy behaviours. 2. Body image did not contribute to ED symptomatology but due to existence of weight classes and weight-making in judo. 3. Narratives. ED hidden during career. 4. Career termination to mental and physical exhaustion... "quit because of the dieting."
Degoutte et al. (2006)	France	20 male judokas Age range: Technical level: 1st to 4th Dan black belt Competitive level: National Training history: 15 years; 9 hr/week	QT EXP: Randomly assigned to either diet (5% weight loss) or control. One-day simulated judo competition after a 1-week weight loss period (T1) Period of weight maintenance (T1), after 7-day food restriction for diet group (T2), the morning of and at the end of the simulated competition (T3) QUES: POMS at all three time points	Significant increases in Fatigue, Tension and decreases Vigour for both groups at the end of the competition compared with T2.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
Dubnov-Raz et al. (2016)	Israel	112 competitive TKD fighters Age range: 12-21.5 years National Championships and regional competitions	QT CS QUES	High rate of pre-competition RWL in young Taekwondo fighters. Most athletes did not feel that RWL affected their sport performance, yet a significant proportion felt decreased levels of performance.
Escobar-Molina et al. (2015)	Spain	144 judo athletes (66 female and 78 male) from the Spanish judo teams Cadets, juniors, and seniors.	QT CS QUES: STAI-T, FCQ-T, RS, and EAT-40	Seniors presented higher use of WLM, especially one week before competition compared with juniors. Judoists were more involved in their diets and reduced more weight as they were older. Female athletes were more concerned about their diets, presented higher anxiety, scored higher in the emotion scale, and more eating disorders symptoms, although weight loss was lower. Anxiety and eating disorders symptoms differences were more common in juniors and cadets, respectively, with higher scores in female athletes.
Filaire et al. (2007)	France	12 judoists Fifteen cyclists and seventeen non-competitive students matched for BMI and used as controls	QT CS QUES	65% of athletes (judoists and cyclists) lost more than 3kg during a season. Judoists lost 3.4 + 0.2 kg 14% reported fasting 25% felt pressured to lose weight Causes of perceived pressure were 8.3% coaches, 25% fellow or former athletes or themselves (25%)

Table 1. Continued.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
		Mean age: 19.5 + 0.5 years Training history: 9.6 + 2.4 years; average 15 hr/week	EAT-26, MPS, the BES and the POMS were also used to evaluate the relationships between eating disorders and psychological characteristics. Athletes completed the tests during their competitive period and controls completed the same scales at the same time.	EAT-26 None of participants found to be at risk of DE. Controls reported higher body esteem and weight satisfaction. Depression largest significant predictor of Global EAT scores and Bulimia scores.
Filaire et al. (2001)	France	11 judoists Age range: 10 + 3.2 years 6-9 hr training per week Competitive experience in regional and national tournaments 2nd and 3rd Dan black belt	QT CS: Surveyed two months (T1) and one day (T2) before a major national competition QUES: POMS	Iceberg profile at T1 Profile at T2 (following weight loss) was characterised by lowered vigour and increased tension, anger, fatigue, and confusion.
Fortes et al. (2019)	Brazil	39 judokas (EG = 20 and CG = 19) Semi-elite	QT EXP Two-week study	Magnitude of stress symptoms increased for EG but not for the CG Reduced perception of psychophysiological recovery for EG but increased for CG

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
		Brazilian Judo Championships Age range: 18-25 years Trained on average for 2 hr/day, 5 days/week Judo for at least three years registered in national championships	The goal for the EG was a 10% reduction in body weight, that is, a 5% reduction for each week of the investigation. Part B (symptoms only) DALDA. Perception of psychophysiological recovery using RESTQ-Sport. Food restriction and weight reduction subscale of the disordered eating in sports scale (DES)	Food restriction and weight deduction subscale increased from pre- to post-test for EG but not for CG (not different between groups at pre-test)
Gonçalves et al. (2021)	Portugal	166 combat sports athletes (75.3% male) Karate (n = 64; 38.6%), kickboxing (*n* = 49; 29.5%), judo (*n* = 38; 22.9%), TKD (*n* = 7; 4.2%), Muay Thai (*n* = 2; 1.2%), boxing (*n* = 1; 0.6%), or jiu-jitsu (*n* = 1; 0.6%).	QT CS QUES: Surveyed on personal variables, cognitive appraisal (i.e., threat/challenge) using PSCAS, coping (i.e., denial) using COPE-R, emotions (i.e., anxiety) via SEQ, and eating behaviours via ED15 related to an unwanted weight change (i.e., "change against your will") before a competition (hypothetical situation).	1. Evidence of disordered eating (e.g., dietary restraint, intense physical activity, binge eating episodes, and induced vomiting). 2. Hypothetical weight change before competition perceived as stressful. 3. Higher threat perception associated with more eating concerns and had a greater tendency to experience negative emotions whereas challenge perception was associated with positive emotions. 4. Higher threat perception also associated with problem-focused coping (active confrontation and emotional support). 5. Personal variables did not predict DE; primary cognitive appraisal 5% of DE variance; coping variables explained 24% of DE variance; emotions explained 28% variance.

Table 1. Continued.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
Hall & Lane (2001)	UK	Age range: 14-56 years Mean age: 22.73 ± 8.03 years Competitive experience: Mean: 7.14 + 5.54 years Range: 1-44 years 16 amateur boxers Mean age: 23.5+ 4.8 years Competitive experience: 5 + 2.67 years; training history: 12 + 5 hr/week Weight category: Flyweight to heavyweight: mean body mass: 67.87 + 10.50 kg	MIXED-M (QL, QUES, Competitive Performance)	Interviews: Amateur boxers have four phases in their weight control programme: natural weight; training weight; interclub competition weight and championship weight. Perception that weight-making is necessary and reduced weight associated with better performance. POMS: Poor performance associated with negative mood profile: Increased anger, fatigue and tension and reduced vigour. Key finding: Paradox: Perception that RWL is associated with good performance, but findings showed they underperformed when performance compared to standard set as a goal (repetitions completed during circuit at training and championship weights).

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
Isacco et al. (2020)	France	20 well-trained male judo competitors (national level, black belt, 24 ± 5 years, 75.5 ± 7.7 kg). The average duration of practice was 15 years with a volume of 9 hr of judo training and 3 hr of intense conditioning per week.	QT EXP: between-groups design. Following one month of weight-management (baseline), participants (n = 20) were randomly divided into two groups: (i) a Weight Loss group (WL; n = 10) asked to lose at least 3% of body mass using the participants' usual restrictive diet within the week before the experimental day (simulated competition; five fights, interspersed by 30 min rest); (ii) a Weight Stable group (WS; n = 10), asked to maintain body mass. QUES: POMS: morning of the simulated competition before weigh-in and breakfast (T0) and after each fight (F1, F2, F3, F4, F5). Rate of Perceived Exertion (RPE; 6-20)	No significant group differences for each of the POMS dimensions, but each of them showed a time effect (p < .001) and significant group x time interactions at F4 and F5. RPE showed a group effect with overall RPE being significantly higher in the WL group compared to the WS group (p < .05), with both groups showing a significant time effect (p < .001). A time x group interaction was observed at F4 (p < .05) and F5 (p < .0001). Participants in the WL group lost 3% of their body mass.
Karninčić, Baić, & Slačanac (2016)	Croatia	77 male cadet wrestlers	QT CS	70.1% reduced their body mass. Mean body mass reduction for all groups was 1.25%. HW groups reported smallest weight reduction (kg).

Table 1. Continued.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
		Mean age: 16.0+0.8 years LW, MW, HW Competition level: Croatian National RG Wrestling Championship Experience: 5.1 + 2.4 years	QUES: BRUMS, self-reported weight loss (%)	MW group reported higher mood scores for 3 of the 5 dimensions, which the authors suggest could increase their risk of injury. Only fatigue distinguished between groups (MW vs HW, LW vs HW). In terms of BM reduction and mood for the LW group, a significant correlation was reported for anger; for the MW group, significant correlations were reported for anger, depression, fatigue, and calmness; but none for HW group.
Koral & Dosseville (2009)	France	27 male and 16 female college judoists All qualified French Junior National Championships Split into two groups: 30 (22 male, 8 female) weight reduction and 13 (5 male, 8 female) non-weight-reduction.	QT CS: Participants surveyed 20 days (T1) and 1 day before competition (after weight reduction period; T2). QUES: French version of POMS	Diet group reported significant (p = 0.05) increase in scores for confusion and tension (women only), but a decrease in vigour, one day before the championship (i.e., T2).

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
		Training history: 9 + 2.4 years; 10-14 hr/week All between 1st and 2nd Dan belts		
Kurt & Sagiroglu (2015)	Turkey	62 male, 50 female judo (*n* = 46), karate (*n* = 11), muay-Thai (*n* = 6) TKD (*n* = 28) and wrestling (*n* = 21) Current (54.5%) and former (27.7%) National team membership	QT CS QUES	21.54 ± 3.78 years, a mean body weight of 66.38 ± 11.45 kg and a mean height 170.05 ± 8.80 cm. The mean years of the sports experience was 10.42 ± 3.98 years. The mean age of start to use rapid weight loss methods were 15.29 ± 2.56 years. 80.36 % reported not using a dietician The most perceived problems during reduction period were excessive fatigue (70.5 %), decrease of the physical performance (67.9 %) and nervousness (66.1 %). On the other hand, reported binge eating episodes ratio is 60.71 %.
Landers, Arent, & Lutz (2001)	USA	45 male RG wrestlers Age range: 14-18 years	QT CS EXP QUES: PANAS	RWL group reported 6.34% body mass reduction versus MG (0.36%) No change on cognitive performance measures Positive affect deteriorated whilst negative affect increased with RWL.

Table 1. Continued.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
		Competitive experience: Range: 6 months to 10 years Mean: 4.65 years average of 4.65 years (range: 6 months to 10 years). 31 were actively losing weight (>1% BM) while other 14 maintaining. Of 31, 14 losing more than 5% of BM (RWL).	Two sessions ~45 min at normal weight 5-10 days prior to competition and 8-12 hr prior to weigh-in. CP: TMT A & B, ST, Wechsler digit span, and CRT	
Langan-Evans et al. (2020)	UK	Male international featherweight TKD athlete Age: 19 years	MULTI-M CS Intervention to reduce BM to compete in bantam weight category (<63kg). Measurements taken at 8 weeks, 4 weeks and 1 week prior to competition as well as day before official weigh-in, weigh-in day, and 24 hr and 1 week post competition.	POMS: No disturbances in mood across time except weigh-in where reduced vigour and increased fatigue resulted in TMD (still normal). Semi-structured interviews: Phase 1: fear and perceived losing large volume of BM would negatively impact health and performance. Phase 2: Anxiety yet realisation and confidence that he will achieve goal. Phase 3. Exhilaration and sense of accomplishment and focus on performance.
Martínez-Rodríguez et al. (2019)	Spain	146 (90 men, 56, women)	QT	No differences in CA between groups, but lower SA and CA in nutritional intervention group.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
		Sample: Judo (*n* = 29 male, 24 female) Karate (*n* = 30 male, 18 female), TKD (*n* = 31 male, *n* = 14 female) Age: males 20.70 + 2.8 years, females 20.6 + 2.6 years Comp level: National University Championships	CS (EXP) QUES Experimental design: comparison of Spanish version of CSAI-2R between two experimental groups (nutritional intervention *n* = 30 vs free diet *n* = 116). Intervention lasted at least months prior to T1. T1: 15 min before weight control (i.e., day before contest) T2: 15 min before warming up (i.e., post-weight)	Judo and TKD reported higher SA and CA than karate.
Marttinen et al. (2011)	USA	16 male Division I competitive collegiate wrestlers Mean age: 20 ± 2 years	QT CS (EXP): One group before-after design QUES: BRUMS at 10 days before a competitive meet (D-10) and on the day of competition (D-0).	Magnitude of mass loss significantly correlated with change in confusion (r = 0.733) and change in tension (r = 0.568). No other variables significantly correlated with magnitude of mass loss.

Table 1. Continued.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
Marquart & Sobal (1994)	USA	197 wrestlers High school wrestling teams in one county	QT CS	Making weight perceived as very important. Increased activity (exercise training) and decreased food intake most frequent weight loss methods. Vomiting and use of laxatives sometimes used, despite being perceived as unhealthy and detrimental to performance. Motivation to win, coaches and teammates were greatest influence on weight loss efforts. Coaches and physicians perceived to be most credible sources of weight loss information.
Massey et al. (2013)	USA	9 MMA athletes 8 Male, 1 Female Competitive level: Amateur to elite	QL INT	Grounded theory methodology Self-regulation emerged as integral to optimal performance dietary and training plan adherence Structured “rest periods”- i.e., scheduled in “cheat meals” to take a break from their training diet and nights out with friends Motivational conflicts Dietary intake needed to make weight became the focus of evaluation in the days leading up to competition
Park et al. (2019)	USA	92 male professional MMA athletes	QT CS	98% of professional MMA athletes recruited reported using RWL to make weight for competition. Greatest frequency of MMA athletes engaging in RWL occurs at 4 and 6 weeks prior to competition.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
		Weight category: Atomweight (47.6kg) to heavyweight (120kg) Age range: Not reported	QUES Survey questions included duration of overall weight loss prior to competition, methods of weight-cutting, and their sources of advice regarding weight cutting.	Greatest amount of weight lost occurs within last week prior to competition with 30% 1 week before, 27.8% 48 hours prior and 22.2% 24 hours prior. Most used methods without registered dietitian.
Pettersson, Ekström, & Berg (2012)	Sweden	14 Swedish national team athletes Wrestling (*n* = 7), judo (*n* = 3) and TKD (*n* = 4). 9 men, 5 women Age range: 18 to 36 years	QL INT	Time-periods: between, close to competition weigh-in (b) and post weigh-in. The most intense period of the rapid weight reduction phase (b) is characterised by impatience, uncertainty, frustration and increasing levels of irritation. Drastic day-to-day improvements regarding weight loss is sought and some of the athletes experience a tremendous amount of pressure.
Pettersson & Ekström. (2014)	Sweden	Former world class female boxer (*n* = 1) Age: Thirties 15 years' experience Competed at Olympics, medals at World and European Championships	QL INT	Three themes about weight management identified: balance (novice), identity (elite), and knowledge (coach) Novice: told how much weight to lose by coach. Males in the gym provided tips on weight reduction strategies by means of sauna and sweat suit. Balance theme characterised by short-term approach to weight loss with little consideration of health.

Table 1. Continued.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
				Elite: Dietary practice and weight regulation now 'part of her profession' (identity). Developed deeper understanding of weight regulation strategies, listening to fewer people and trying to gain theoretical knowledge via sports nutrition courses. Coach: Acknowledged significance of weight reduction in combat sports but would strive to educate athletes and then leave them to decide what is "right or wrong". Coach knowledge key to achieving balance (ethics of weight reduction versus enjoyment of boxing) and avoiding weight fluctuations.
Pettersson, Ekström, & Berg (2013)	Sweden	14 Swedish national team athletes 9 men, 5 women in 3 Olympic combat sports (wrestling, judo, and TKD). Age range: 18-36 years	MULTI-M (QL) INT, OBS, & ONL	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 pre-competition 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.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
Simpson & Wrisberg (2013)	US and UK	9 male professional British boxers Age range: 22 to 42 years Mean: 31 years Years as professional: 5.1 years, range 1-14 years Currently active (i.e., not retired), held professional status and fight record Sample included former and current World, Commonwealth, European and British Champions	QL INT: Existential Phenomenology	Six major themes: 1) Achieving Potential, Preparing, Sacrificing, Finding Support, Fearing, and Loving/Hating. Sacrifice (nutrition, sleep) and finding support (boxer-trainer relationship). Preparing theme: "Hardest thing about boxing is your diet (Adam)"... Frank: "No problem making weight."
Sitch & Day (2015)	UK	Judo	MULTI-M (QL) DIARY & INT	Weight-making duration ranged from 5-42 days Holistic content analysis

Table 1. Continued.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
		3 male, 3 female International standard, actively competing Age range: 18-28 years 5-18 years of competitive experience, previous experience of making weight, previous use of weight loss methods		1. Initiation of weight-making was well-planned; RPWL seen as something that is avoidable with gradual strategies, yet all participants eventually used them. Lack of progress increases negative thoughts. 2. Competing demands and maintaining life roles (cope as athlete/student/parent/worker and cope with making weight). 3. Temptation. Unprompted temptation easier to cope with than prompted (negative perceptions of others, societal norms to accept food from others, e.g., family and friends, and what might be perceived as unhealthy eating). 4. Impact of hunger and restricted nutrition. Heightened depression, frustration, agitation, and anger in response to dietary restriction. Impact on relationships. Tiredness and fatigue impact on psychological wellbeing. 5. Desire for social support. Motivation that support provides [to make weight] and help with coping with emotional impact.
Yoshioka et al. (2006)	Japan	22 male and 8 female judoists who required weight reduction	QT CS QUES	WR for men (3.4%) and women (4.9%) TMD significantly increased after weight reduction period compared to pre values.

Table 1. Continued.

Authors (year)	Country	Sample (size, gender, age, competitive level)	Study design and outcomes measured/phenomenon of interest	Summary
		Mean age: WR group (19.25 + 0.9 years) 5 male and 8 female athletes in non-reduction group Mean age: 18.95 + 1.1 years Men competed in University Championships and women in National Championships Six weight classes	POMS assessed at 20 days and 1 day before competition	For male athletes in the WR group, Fatigue, Tension, and TMD scores significantly increased, and vigour significantly decreased after the weight reduction. Furthermore, the change in the TMD scores significantly correlated with the BW changes during the weight reduction period in males. No significant changes in POMS scores for female athletes in the WR group.

Note. QT = Quantitative, QL = Qualitative MIXED-M, CS = Cross-sectional, LT = Longitudinal, ET = Ethnographic, INT = Interviews, OBS = Observations, QUES = Questionnaire measure, COG = Cognitive Performance, RG = Roman-Graeco, TKD = Taekwondo, BES = Body Esteem Scale, BRUMS = Brunel Mood Scale, COPE-R = COPE inventory-reduced, CRT = Choice Reaction Time, DALDA = Daily Analysis of Life Demands in Athletes, DES = Disordered Eating in Sports Scale, EAT-26 = Eating Attitudes Test-26, EAT-40 = Eating Attitudes Test-40, EDI = Eating Disorder Inventory, ED-15 = Eating Disorder Examination Questionnaire, FCQ-T = Food Craving Questionnaire-Trait, MES = Multidimensional Perfectionism Scale, ONL = Online Internet Sources, PANAS = Positive and Negative Affect Schedule, POMS = Profile of Mood States, PSCAS = Primary and Secondary Cognitive Appraisal Scale, RESTQ-Sport = Recovery-Stress Questionnaire for Athletes, RPE = Rating of Perceived Exertion, RS = Restraint Scale, SEQ = Sport Emotion Questionnaire, STAI-T = State-Trait Anxiety Inventory, ST = Stroop Test, TMD = Total Mood Disturbance, TMT = Trail-Making Test

Findings

General Findings

The final sample consisted of 33 studies (see Table 1) comprising a total population size of 1533 combat athletes. Sample sizes ranged from 1 athlete (Pettersson & Ekström, 2014) to 166 athletes (Gonçalves et al., 2021). Sports: boxing (*n* = 3), judo (*n* = 14), jiu-jitsu (*n* = 1), karate (*n* = 2), kickboxing (*n* = 1), taekwondo (*n* = 7), mixed-martial arts (*n* = 5), Muay-Thai (*n* = 1), freestyle/Roman-Graeco wrestling (*n* = 9). It was difficult to draw valid conclusions about expertise from the included studies because of the significantly different criteria used to define experts within and between sports (e.g., training time, university level. international and/or national competitive standard, professionalism). For example, it was difficult to separate athletes competing at national level, e.g., university championships, (Martínez-Rodríguez et al. 2019) and national championships where athletes ranged from 1st to 4th Dan black belt (Degoutte et al., 2006) from those competing at both national and international level (e.g., national team membership, Kurt & Sagiroglu, 2015).

Geographical Spread

Distribution of geographical location of the studies is shown in Table 1. The findings showed that nine studies were conducted in the USA (Choma et al., 1998; Marttinen et al. 2011; Massey et al., 2013; Landers et al. 2001; Marquart & Sobal 1994; Dale & Landers, 1999; Lakin et al. 1990; Choma et al., 1998; Kiningham & Gorenflo 2001), three in the UK (Hall & Lane, 2001; Langan-Evans et al., 2020; Sitch & Day, 2015), four in Brazil (Brandt et al. 2018; Camarço et al., 2016; Coswig et al., 2019; Fortes et al. 2019), four in France (Degoutte et al. 2006; Filaire et al., 2001; Filaire et al., 2007; Isacco et al. 2020; Rouveix et al., 2007), three in Sweden (Pettersson et al., 2012; Pettersson et al., 2013; Pettersson & Pipping Ekström 2014), two in Spain (Escobar-Molina et al., 2015; Martínez Rodríguez et al.,

2019) and one in Israel (Dubnov-Raz et al., 2016). The remaining studies were undertaken in Japan (Yoshioka et al., 2006), Netherlands (de Bruin & Oudejans., 2018), Croatia (Karninčić et al., 2016), Portugal (Gonçalves et al., 2021), Turkey (Kurt & Sagiroglu, 2015), and Mexico (Castor-Praga et al., 2021).

Methodological Characteristics

Seven qualitative, twenty-two quantitative, and three mixed-methods study (Dale & Landers, 1999; Hall, & Lane, 2001; Langan-Evans et al., 2020). Quantitative studies were mostly observational, using a cross-sectional design (e.g., Costarelli & Stamou 2009; Dubnov-Raz et al. 2016; Escobar-Molina et al. 2015; Karninčić et al. 2016), although several studies used experimental designs in simulated or naturalistic settings, e.g., prior to and/or including competition (Degoutte et al. 2006; Fortes et al. 2019; Hall & Isacco et al. 2020; Lane, 2001; Landers et al. 2001; Marttinen et al. 2011; Martínez-Rodríguez et al. 2019). Qualitative studies (including multimethod) mostly involved interviews (Dale & Landers, 1999; Massey et al., 2013; Pettersson et al. 2012; Pettersson et al. 2013; Pettersson & Pipping Ekström, 2014; Simpson & Wrisberg, 2013; Sitch & Day, 2015), but also included ethnography (de Bruin & Oudejans, 2018), diary (Sitch & Day 2015), and observations (Pettersson et al., 2012).

In terms of data analysis, quantitative data were analysed using a combination of descriptive (e.g., frequencies for prevalence of WL and methods of WL) and inferential (e.g., changes in pre-post scores) statistics. Qualitative studies reported using thematic analysis (Simpson & Wrisberg, 2013), content analysis (Sitch & Day, 2015), and grounded theory (Massey et al., 2013; Pettersson et al., 2013).

Quantitative Assessment

The measurement of psychological variables was carried out with different instruments and tests. Eating attitudes were assessed via the EAT-26 (Filaire, et al., 2007) or EAT-40 (Escobar-Molina, 2015), EDI (Dale & Landers, 1999), or ED-15 (Gonçalves et al., 2021). Mood was assessed using BRUMS (Brandt et al., 2018; Castor-Praga et al., 2021; Karninčić et al. 2016; Marttinen et al., 2011) or POMS (Choma et al., 1998; Coswig et al., 2019; Hall & Lane, 2001; Isacco et al., 2020; Koral, & Dosseville, 2009; Langan-Evans et al, 2020; Yoshioka et al., 2006). Emotion was assessed with the SEQ (Gonçalves et al., 2021) and PANAS (Landers et al., 2001) whilst specific measurement of anxiety was assessed using the CSAI-2 (Martínez-Rodríguez et al., 2019). Stress and recovery were assessed with the COPE-R (Gonçalves et al., 2021) or RESTQ-Sport (Fortes et al., 2019). Importance, challenge, and threat perceptions were assessed using the PSCAS (Gonçalves et al., 2021)

Cognitive performance was assessed in three studies with either a single measure such as the Stroop test (Camarço et al., 2016; Landers, et al., 2001) or a battery of cognitive tests for attention, short-term memory and visuomotor skills (Choma et al., 1998).

Content of Included Studies

Content within the included studies represented athlete knowledge; attitudes and beliefs regarding weight-cutting (sub-themes: athletic identity and perceived competitive advantage); mood responses; and self-regulation.

Knowledge

This section focuses on studies that investigated the role of knowledge generation (i.e., sources of advice) regarding weight-regulation/weight loss for competition. In terms of sources of advice, the studies reviewed identified that coaches and team-mates were the most

influential when it comes to cutting weight (de Bruin & Oudejans, 2018; Dubnov-Raz et al., 2016; Pettersson & Ekström, 2014; Reale et al., 2018). A case study report of a female boxing world champion by Pettersson and Ekström (2014) suggests that knowledge is generated differently throughout an athlete's career. In this particular case, the athlete recalled that their coach would weigh them in the gym and tell them how much weight they needed to lose.

In a separate study by the same authors, Pettersson and Ekström (2014) suggested that knowledge was key to safe and effective weight making and influenced athletes' perceptions of its importance for fighting within a weight limit, as well as understanding of the process (i.e., what is involved). It appears that many athletes begin weight cutting with little-to-no knowledge on how to lose weight safely or effectively (i.e., gradually rather than aggressively) or the physical and/or psychological side effects of weight loss. A lack of knowledge was cited as reason why some athletes felt the experience of weight-cutting represented a significant stressor. Drawing on Lazarus' Transactional Model of Stress and Coping (1991), Gonçalves et al. (2021) examined the effect of unwanted weight change before competition, and whether primary and secondary cognitive appraisals of the experience could predict disordered eating. This was based on the notion that weight change before competition could be a stressful experience if the athlete is unable to make weight. The authors found that those athletes who reported the experience as threatening tended to experience more negative emotions and more eating concerns. Conversely, those who perceived the experience as a challenge tended to report positive emotions. In terms of coping, threat appraisal was associated with active confrontation and emotional support coping strategies—the former predicting disordered eating behaviours.

Attitudes and Beliefs About Weight Cutting in Combat Sports

This section focuses on findings related to the attitudes and beliefs towards weight loss for competition. Key themes identified included the sense of an athletic identity and belonging within the sport and among teammates/clubs, and a belief that losing weight is necessary but can also elicit a competitive advantage.

Athletic Identity. Successful weight reduction was perceived to strengthen the sense of an athletic identity, instil self-discipline, increase perceptions of control, focus and preparation, and create a feeling of belonging whereby (Castor-Praga et al., 2021; Gonçalves et al., 2021; Hall & Lane, 2001, Karninčić et al., 2016; Koral & Dosseville, 2008, Pettersson et al., 2012; Pettersson et al., 2013, Reale et al., 2016). For example, Pettersson et al. (2013) reported that weight cutting is firmly rooted within the traditions and culture of [weight-class] sports, strengthening an individual's feelings that they "belong" to the sport culture, particularly when substantial weight loss is seen to define success. Furthermore, this affinity seems to be integral to feeling like a "real sportsperson" and being perceived as a professional. Pettersson and Ekström (2014), interviewed a former world class female boxer who spoke about weight cutting being part of the job for a professional athlete in a weight-category sport. Such is the need to manage weight, some athletes reported that they felt they needed to look lean and struggled to relax in the off-season (Pettersson et al., 2012).

Perceived Competitive Advantage. One key belief was the idea that RWL can give athletes a perceived competitive advantage (Hall & Lane, 2001), although this did not always translate into improved performance (Dubnov-Raz et al., 2016; Hall & Lane, 2001; Koral & Dosseville, 2009).

Mood Responses Associated with Weight-Loss

This section focuses on findings in relation to athletes' mood responses to cutting weight and associated risks with weight making. The majority of studies that assessed mood used either the BRUMS or POMS questionnaire to characterise athlete mood profiles. Several studies reported negative mood responses during the period leading up to weigh-in although these responses varied. For example, Filaire et al. (2007) reported an iceberg profile two months before a major competition but this changed to a negative profile characterised by decreased vigour and increased anger, confusion, fatigue, and tension when participants were re-assessed one day before competition. Marttinen et al. (2011) reported that the magnitude of weight loss associate with changes in confusion and tension, whilst Langan-Evans et al. (2020) reported reduced vigour and increased fatigue during weigh-in only.

Athletes also reported feeling pressure and anxiety during the weight cut process. Gonçalves et al. (2021) suggested that an athlete's emotional response to weight cutting depends on how they appraise the process. If weight cutting is perceived to be threatening or something they could not achieve (primary appraisal), they reported higher feelings of anxiety and negative mood response during the process. If the athlete viewed it as a challenge, one that they could achieve, they had better weight cutting process and mood responses (Gonçalves et al., 2021). For these athletes, a challenge appraisal was associated with lower levels of anger, confusion, depression, and higher vigour than those who viewed the process as a threat (Gonçalves et al., 2021).

Mood profiling athletes was also used to explore relationships with eating attitudes and behaviours, although actual eating behaviour was not observed. Dubnov-Raz et al. (2016) and Filaire et al. (2007) reported that depression was the strongest predictor of eating disorders.

Eating Attitudes

This section focuses on the relationship between weight cutting and attitudes towards eating. It has been suggested that athletes who compete in weight-cutting sports are an "at-risk" population of developing eating disorders (Garner et al., 1998). Four studies were synthesized under this category (Dale & Landers, 1999; Escobar-Molina et al., 2015; Filaire et al., 2007; Fortes et al., 2019; Gonçalves et al., 2021). Several risk factors were reported, including low self-esteem (Dubnov-Raz et al., 2016; Filaire et al., 2007), negative mood, and perfectionism (Filaire et al., 2007). Dubnov-Raz et al. (2016) suggested that those who are involved in competitive sports and have low trait self-esteem are more likely to struggle to cut weight, develop a negative mentality, and develop disordered eating behaviour.

Filaire et al. (2007) examined athletes had significantly higher Dieting ($p < 0.01$), and Bulimia scores ($p < 0.05$) than the controls. Dieting is related to an increased risk for restrictive eating and overeating problems, as well as binging and purging behaviors. Thus, even if the athletes did not have a score above 20 in the Global EAT score, they did engage in pathogenic weight loss methods several times in the year and especially during the period of competition, putting these athletes at risk for developing eating disorders. In fact, purging behaviors such as self-induced vomiting, use of laxatives and diet pills were reported by 4%, 10%, and 8.5% respectively of the athletes. Finally, Dubnov-Raz et al. (2016) reported that lightweight athletes were at greater risk of eating disorders than those who did not need to cut weight.

Self-Regulatory Function and Processes in Weight-Regulation

This section focuses on findings in relation to self-regulation during periods of weight cutting. Whilst only one study explicitly explored the role of self-regulation during combat sport training (Massey et al., 2013), collectively, the findings suggest that weight-making in

combat sports places enormous self-regulatory demands on athletes. Massey and colleagues (2013) adopted a grounded theory approach to explore the role of self-regulation during training among MMA athletes.

Several other studies revealed distinct self-regulatory components (de Bruin & Oudejans, 2018; Langan-Evans et al., 2020; Petterson et al., 2012; Simpson & Wrisberg, 2013; Sitch & Day, 2015). For example, Petterson et al. (2012) conceptualised weight-making in combat sport as a "problematic fight", arguing that weight-making is motivated by the potential to optimise performance but requires dietary restraint and short-term weight regulation. In this context, self-control is defined as the ability to engage in processes that guide athletes towards the attainment of goals, standards, or ideals (Carver & Scheier, 2009) and is an important variable explaining success in sport and exercise settings (Englert, 2016). Self-control is an important component here, and consistent with the idea that it involves effort and inhibition (Mischel et al., 1989; Muraven & Baumeister, 2000), athletes in the included studies frequently reported exerting restraint and avoiding tempting foods whilst cutting weight. Other self-regulatory demands included management of unpleasant mood states during training and in the lead up to and including competition (Massey et al., 2013; Pettersson et al., 2012).

Self-discipline appears to be a key self-regulatory behaviour when following strict training and dietary regimes in sport (Fullerton et al., 2018). Studies on strategic self-control use (Gillebaart et al., 2016; Gillebaart & Adriaanse, 2017) emphasise that self-control is an active component of the broader concept of self-regulation, which involves setting goals and monitoring progress towards them. Self-control is everything that one does to steer behaviour towards the goal, end state, or standard (Baumeister & Vohs, 2003). In sum, self-regulation appears be a key variable that explains why some find making weight more difficult and effortful than others.

Conclusions, Strengths, Limitations, and Future Directions

The aim of this review has been to provide an understanding of the psychosocial factors associated with weight-making in combat sports. Consistent with findings in other weight-category sports, weight cutting is prevalent in combat sports, with reported estimates as high as 96% (Escobar-Molina et al., 2015). Both older and elite athletes participate in rapid weight-loss methods (RWL; >5%), despite knowledge that weight loss negatively impacts performance. There is some evidence that women and children appear to be more at risk (Escobar-Molina et al., 2015).

Perceptions about weight-cutting as well as methods of weight-loss used prior to competition appear to be influenced by a mix of personal and contextual factors. On an individual level, there appears to be a perception among athletes that making weight is very much part of the job for a combat sports athlete (i.e., fighting within a weight limit) and thus central to their sense of an athletic identity (i.e., being a "real" combat sports athlete). When considering the wider context in which the athletes operate in, the environment appears to be key to shaping athletes' beliefs and behaviours concerning weight-regulation. Coaches, in particular, appear to be instrumental when it comes to the culture of the gym environment. These factors appear to motivate athletes to use a variety of weight-loss methods in training and during the final week and days before competition.

In addition, the main psychological responses reported either before weigh-in, during the period between weigh-in and competition, and after competition, included disturbed mood (increased anxiety, confusion, depression, and fatigue), negative thinking associated with struggles to make weight (but positive thinking and increased confidence if the athlete makes weight), and a perceived mental advantage characterised by feelings of competency and readiness to compete. Taken together, the responses appear to be more marked depending on the outcomes of weight-regulation. Put simply, successful weight-regulation (i.e., making

weight) appears to associate with positive feelings, thoughts, and performance, whereas unsuccessful or challenging weight-regulation (i.e., failing or struggling to make weight) appears to have deleterious effects, including decreased confidence, heightened stress and anxiety and perceptions of feeling unprepared, incompetent, and/or not feeling like an athlete.

Strengths and Limitations. From the literature review there are some limitations that have implications for current research regarding the psychology of weight cutting in combat sports. It was difficult to define the sample as a whole because of the varying criteria used by researchers. For example, Isacco et al. (2020) defined the participants in their study as "well-trained competitors", while Langan-Evans et al. (2020) and Sitch and Day (2015) defined participants as "international level" and "international standard", respectively. In contrast, Martínez-Rodríguez et al. (2019) reported competition level (National Championships). One such issue with this criterion is that some of the athletes may be competing at more than one level (e.g., national, and international) at that time in their career. Other researchers, such as Lander et al. (2001) reported competitive experience rather than level. A similar issue emerges when one tries to define elite/expert status on the basis of professionalism (e.g., Coswig et al., 2018; Park et al., 2019) or training history (Koral & Dosseville, 2009). For example, Simpson and Wrisberg (2013) reported that their sample of professional boxers that included "… former and current World, Commonwealth, European and British champions as well as relatively unsuccessful boxers." Such issues are discussed in detail by Swann et al. (2015) who proposed that five key variables must be considered when defining elite/expert athletes within and between sports: 1) an athlete's highest standard of performance, 2) success at the highest level, 3) experience at the athlete's highest level, 4) competitiveness of sport in athlete's country, and 5) global competitiveness of sport.

Some studies gathered information from only one participant population (e.g., athletes). To strengthen the quality of results, future research should aim to collect data from several populations that influence athletes' weight-regulation practices (e.g., coaches, teammates, nutritionists)

Whilst most of the research reviewed in this area relied on non-experimental methods (e.g., self-report), some studies did adopt an experimental approach to examine the effects of weight-cutting on psychosocial and performance outcomes (Degoutte et al., 2006; Hall & Lane, 2001; Landers et al., 2001; Marttinen et al., 2011). Only one study adopted a mixed-methods design (Hall & Lane, 2001). To improve research within this area, future studies might combine several research approaches.

Hall and Lane (2001) identified that boxers divide their weight-regulation strategies into four phases of the season (natural weight, training weight, interclub weight, and championship weight). The physical and mental demands associated with weight regulation are likely to vary during each of these phases. For example, mood is unlikely to be disturbed (i.e., iceberg profile) at natural weight because there is no requirement to regulate weight. However, weight regulation prior to competition is likely to disturb mood. Hall and Lane (2001) found that boxers reported increased anger and tension at championship weight (i.e., just before competition). Future research should consider these temporal demands when examining psychosocial factors associated with weight-regulation. However, Dale and Landers (1999) studied athletes in and out of season and found that athletes out of season cared less about their weight and showed better mood responses, meaning that whilst athletes may have negative mood and display disordered eating during the weight cut, it does not affect them year-round and contradicts studies that suggest these combat athletes are at a higher risk of developing eating disorders or other mental illnesses.

In terms of the literature review itself, a full systematic review and quality assessment of both the information gathered from, and methodological rigour of, the included studies, using a tool such as the Mixed Method Appraisal Tool (Pluye et al., 2011), would ensure this process is more replicable and robust. The SPIDER tool was used to incorporate qualitative and mixed-methods research. Furthermore, it was deemed more suitable for this research and aligning the search strategy to the research question, as opposed to using or combining the PICO tool. The SPIDER tool provides a more specific search of the databases, although not as sensitive, which is beneficial to researchers who may not be able to carry out a fully comprehensive search (Methley et al., 2014).

Future Directions. Going forward there are several clear gaps in weight-cutting research that can be addressed. Most studies have examined weight cutting in boxing, judo, MMA and wrestling. There was surprisingly little research on psychosocial factors associated with weight-regulation in Karate. It would be prudent to investigate weight-regulation behaviours further in this population. There are considerable differences between these sports when it comes to competition (e.g., frequency of competitions in the year, duration between weigh-in and competition). For sports such as professional boxing, fighters might only have to make weight once or twice per year (Morton et al., 2010). Massey highlighted how self-regulatory demands change during training, depending on whether dietary and weight control is needed. Thus, when assessing weight-regulation practices in combat sport, researchers are encouraged to comprehensively assess both individual (e.g., weight history, preferred choice of WL methods) and contextual factors (e.g., environmental influences; and temporal factors, such as during versus out of season).

Summary

The aim of this review has been to provide an understanding of the psychosocial factors associated with weight-making practices in combat sports. Several factors influencing weight-making practices were identified including the coach's influence, culturally adopted beliefs and practices within the sport, the sense of an athletic identity, and a perceived competitive mental advantage. In addition, the main psychological responses reported either before weigh-in, during the period between weigh-in and competition, and after competition, were disturbed mood, impaired cognitive function (attention and memory recall) and increased or decreased confidence depending on whether weight-regulation had been successful or not. In some cases, mood and cognitive performance returned to baseline levels following rehydration and food consumption; however, dietary and weight control was consistently reported as psychologically challenging, placing self-regulatory demands on athletes.

Aims and Hypotheses

Against this background, the current study had two aims. The first aim was to characterise the prevalence and methods of weight-loss in a sample of karate athletes. The second aim was to explore cross-sectional relationships between self-regulation of eating attitudes in sport, mood, and eating attitudes. Guided by theory and research, it was hypothesized that participants' mood recalled during their most recent period of weight making prior to competition would be characterised by a negative mood profile, which would be more pronounced among lightweight and middleweight athletes, as well as among female athletes. In addition, given the link between EDs and mood states, it was hypothesized that negative mood dimensions (tension, depression, anger, fatigue, confusion) would positively associate with higher EAT-26 scores.

$H1_0$ Weight regulation will not be associated with a negative mood profile comprising increased anger, confusion, depression, fatigue, tension, and reduced vigour on the Brunel Mood Scale.

$H1_1$ Weight regulation will be associated with a negative mood profile comprising increased anger, confusion, depression, fatigue, tension, and reduced vigour on the Brunel Mood Scale.

$H2_0$ Female lightweight athletes will not report more negative eating attitudes as determined by scores on the Eating Attitudes Test-26.

$H2_1$ Female lightweight athletes will report more negative eating attitudes as determined by scores on the Eating Attitudes Test-26.

$H3_0$ Depression scores, as determined on the Brunel Mood Scale, will not be positively associated with Eating Attitudes Test-26 scores.

$H3_1$ Depression scores, as determined on the Brunel Mood Scale, will be positively associated with Eating Attitudes Test-26 scores.

$H4_0$ Self-regulation of eating attitudes will not be negatively associated with eating scores, as determined by the Self-Regulation of Eating Attitudes in Sports Scale and Eating Attitudes Test-26 scores, respectively.

$H4_1$ Self-regulation of eating attitudes will be negatively associated with eating scores, as determined by the Self-Regulation of Eating Attitudes in Sports Scale and Eating Attitudes Test-26 scores, respectively.

Chapter Three: Research Methods and Design

Participants

Of the *N* = 58 (33 female, 25 male) karate athletes (*karateka*) surveyed, respondents ranged in ability from amateur to elite as long as they had some form of competitive experience (local, *n* = 1; regional, *n* = 1; national, *n* = 14; international, *n* = 42). 89.7% self-reported more than 2 years' training for competition, 3.4% more than 1 year, 1.7% 6-12 months, and 5.2% less than 3 months. Participants were grouped as male-lightweight (*n* = 10), male-middleweight (*n* = 6), male-heavyweight (*n* = 9), female-lightweight (*n* = 8), female-middleweight (*n* = 9) or female-heavyweight (*n* = 16). All participants belonged to a club and had a coach. Ethical approval was granted by the University of Kent School of Sports and Exercise Sciences Ethics and Research Advisory Group (REF: Prop 59_2018_19). The provision for informed consent was included as part of the online survey. If participants did not explicitly provide consent, then they were not able to complete the subsequent questions. Data collected were anonymous and not identifiable to any individual.

Procedure

An invitation letter was posted on social media (Instagram, Twitter, and Facebook) to find participants to complete an online survey via Google Forms. The invitation included a description of the study and how the data was going to be used and contact details of the research team should they have any questions. Individuals who expressed interest were sent the survey and coaches were asked to send the survey to any athletes they knew who may be eligible. Both eligible and non-eligible athletes agreed to send out the questionnaire to any other individuals who met the inclusion criteria of the study. Data collection was conducted over a period that included the global COVID-19 pandemic, during which competition was postponed. All athletes were asked to respond based on how they felt when they last

competed but, for some, this would have been prior to the pandemic. Individuals could withdraw from the study at any time.

The Survey

The online survey combined three validated questionnaires: the Brunel Mood Scale (BRUMS; Terry et al., 2003), the Self-Regulatory Eating Attitudes in Sports Scale (SRESS; Scoffier et al.,2010) and the Eating Attitudes Test-26 (Garner et al., 1983). (Copies of the questionnaires can be found in the Appendices.) Participants were asked preliminary questions regarding demographic and sporting history. Questions were related to training habits (e.g., "How many days per week do you train?"), competition level (e.g., "What standard of competition do you take part in?"), experience (e.g., "How long have you been training for? [months/years]"). To encourage openness, participant names and clubs were kept anonymous, and participants were asked to respond honestly to all the items of the questionnaires. The instructions outlined the general nature of the investigation but made no mention of EDs.

Weight-Making Practices. Participants were next asked questions about their weight loss habits (e.g., "Do you use weight loss methods before the competition?"), knowledge sources (e.g., "Where do you get your information / seek advice for weight cutting?"), and beliefs (e.g., "Do you think weight cutting gives you a competitive advantage over your opponent?", "I feel pressured to weight cut before fights").

Mood. The Brunel Mood Scale (BRUMS; Terry et al., 2003) is a self-rating questionnaire of mood based on the 65-item POMS Scale (McNair et al., 1971) and provides an insight into an individual's mood and feelings at given moments. It is a 24-item survey that assesses six mood dimensions: tension, anger, confusion, fatigue, vigour, and depression. The original instructions ask respondents to rate "How are you feeling right now?" on a 5-

point scale anchored by 0 (“Not at all”) to 4 (“extremely”). Each dimension is scored from 0 to 16. In addition, it is possible to obtain a single measure of mood disturbance (Total Mood Disturbance; TMD) by adding the scores for the negative mood scales and subtracting this score from vigour (TMD = vigour – [anger + confusion + depression + fatigue + tension]). The scale was validated with athletes aged 12 to 39 years old using confirmatory factor analysis (Terry, Lane, & Fogarty, 2003). The BRUMS has been used in a variety of ways across different sports to monitor and assess risk of burnout from overtraining (Morgan, 1987), training-induced distress (Main & Grove, 2009; Raglin & Morgan, 1994) and reduced physical performance (Lahart et al., 2013), predicting the likelihood of developing an eating disorder (Terry & Galambos, 2004), and reacting to poor performance (Beedie et al., 2000). In this study, respondents were asked to recall their most recent experience of weight-making for an event/competition and to rate “how you felt during that period”. Although the use of retrospective recall has been criticised in the literature (Roberts & Lane, 2021), the focus here was not on current mood but on memories of mood during a period of weight-cutting prior to competition.

Self-Regulation of Eating Attitudes. The Self-Regulation of Eating Attitudes in Sports Scale (SREASS; Scoffier et al., 2010) is a self-rating questionnaire that assesses an individual’s eating attitudes specifically in sports. It is a 16-item test with a 6-point scale ranging from “not at all” to “totally agree”. Participants were asked to pick one of the six points on the scale that best fit how they related to each of the 16 items. The test is made of five different subscales: lack of anticipation of consequence on performance, food temptation, negative effects, lack of compensatory strategies and social interaction. This test was developed because the Eating Self-Efficacy Scale (Glynn & Ruderman 1986) and the Eating Disorder Recovery Self-Efficacy questionnaire (Pinto et al., 2008) were not adapted to be used accurately within a sports setting. When Scoffier et al. (2010) developed this test, they

conducted a series of studies to validate the temporal structure, temporal stability, gender invariance and external validation via correlation with locus of control.

Eating Attitudes. The Eating Attitudes Test (EAT-26; Garner et al., 1983) is a self-rating questionnaire to identify abnormal eating habits and concerns about weight derived from a 40-item original inventory (Garner & Garfinkel, 1979). Respondents rate their agreement with statements about weight and food. Furthermore, scores on dieting behaviours could influence composite score on ET. The original factor analysis showed three interrelated factors: Dieting behaviours (13 items), Bulimia and food preoccupation (6 items) and Oral control (7 items). The factor "dieting" describes the preoccupation with being thinner and avoiding fattening foods and includes items such as "Engage in dieting behaviour" and "Am terrified about being overweight". The factor about bulimia and food preoccupation includes items such as "Vomit after I have eaten" and "Give too much time and thought to food". The factor about oral control includes items such as "Feel that others pressure me to eat" and "Display self-control around food". While previous research tends to sum EAT scores into a single scale, Lane et al. (2004) provided evidence to support using each scale independently. Participants rate the intensity of attitudes from six possible options: Always = 3, Very Often = 2, Often = 1, and Never, Rarely, or Sometimes = 0. However, the 26th question is scored in reverse with never = 3, rarely = 2 and sometimes = 1 with the other three = 0. The test would also normally include six behavioral questions at the end such as "Ever used laxatives, diet pills or diuretics (water pills) to control your weight or shape?" A score greater than 20 is an indicator of a possible ED problems (but, importantly, not a diagnosis), and individuals who score 20 or more are advised to seek support from a professional.

Data Analysis

Questionnaire data were first organised into separate data files in Microsoft Excel. Total scores for each of the validated psychological questionnaires were computed. Where appropriate, these results were also interpreted using scoring criteria, for example, participants that score ≥20 on the EAT-26 (Garner et al., 1983) are suggested to be "at risk" of eating disorders and, in the case of the SREASS (Scoffier et al., 2010), the higher the score, the higher an individual's self-regulation with food. For BRUMS (Terry et al., 2003), the higher the score, the higher the intensity of each mood an individual felt.

Prevalence of weight loss and weight-loss methods and history were calculated using frequency statistics (%) and Pearson's correlation coefficient was used to identify any correlations between questionnaire variables (e.g., mood and EAT-26). Chi-square tests of independence were also used to test for associations with categorical levels of gender (men vs. women), age (18-24; 25-35; 36-45, 46+ years), and weight class (lightweight, middleweight, and heavyweight). Independent samples *t*-tests were used to discern if there were any differences in mood states and self-regulation of eating attitudes between those who score 20 or above on the EAT-26 and those who scored below. All statistical analyses were completed with IBM® SPSS® 28 statistical software (SPSS Inc., Chicago, IL).

Data derived from the open-ended questions at the end of the survey were summarised with representative quotations.

Chapter Four: Results

Descriptive statistics for the sample are provided in Table 2.

Table 2

Participant Characteristics

Participants' characteristics	Range	Mean ± SD
Age (y)	18-72	25.8 ± 10.6
Habitual body mass (kg)	51-105	69.5 ± 10.7
Stature (cm)	155-185	170.8 ± 7.0
Habitual Body Mass Index (kg/m^2)	18.6-33.1	23.8 ± 3.2
Days spent training per week	2-7	4.4 ± 1.4
Years of training	1-57	14.9 ± 9.8
Desired weight (kg)*	49-98	66.6 ± 9.6
Habitual body mass – desired weight (kg)	-17 – 8	-2.9 ± 5.3
Number of competitions per year	1 – 30	8.5 ± 6.4

Note. All data are self-reported. *The athletes were asked to indicate what they felt was their "ideal body weight" for competition.

Weight History

The details of participants weight history are provided in Table 3. Frequency analysis shows that athletes typically lose up to 3.6% of their body weight.

Table 3

Weight History

Weight history questions	Range	Mean ± SD
Average weight during normal training (kg)	52-103	68.9 ± 10.4
Average weight two weeks before competition (kg)	51-100	67.8 ± 10.2
Average weight one week before competition (kg)	51.5-100	67.3 ± 10.2
Average weight loss 48h before weigh-in (kg)	50.5-99	66.8 ± 10.4
Average weight at weigh-in (kg)	49.7-98	66.4 ± 10.3

Methods, Duration and Timing of Weight Cutting

As shown in Table 4, most athletes started cutting weight more than one week prior to competition, although this appeared to be highly individualised. Only seven athletes reported cutting weight less than 12 hours before competition. Many athletes (60.3%) used weight-cutting methods during training camps/preparing for competitions or in the days leading up to competition (44.8%), while 29% reported that they used these methods in the hours before competition. Only four athletes (6.9%) reported using these methods out of season.

As shown in Table 5, participants self-reported a range of methods used to cut weight. The most common were food restriction (65.5%), drink restriction/dehydration (37.9%) and intense exercise/increased training (56.9%). 43.% of participants reported that they were actively trying to lose weight while 48.2% reported that they always use these methods.

Table 4

Duration of Weight Cutting Practices Prior to Weigh-In (Frequencies)

Duration of weight cut (days/weeks) prior to weigh-in	M-LW (*n* = 10)	%	M-MW (*n* = 6)	%	M-HW (*n* = 9)	%	F-LW (*n* = 8)	%	F-MW (*n* = 9)	%	F-HW (*n* = 16)	%
8 or more weeks	1	10	1	16.6	2	22.2	2	25	1	11.1	1	6.25
6 weeks	1	10	0	0	0	0	0	0	0	0	2	12.5
4 weeks	2	20	0	0	1	11.1	0	0	3	33.3	2	12.5
3 weeks	0	0	0	0	2	22.2	1	12.5	1	11.1	3	18.75
2 weeks	1	10	3	50	0	0	2	25	1	11.1	4	25
1 week	3	30	1	16.6	1	11.1	2	25	1	11.1	1	6.25
1-3 days	1	10	1	16.6	0	0	0	0	0	0	0	0
12-24 hours	0	0	0	0	1	11.1	0	0	1	11.1	1	6.25
<12 hours	1	10	0	0	2	22.2	1	12.5	1	11.1	2	12.5

Note. M-LW = male lightweight, M-MW = male middleweight, M-HW = male-heavyweight, F-LW = female lightweight, F-MW = female middleweight, F-HW = female heavyweight

Table 5

Preferred Weight Cutting Practices Prior to Weigh-In (Frequencies)

Methods (preferred)	M-LW (n = 10)	%	M-MW (n = 6)	%	M-HW (n = 9)	%	F-LW (n = 8)	%	F-MW (n = 9)	%	F-HW (n = 16)	%
Fasting	1	10	4	66.6	1	11.1	1	12.5	1	11.1	9	56.25
Food restriction	4	40	3	50	6	66.6	8	100	7	77.77	10	62.5
Drink restriction	4	40	2	33.3	4	44.4	4	50	3	33.3	5	31.25
Laxatives	0	0	0	0	0	0	2	25	0	0	2	12.5
Diuretics	0	0	0	0	0	0	0	0	0	0	1	6.25
Sauna	1	10	1	16.6	1	11.1	4	50	2	22.2	3	18.75
Plastic clothing	1	10	0	0	2	22.2	3	37.5	3	33.3	1	6.25
Intense exercise/ increased training	5	50	2	33.3	7	77.77	6	75	5	55.55	8	50
Salt bath	2	20	1	16.6	1	11.1	4	50	1	11.1	1	6.25
Vomiting	0	0	0	0	0	0	0	0	0	0	1	6.25
Water loading	2	20	0	0	2	22.2	3	0	1	11.1	1	6.25
Other	0	0	0	0	0	0	1	0.8	0	0	1	6.25
None	2	20	2	33.3	1	11.1	2	25	1	11.1	5	31.25

Table 6

Frequency Analysis of Beliefs Regarding Weight-Cutting Methods Reported by the Karate Athletes

	Not at all (%)	Somewhat disagree (%)	Neither agree or disagree (%)	Somewhat agree (%)	Completely agree (%)
Do you think these methods are effective?	1.7	6.9	27.6	37.9	25.9
Do you think these methods are safe?	12.1	20.7	41.4	19.0	6.9
Do you think weight cutting gives you a competitive advantage over your opponent?	15.5	27.6	36.2	8.6	12.1
Do you think you perform better after weight cutting?	12.1	36.2	32.8	10.3	8.6
Do you think weight cutting has a negative impact on your performance?	6.9	19.0	27.6	27.6	19.0

Sources of Advice

In this study, athletes typically reported using more than one source of advice for information on weight cutting. Other athletes (44.8%), coaches (41.4%) and teammates (34.5%) were the most popular sources of advice. As shown in Table 7, only 20.7% of the sample reported using a registered dietician or nutritionist for advice.

Table 7

Frequency (%) of Karate Athletes That Used a Source of Advice for a Specific Method to Cut Weight

Source of advice	*n*	%
Doctor	6	10.3
Social Media	11	19
Teammates	20	34.5
Coaches	24	41.4
Experience (i.e., trial and error)	3	5.1
Registered dietician/nutritionist	12	20.7
Other athletes	26	44.8
Magazines	3	5.1
Other sources (e.g., YouTube)	2	3.4
Professional organization	7	12.1

Situational Context

Table 8

Psychological Factors Influencing Weight-Regulation Practices

	Totally Disagree (%)	Somewhat Disagree (%)	Neither (%)	Agree (%)	Totally Agree (%)
In my training gym coaches are urging combat sport athletes to diet	12 (20.7)	16 (27.6)	13 (22.4)	11 (19.0)	6 (10.3)
In my training gym coaches attribute performance failure to athletes' weight	21 (36.2)	18 (31.0)	10 (17.2)	6 (10.3)	3 (5.2)
I feel pressured to weight cut before fights	26 (44.8)	7 (12.1)	7 (12.1)	7 (12.10)	11 (19.0)

Open-Ended Comments

The survey included space for participants to document any side effects associated with cutting weight. Forty-six of the participants provided comments. Many commented that weight control was associated with a range of negative consequences, such as lower concentration, tiredness, and fatigue. Several athletes commented that it adds to the stress when they should be focusing on competition. One athlete reported that "... weight cutting resulted in me being overly obsessive when it came to calorie counting, weighing myself excessively and worrying about the types of food I was eating too much. It also negatively impacted my body image… [and] lead to lots of binge and restrict cycles." Another athlete reported that "cutting weight is harder around your menstrual cycle". Other comments included "… [I] tend to overeat after the weigh-in", and that "… [my] strength-to-speed ratio needs monitoring and care" suggesting that weight regulation could impact physical fitness. In addition, one athlete reported that they "… developed an eating disorder that nearly killed me. My internal organs were close to shutting down. I was scared not to be training. I couldn't rest."

One athlete, however, commented, "why bother? Train all year round at weight so fight at the same weight", whilst another had seen their teammates weight cut, which "…wasn't nice to see."

Table 9

Descriptive Statistics for the Self-Regulation of Eating in Sports Scale

	Factor 1		Factor 2		Factor 3		Factor 4		Factor 5	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
All	3.94	1.19	4.26	1.22	4.53	1.15	4.36	1.25	4.81	0.83
Gender										
Male	4.37	1.91	4.77	1.11	4.96	0.86	4.63	0.94	5.01	0.76
Female	3.61	1.24	3.87	1.18	4.21	1.26	4.15	1.43	4.66	0.88
Weight class										
M-LW	4.79	0.92	5.27	0.83	4.88	0.91	4.91	1.07	5.36	0.48
M-MW	4.45	1.28	4.78	1.41	5.28	0.58	4.72	1.04	5.21	0.64
M-HW	3.78	0.60	4.00	0.91	4.89	0.94	4.33	0.69	4.50	0.86
F-LW	3.39	0.90	3.85	1.16	4.03	1.04	3.42	1.38	4.66	0.81
F-MW	3.60	0.87	4.20	1.04	4.67	0.94	4.66	0.97	5.10	0.49
F-HW	3.75	1.58	3.81	1.32	4.13	1.50	4.40	1.48	4.47	1.00

Note. Factor 1. Self-regulation in context of food temptation; Factor 2. Self-regulation in context of negative affects; Factor 3. Self-regulation in context of social interaction; Factor 4. Self-regulation in context of compensatory strategies; Factor 5. Self-regulation in context of lack of anticipation of consequences on performance.

Table 10

Descriptive Statistics for Mood Scores (BRUMS) by Gender and Age Using The "How You Felt During Your Most Recent Experience of Weight-Making for an Event Competition" Response

	Tension		Depression		Anger		Vigour		Fatigue		Confusion		TMD	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Gender														
Male	7.52	3.33	5.20	2.00	5.80	2.52	11.84	3.48	8.56	3.92	5.36	2.04	-32.44	10.23
Female	11.79	4.61	10.15	5.26	10.39	4.99	9.88	3.22	11.79	5.00	8.67	4.35	-52.79	22.13
Age group														
18-24 (*n*=38)	9.82	4.37	7.61	4.80	7.95	4.60	9.92	3.12	10.05	4.93	6.82	3.30	-42.24	19.99
25-35 (*n*=14)	10.00	5.74	9.07	5.41	9.50	4.96	11.79	3.38	11.43	4.29	8.43	5.47	-48.43	23.84
36-45 (*n*=3)	11.33	2.08	8.67	4.51	8.67	4.62	11.67	4.04	8.67	3.05	7.00	3.00	-44.33	13.61
46+ (*n*=3)	10.00	5.29	7.67	4.04	9.00	6.25	15.00	4.36	11.6	8.02	7.33	3.51	-45.67	23.80

Table 11

Descriptive Statistics for Mood Scores by Weight-Class Using The "How You Felt During Your Most Recent Experience of Weight-Making for an Event Competition" Response

	Tension		Depression		Anger		Vigour		Fatigue		Confusion		TMD	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Weight class														
M-LW	7.10	3.25	5.30	1.25	6.80	3.26	12.00	3.37	10.80	3.36	5.21	1.55	-23.20	11.77
M-MW	8.00	3.29	4.67	1.21	4.83	0.98	10.00	4.43	6.17	2.99	4.50	0.84	-18.17	7.08
M-HW	7.67	3.77	5.44	3.00	5.33	2.06	12.89	2.76	7.67	4.03	6.11	2.85	-19.33	14.09
F-LW	10.38	4.53	9.50	5.93	8.88	5.03	8.63	2.83	11.63	5.53	8.13	3.91	-39.88	24.49
F-MW	11.22	3.70	9.56	4.50	10.00	4.27	9.89	3.10	11.44	4.28	7.67	3.28	-40.00	20.55
F-HW	12.81	5.11	10.81	5.55	11.38	5.41	10.50	3.46	12.06	5.41	9.50	6.10	-46.06	24.04

Note. M = Male, F = Female, LW = lightweight, MW = middleweight, HW = heavyweight

Eating Attitudes

A total EAT-26 score was calculated yielding a mean score of 10.76 (*SD* = 12.10, range 0 to 53), although for males, this was 5.96 (5.56); and for females, this was 14.39 (14.34). Highest scores were found for the group female-heavyweight (16.93±17.55). Twelve athletes (4 F-LW, 1 F-MW, 6 F-HW, 1 M-LW; 20.7%) reported EAT-26 scores ≥ 20.

Table 12

Means and Standard Deviations of Scores on Eating Attitudes (EAT-26) Among Karate Athletes

		EAT-26	
Group	*N*	*M*	*SD*
All participants	58	10.76	12.10
Male	25	5.96	5.56
Female	33	14.39	14.34
Female-lightweight	8	13.64	11.25
Male-lightweight	10	7.27	7.51
Female-middleweight	9	10.40	9.40
Male-middleweight	6	5.83	4.45
Female-heavyweight	16	16.93	17.55
Male-heavyweight	9	4.00	2.30

Chi-square tests of independence (categorical data) revealed no associations between any of the variables (EAT-26, SREASS, TMD) with these demographics.

Relationships Between Mood and EAT-26

Relationships between EAT-26 (three factors) scores and mood (six dimensions) are presented in Table 13. Correlation results show that depression and fatigue correlated significantly with dieting, bulimia and food preoccupation and oral control. Anger, confusion, and tension showed significant positive correlations with dieting and bulimia and food

preoccupation but showed no significant correlation with oral control. Vigour showed significant negative correlations with dieting and bulimia and food preoccupation but showed no significant negative correlation with oral control.

Table 13

Correlation Analysis Between EAT-26, BRUMS, and SREASS Scores

Variable (*N* = 58)	Dieting	Bulimia and Food Pre-Occupation	Oral Control	EAT-26
Anger	.403**	.507**	.247	.431**
Confusion	.362**	.445**	.169	.373**
Depression	.532**	.600**	.375**	.565**
Fatigue	.382**	.446**	.370**	.429**
Tension	.369**	.478**	.237	.397**
Vigour	-.274*	-.306*	-.120	-.264*
TMD	-.477**	-.572**	-.318*	-.507**
Food temptation	-.506**	-6.13**	-.189	-.526**
Negative affects	-.331*	-518**	.045	-.330*
Social interaction	-.632**	-.552**	-.469**	-.660**
Compensatory strategies	-.499**	-.511**	-.319*	-.529**
Lack of anticipation of consequence on performance	-.516**	-.517**	-.100	-498**

Note. TMD: Total Mood Disturbance = Vigour - (Tension + Depression + Anger + Fatigue + Confusion). * p <.05; ** p <.01

There were significant differences between athletes who scored 20 or above on the EAT-26 and those who scored below 20. High EAT-26 scores were associated with negative mood states, total mood disturbance, as well as four of the five factors on the SREASS. No differences were found between these dichotomized groups for vigour on the BRUMS or negative affect on the SREASS. (See Table 14 for a review of the significant findings.)

Table 14

Differences in BRUMS and SREASS Scores Between Participants Who Scored 20 and Above on the EAT-26 Versus Those Who Scored Below 20

Variable *(N=58)*	EAT-26 ≥ 20		EAT-26 < 20				
	M	*SD*	*M*	*SD*	*t*	*p*	*Cohen's d*
Anger	11.42	5.50	7.63	4.17	2.61	0.11	0.85
Confusion	9.50	4.91	6.65	3.39	2.35	0.22	0.76
Depression[§]	12.33	6.04	6.89	3.79	2.94	.010	1.26
Fatigue	13.42	5.14	9.61	4.45	2.56	.013	0.83
Tension	12.33	5.57	9.33	4.16	2.07	.043	0.67
Vigour	9.08	3.27	10.96	3.49	-1.05	.319	-0.33
TMD	-49.17	27.16	-29.15	18.20	-2.46	.004	-0.99
Food temptation	2.94	1.40	4.20	1.00	-3.55	<.001	-1.15
Negative affects	3.67	1.44	4.41	1.13	-1.92	.060	-0.62
Social interaction	3.28	1.19	4.86	.91	-5.04	<.001	-1.63
Compensatory strategies	3.17	1.47	4.67	1.00	-4.19	<.001	-1.36
Lack of anticipation on performance	3.94	.77	5.04	.70	-4.74	<.001	-1.54

§ Equal variances not assumed

Chapter Five: Discussion

The findings of this study provide a useful depiction of weight-regulation practices in a sample of karate athletes, as well as their self-reported mood responses during a period of weight-regulation prior to competition and eating attitudes.

Prevalence and Magnitude of Weight Loss

The percentage of weight loss (3.6%) reported by respondents in this study (see Table 3) is lower than the average of 5%-10% that is shown in other martial arts (Gonçalves et al., 2021). Responses indicated that 43.1% of the athletes were actively trying to lose weight. 55.1% reported they typically practised weight cutting in the final 2 weeks before weigh-in. Khodaee et al. (2015) reported that athletes lost 9±2% body weight over the course of a training camp, with the process having started 8 weeks prior to weigh in, then lost the final 5±2% in the final 24 hours. In another study, Marttinen et al. (2011) found that wrestlers chose to lose most of their weight in the few days prior to weigh-in.

Previous research has shown that athletes use both chronic and acute weight loss strategies in the lead up to weigh-in (Kiningham & Gorenflo, 2001). In this study, athletes used a combination of strategies during their preparation for competition, with weight-regulation being practiced in their "training camps" (60.3%). For many, weight regulation began several weeks out from competition, suggesting chronic strategies (prolonged dieting and increased exercise training) featured heavily in their preparation, but give that many also reported practicing weight-loss methods in the final days (44.8%) and final hours (29%) before competition, acute strategies also feature prominently. Sitch and Day (2015) showed that even though gradual weight loss is the safest and most common way to cut weight, many athletes eventually resort to using the RWL methods. The findings in this study appear to show mixed support for this. They suggest that lightweight athletes tend to engage in

prolonged weight-regulation practices. For lightweight athletes, there tends to be greater emphasis placed upon leanness, especially for those whose natural weight is around borderline between lightweight and middleweight (Terry & Waite, 1996).

In terms of the heavyweight athletes, because they tend to leave weight cutting until less than 12 hours before competition, making weight does not appear to be as important (this category has no upper weight limit). However, it could be that these athletes typically compete in the middleweight category but naturally sit at the bottom of the heavyweight category and acute strategies are effective enough to allow them to reduce the weight needed to compete in the lower weight class.

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Preferred Choice, History, Timing of Weight-Loss Methods, and Perceived Side-Effects

As seen in Table 5, the most prominent methods of weight cutting were dieting (65.5%), increased exercise training (56.9%), and using drink restriction (37.9%). 63.8% of the study felt that weight cutting was effective and 25.9% felt that it was safe (Table 6). This shows that despite most athletes deeming weight cutting unsafe, they still regarded their techniques as effective and therefore will most likely continue to use them. This resonates with the work of Pettersson et al. (2012) who reported that athletes acknowledged that weight cutting is not good for them (e.g., they would lose muscle mass), but do it anyway. In this study, only 18.9% of participants perceived they performed better whilst 46.6% perceived WLMs negatively impact performance. Several studies reported that athletes perceive weight cutting provides added focus for competition (Escobar-Molina et al., 2015; Gonçalves et al., 2021; Langan-Evans et al., 2020; Pettersson et al., 2013), and the discipline required strengthens feelings of professionalism and prestige (Pettersson & Ekström, 2014).

Whilst it is worrying that a large percentage of athletes perceived weight cutting as safe, 46.6% reported that WLMs negatively impacted performance, which suggests these

views could be influenced by individual factors and whether the weight-making practices are sustainable (i.e., avoid physical and psychological damage); for example, the amount of weight loss needed (e.g., a gradual weight loss of 1.5%), and the types of strategies used (e.g., increased exercise training versus vomiting) may be perceived as safe and sustainable and thus effective for making weight (i.e., goal attainment). In addition, athletes might feel that weight-regulation is safe if their practices are supervised or informed.

However, there are mixed findings about whether coaches have sufficient knowledge about nutritional needs and physiological and psychological effects of various weight loss practices (Pettersson & Ekström, 2014). Rapid and aggressive weight loss, over a short period of time (less than 7 days), has been discouraged by several research teams. However, the fact that a large proportion of the sampled athletes self-reported that they perceived weight cutting to be unsafe yet still used weight cutting methods warrants further investigation.

The main self-reported side effect was the perception that weight-cutting left athletes feeling fatigued and lacking energy (see “Open-Ended Comments”), which resonates with previous research (Degoutte et al., 2006; Franchini et al., 2012; Kurt & Sagiroglu 2015). Other reported side-effects included light headedness, nausea, weakness, menstrual changes, headaches, dizziness, an increase in negative mood states such as stress and anxiety, sadness, anger, and frustration, feeling hungry and dehydrated, perceived muscular weakness and loss of strength and speed, feeling sleep deprived and experiencing more injuries.

Open-ended comments from one athlete indicated that cutting weight affected their build up to competition and shifted their focus away from performance to cutting weight. The athlete commented that they felt tired and stressed and ended up losing all motivation for the training and the event in which they were trying to cut weight for. Two athletes reported that they developed eating disorders and claimed that, despite knowing weight cutting was bad for them, they could not resist it.

Psychosocial Influences

31.1% of athletes in this study reported they felt pressure to lose weight for competition, which is similar to previous findings. Filaire et al. (2007) reported that 25% of judoists reported feeling pressure to control their body weight from coaches (8.3%) or fellow or former athletes (25%).

Sources of Advice

Athletes looked to other athletes, their coaches and teammates, and social media for information about weight-loss. Alarmingly, these were more popular than registered dieticians or nutritionists, although there could be several reasons for this. One issue could be access to, and trust and use of, information. Not all athletes will have access to safe and credible information.

Previous research by Pettersson (2014) with a former world class boxer suggests age and experience could be important influencing factors. Young athletes turning to others in their gyms for tips and advice. However, with experience and progression novice to elite, and increasing knowledge of eating and weight control, athletes may start to look for their own advice. Found that coaches and teammates have a negative influence. The findings in this study are consistent with previous research in this area: the gym environment appears to be incredibly influential when it comes weight-making practices.

Mood Profiles

One purpose of the present study was to explore recalled mood profiles among karate athletes during a period of weight regulation when they last prepared for competition. At the start of the thesis, it was hypothesized that athletes would self-report a negative mood profile during this period, and that this would be more pronounced among female lightweight

athletes. Collectively, the hypothesis that athletes would report a negative mood profile cannot be accepted given that, for men, scores for vigour were not reduced. For male middle and heavyweight athletes, an iceberg profile was observed. However, support was found for the hypothesis that a negative mood profile would be more pronounced among female lightweight athletes who self-reported reduced vigour. Of particular note, total mood disturbance was more pronounced for male lightweight athletes, who also self-reported higher fatigue scores than male middle and heavyweight athletes; and for female heavyweight athletes, who also self-reported higher anger and vigour scores than female lightweight and middleweight athletes.

Different mood profiles emerged for men and women with women self-reporting a negative mood profile when they last prepared for competition. Many studies have reported a decrease in mood states after practicing weight cutting. For example, Degoutte et al. (2006) found that weight loss removed the iceberg profile by lowering vigour and increasing negative mood states of tension, anger, and fatigue. Similar findings were reported by Koral (2009) among judo athletes. From four weeks to one day prior to competition, confusion in male judo athletes and confusion and tension in female judo athletes increased, whilst vigour decreased for both groups. However, some studies, albeit in non-athletic populations, have found that tension and depression are diminished while mood is improved with dieting (Custer et al., 2000; Halyburton et al., 2007), although the process of dieting is often associated with negative responses such as confusion, depression, and tension (Butow et al., 1993).

Eating Attitudes

It was hypothesized that depression would be associated with EAT-26 scores. Support was found for this hypothesis. Findings showed EAT-26 scores were positively associated

with negative mood states (tension, depression, anger, fatigue, and confusion) and negatively associated with vigour. Correlation results also investigated associations between mood states and three interrelated factors on the EAT-26 scale: dieting, bulimia and food preoccupation, and oral control. Findings showed that depression and fatigue correlated significantly with dieting, bulimia and food preoccupation, and oral control. Filaire et al. (2007) showed that depressed mood accounted for 73% of the variance in Dieting and Bulimia scores and 64% of the variance in the Global EAT-26 scores in judoists and cyclists. Anger, confusion, and tension showed significant positive correlations with dieting and bulimia, and food preoccupation, but showed no significant correlation with oral control. Vigour showed a significant negative correlation with dieting and bulimia and food preoccupation but showed no significant negative correlation with oral control.

Twelve athletes (11 female, one male) showed EAT-26 scores above the "at risk" criterion associated with eating disorders. As suggested by Gonçalves et al. (2021) and Pettersson et al. (2012), athletes who compete in sports with weight classifications are more susceptible to developing eating disorders, such as binge eating and anorexia, or a bad relationship with food. Previous research reports that eating disorders show a higher incidence among female athletes (Sungot-Borgon, 1993; Thompson & Sherman, 1993). In a sample that included 12 male judoists, Filaire et al. (2007) found that despite the athletes reporting they wanted to lose weight and actively used several weight-regulation strategies to achieve this goal, none reported EAT-26 scores $\geq$20. In contrast, Rouveix et al. (2007) reported 25% of female judo athletes would be "at risk" of EDs (EAT-26 $\geq$ 20). In this study, 33% of female athletes recorded "at risk" scores. As several researchers have already commented, the prevalence of EDs could be much greater than currently reported, although gender does appear to contribute to the variance and the methods of assessment (self-report and/or interview) make it hard for researchers to compare findings. In this study, qualitative

data from two athletes stated that they developed eating disorders from cutting weight and had developed a bad relationship with food, leading to multiple restrictive cycles, calorie counting and a fear of not exercising. Research suggests that chronic/prolonged dieting, extreme weight fluctuations are risk factors for disordered eating (Bratland-Sanda & Sundgot-Borgen, 2013).

Self-Regulation of Eating Attitudes

The SREASS (Scoffier et al., 2010) was used to assess an individual's self-regulation when it came to food and weight loss specifically. Descriptive statistics (Table 9) show higher mean values for men at all weight classifications, across all five factors. It was hypothesized that self-regulation of eating attitudes would negatively associate with EAT-26 scores. All five factors showed strong negative correlations with EAT-26 scores, thus confirming the hypothesis that poor self-regulation would associate with higher EAT-26 scores. This is consistent with theory and research that self-regulation is generally a protective factor for negative health outcomes, including disordered eating (Scoffier-Meriaux & Paquet, 2022). Factors 1, 2, and 5 showed no significant correlations with oral control, which concerns the control of eating and perceived pressure from others. This finding differs from Scoffier et al (2010) who found lower self-regulation of eating attitudes (i.e., poor self-regulation) when significant others (coach and sports friends) were influential (as determined by a higher external locus of control score).

More recently, Scoffier-Meriaux and Paquet (2022) examined the interaction between SREASS and EAT scores. Consistent with previous findings and those in the current study, the authors reported a negative linear relationship between SREASS and EAT scores. However, consistent with the notion that self-regulation can sometimes be 'too much of a good thing' (Goschke & Job, 2023, Pauligk et al., 2021), the authors also revealed three

distinct relationships between SREASS and EAT scores: high self-regulation (SREASS >24) was associated with high EAT scores (>20); medium levels of EAT scores were associated with low SREASS scores (<19); and low EAT scores were associated with medium SREASS scores (19-24).

In this study, athletes were also dichotomized into “at risk” and “not at risk” groups. Eleven of the twelve “at risk” athletes were women. Findings showed significant differences for negative mood states on the BRUMS, suggesting that for this group making weight for competition was stressful. Significant differences were also found for four of the five factors on the SREASS, suggesting that self-regulation may increase the risk of disordered eating. Research by Gonçalves et al. (2021) found that disordered eating may be related to how athletes perceive unwanted weight changes before competition. Interestingly, a significant difference was not found for the factor, ‘negative affect’ on the SREASS, which relates to the ability to self-regulate eating when experiencing negative affective states (e.g., “Do you feel capable of controlling what you eat when you are irritable?”). However, the findings do suggest that “at risk” athletes struggle with several aspects of self-regulation; namely, food temptation, the influence of others (e.g., parents, coaches), compensatory strategies (e.g., use of laxatives, vomiting, and exercise) and anticipation of consequences on performance are associated with higher EAT scores between these two groups, and add to the body of evidence that concern with making weight (i.e., worries about body mass and food intake) for competition is associated with an increased risk of disordered eating behaviours (Franchini et al., 2012; Pettersson et al., 2012).

Limitations and Directions for Future Research

There were several limitations to this study that need to be considered. First, the study used correlational and cross-sectional methods. Whilst such research provides some useful

links between variables in the proposed causal system, one cannot infer causation. The use of cross-sectional data only captures responses at one moment in time so a potential solution to this would be to conduct a longitudinal study to determine the stability of contextual (i.e., socio-environmental) influences on athletes' eating attitudes. This type of research could be conducted at different points in the season (e.g., during normal training versus training for competition versus off season) and/or in the weeks leading up to competition. For example, prior research has identified changes in mood in the lead up to the weigh-in and between weigh-in and competition, so using different assessment points (e.g., 4 weeks out, 1 week out, 1-3 days out, 12-24 hours out, etc.) could reveal how these responses fluctuate over time. They could also be correlated with performance. Research by Choma et al. (1998) showed that although mood state was more negative after RWL (immediately after weigh-in), it returned to baseline (i.e., one week before competition season) after rehydration. However, in this study, because of the COVID-19 pandemic, some athletes were not competing and thus it was not possible to use this research design, although Roberts and Lane (2021) overcame this limitation by asking boxers to recall mood states before and during the pandemic. Longitudinal studies are also needed to examine eating behaviours over time (e.g., over the course of an athlete's career). Such research would help identify whether these attitudes and behaviours remain consistent or fluctuate with changes in training and competition experience.

Second, the sample constrains the generalisability of the findings. Karate is a global sport and therefore it would be prudent to survey athletes from different countries. However, this was somewhat offset by the vast experience and competitive level of the participants. It is worth noting, however, that although the majority of this sample had experience at international level, it was not clear whether this also equated to success at this level. As Swann et al. (2015) argue, the amount of experience (i.e., years) and success at this level are

important considerations, more so perhaps than just training time, which the authors argue indicates only effort/time invested but does not indicate performance level. The sample included men and women and a range of lightweight, middleweight, and heavyweight athletes. The addition of a non-combat sport sample and non-competitive sample of students matched for BMI tested at the same time would have been useful (Filaire et al., 2001).

Third, the data for the study variables were self-reported via questionnaires. Filaire et al. (2007) suggested that, whilst self-report measures are useful and reliable, there is the risk of social desirability bias (Goldstein, 1960, Paulhus, 2002). Self-reported measures always carry risks, especially with athletes who might not be forthcoming in their answers. For example, some of the EAT-26 questions may be considered sensitive for certain participants and thus denial and distortion in self-report could lead to inaccurate results (Scoffier et al., 2010). With regards to weight regulation, asking athletes to respond truthfully to questions about weight loss methods and eating behaviours is not straightforward. Some athletes may adjust their responses such that they understate their use of, and support for, weight loss methods, particularly if they are known to be unsafe. Socially desirable responding (e.g., concealing the truth about undesirable eating behaviours), therefore, has the potential to contaminate respondents' self-reports and ultimately the validity of the empirical findings. A potential solution would be to survey athletes before weigh-in and competition (with actual weight loss recorded). However, athletes with and without disordered eating and eating orders can be underweight, normal weight or overweight and are likely to be secretive about their eating behaviours (de Bruin, 2017). Studies that have adopted a two-step approach (self-report followed by clinical interview) suggest that athletes tend to underestimate disordered eating and eating disorders (Sundgot-Borgen & Torstveit, 2004; Torstveit et al., 2008). For this reason, it is recommended that quantitative screening (i.e., surveys) are followed-up with a clinical interview (de Bruin, 2017). While assessment, diagnosis and treatment should

always be conducted by a healthcare professional, several researchers have conducted interventions designed to prevent eating disorders by targeting both athletes (for a review, see Bar et al., 2016) and significant others (e.g., support personnel, parents, and coaches; Martinsen et al., 2015; Stewart et al., 2014). From a practical perspective, Selby and Reel (2011) developed a coach's guide to identifying signs and symptoms and responding to suspected eating disorders in athletes.

Research has shown that people are poor at remembering their moods (Safer & Keuler, 2002; Safer et al., 2002). Such cognitive biases in affective recall, are characteristic of depression and anxiety (Beck & Clark, 1988). For example, those with depressive or anxious symptoms tend to selectively recall negative mood. Theoretically, it has been argued that this is because depressed individuals tend to focus on past events that have entailed failure, whereas anxious individuals tend to focus on future threat. Research indicates that people may also under-estimate or over-estimate recalled emotions but tend to remember their experiences as more intense than what they actually were (Safer et al., 2002). Future studies that track one's mood (e.g., using real-time self-monitoring ecological momentary assessment; Shiffman, 2009), would allow researchers to tie mood ratings to specific events.

Fifth, this study was conducted over a period that included the COVID-19 pandemic. Because of the absence of competitions during this period, many of the participants had not competed for over a year. The absence of competition and the addition of new stressors could have impacted both their mood recall, although it is worth highlighting that similar retrospective reports were used during this period (Roberts & Lane, 2021). Given the different reported mood profiles for male and female athletes, it would be interesting to examine the consequences on performance.

Sixth, it was not clear why athletes self-reported that they perceived certain weight loss practices to be effective. Here, qualitative inquiry would shed light on the reasons for

athletes' preferred choices. It would also be worth following the approach taken by Hall and Lane (2001) by asking athletes to report their habitual weight, training weight, and competition weight.

Summary

This study aimed to examine the prevalence of weight loss and methods of weight-loss, and to explore the associations between self-regulation of eating attitudes in sport, mood, and eating attitudes in karate athletes.

Taken collectively, these findings provide further evidence that gender-based differences in mood states and eating attitudes exist between men and women who compete in weight-category sports. Whilst the weight-regulation behaviours and practices were similar in both men and women, there are sex-specific considerations in terms of body composition and physiology that pose several challenges to female athletes when making weight for competition and may thus account for the differences in self-reported mood states and eating attitudes. It would be prudent to further investigate the gender-based differences in psycho-physiological responses to weight-making.

The findings from this study also suggest that karate athletes face strong temptation to regulate body weight. For this reason, a large proportion of the sample reported that they were trying to lose weight for competition and perceived that using weight-cutting methods were effective for the goal of weight loss (e.g., to make weight). However, weight loss was perceived to have negative effects on performance and was thus not perceived to be advantageous when fighting against lighter opponents. Dietary restraint, negative mood responses and weight control point to a need to take self-regulatory behaviours, particularly among "at risk" athletes, into account when assessing the effects of weight-regulation prior to and during competition, and may help coaches, teammates, and family identify early signs of

disordered eating. Theories of self-control hold promise in framing future investigations, particularly the role of gender-based individual differences in self-regulatory abilities, as well as the design of interventions aimed at improving self-regulatory strategy deployment.

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Appendices

Appendix 1. Online Participant Information Sheet

Dear Participant,

Thank you for expressing interest in our research study. Before you decide to take part in this study it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. A member of the team can be contacted if there is anything that is not clear, or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of the research?
Combat sport athletes typically employ weight management strategies in the week(s) leading up to competition as well as between weigh-in and competition. You have probably heard of athletes referring to this practice as 'making weight' or 'weight-cutting'. We all know that there is a link between weight and performance and in the short term if athletes lose a little bit of weight it is often associated with increased performance. However, rapid weight loss, sustained dieting, and/or a preoccupation with weight, can have negative consequences on health and performance. We also know that many of the strategies used to make weight can increase an athlete's vulnerability to illness and injury. We are conducting this study to investigate psychological factors associated with weight-making in combat sports. The study concerns how much you agree or disagree with a series of statements, or how much they reflect how you typically are. There are no right or wrong answers—we are just interested in your opinion.

Why have I been invited to take part in this study?
You have been invited to take part as you meet our inclusion criteria. If you are a male or female combat sport athlete; aged at least 18y; registered to take part in competition (for at least 1 year); preparing for or engaging in combat sports competition, then we would like to hear from you.

Unfortunately, if you are a combat sport athlete and you intend to stop training or competing within the next 6 months, or have a chronic illness, you will not be able to take part. However, if you are a non-combat sport athlete, but are aged 18y+ and physically active and/or play sport, then we would also like to hear from you.

How long am I expected to be part of the study?
The questionnaires should take no longer than 30 minutes to complete—that's it!

Do I have to take part in the study?
Your participation in this research is entirely voluntary. There will be absolutely no penalty if you do not want to take part in the research, or if you withdraw. You will be able to withdraw anytime during the questionnaire by closing the browser (online). However, once data has been collected, we will be unable to withdraw your data as we will be unable to identify your data due to all responses being kept anonymous.

What will I be asked to do if I agree to take part?
We will check that you understand what is involved in this research study and we will ask you to sign the consent form.

Are there any risks involved?
There are no known risks associated with this study.

What are the possible benefits from taking part?
This is a postgraduate student study so there is no money available for us to pay you for your time.

Will my taking part be confidential?
New European Data Protection legislation came into effect in May 2018. According to data protection legislation, we are required to inform you how we intend to collect and use your personal information. The research team (Danielle Kirby and Dr Chris Fullerton) will be responsible for looking after your information and using it properly.

All paper records of test scores will have an alphanumeric code and will not use your name. The consent form requires that you only confirm your participation and does not require any personally identifiable information. The consent form matching your questionnaire responses will have a code and we will store these files securely. We will keep all anonymised data private and confidential, and only the research team (Dr Chris Fullerton and Danielle Kirby will have access to the data). Authorised researchers may also have access to data (i.e., via a data repository for the purposes of independent analysis). All data from the electronically completed questionnaires will be downloaded from Google Forms and transferred to the research supervisor's computer. After 5 years we will destroy the data.

Further information, including details about how and why the University processes your personal information, how we keep your information secure, and your legal rights (including how to complain if you feel that your personal information has not been handled correctly), can be found in the University's Privacy Notice
https://www.kent.ac.uk/infocompliance/dp/about.html

What will happen to the results of the research?
Results are normally presented in terms of groups of individuals. If any individual data are presented, the data will be totally anonymous, without any means of identifying the individuals involved. We will analyse all of the anonymous results to help us decide how to investigate our research question further and so that we can apply for funding to help us test more people. We may report group results to funding organisations, publication in scientific journals, or present the findings at scientific conferences.

Who is organising and funding the study?
The study is funded by the School of Sport and Exercise Sciences at the University of Kent and is being carried out by Danielle Kirby (MRes Student) and Dr Chris Fullerton (Project Supervisor).

Who has reviewed this study?
The School of Sport and Exercise Sciences Research and Ethics Advisory Group (REAG) at the University of Kent has approved this study (REF: Prop 59_2018_19).

Who can I contact if I need to ask more questions about the study?
You can contact the research team at any time using the contact details below.

Who can I contact if I want to complain about the study?
If you feel that we have not dealt correctly with your personal data you can complain to the Information Commissioner's Office through this link (https://ico.org.uk/make-a-complaint/)

If you wish to complain about the way that the study was conducted you may contact the Head of the School of Sport and Exercise Sciences, Dr Glen Davison, by email (G.Davison@kent.ac.uk); or the chair of the SSES Research Ethics and Advisory Group, Dr Karen Hambly, by email (K.Hambly@kent.ac.uk).

Research Team
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Kent
ME4 4AG

Website: http://www.kent.ac.uk/sportsciences/staff/index.html

Appendix 2. Consent Form

I confirm I have read and understand the information sheet dated 30/06/2021 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.*
Yes
No

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason. In addition, should I not wish to answer any particular question or questions, I am free to decline. *
Yes
No

I understand that confidentiality and anonymity will be maintained and it will not be possible to identify me in any publications. In addition, I give permission for members of the research team and other authorised researchers to have access to my anonymised data. *
Yes
No

I understand that once I submit my data, I will therefore no longer be able to withdraw my data as it will be unidentifiable, due to all responses being kept anonymous.*
Yes
No

I understand that my name will not be linked with the research materials, and that I will not be identified or identifiable in the report or reports that result from the research.*
Yes
No

I give permission for the anonymised data that I will provide to be deposited in the University's cloud-based storage on Google Drive so it can be used for future research and learning*
Yes
No

I agree to take part in the above research project*
Yes
No

I agree for the data collected from me to be used in relevant future research*
Yes
No

Consent

Please tick to go to the next page to indicate that you agree with the statements above and consent to take part in the study*

Yes

No

Appendix 3. Demographic Information

Please state your gender*
Male

Female

Prefer not to say

Other:

Age (years)*

How tall are you? (cm)*

How much do you weigh? (kg)*

What is your desired weight? (kg)*

What is your body weight on average when you are in normal training (not for an event or competition)?*

What is your body weight on average 2 weeks prior to an event/competition?*

What is your body weight on average 1 week prior to an event/competition?*

What is your body weight on average 48 hours prior to an event/competition?*

What is your body weight on average at weigh-in?*

What weight class do you usually compete in?*

What sport do you play?*
Tae Kwondo

Judo

Boxing

MMA

Thai Boxing

Karate

Kickboxing

Wrestling

Brazilian Jiu-jitsu

Other:
Running

Do you take part in competition?*
Yes

No

How many days per week do you train?*

Once per week

1
2
3
4
5
6
7

Every day

How long have you been training for? (months/years)*

What standard of competition do you take part in?*
Local

Regional

National

International

How long have you been involved in training for competition?*
Less than 3 months

3-6 months

6-12 months

More than 1 year

More than 2 years

How many events/competitions do you take part in each year?*

Are you a member of a club?*
Yes

No

Do you have a coach?*
Yes

No

Appendix 4. Weight-making habits

Are you satisfied with your weight?*
Yes

No

Are you trying to lose weight?*
Yes

No

How much weight do you typically cut? (kg)*

Do you use weight loss methods before the competition?*
Fasting

Food restriction

Drink restriction

Laxatives

Diuretics

Sauna

Plastic clothing (e.g., sweat-suit)

Intense exercise/increased training

Vomiting

Salt bath

Water loading

Other

No

How often do you use these methods?*

○	○	○	○	○
Never				Always

Do you think these methods are effective?*

○	○	○	○	○
Not all				Completely

Do you think these methods are safe?*

○	○	○	○	○
Not all				Completely

Do you think weight cutting gives you a competitive advantage over your opponent?*

○	○	○	○	○
Not all				Completely

Do you think you perform better after weight cutting?*

○	○	○	○	○
Not all				Completely

Do you think weight cutting has a negative impact on your performance?*

○	○	○	○	○
Not all				Completely

Please use this section to describe any negative effects of weight-cutting you have experienced (if any)*

When do you typically use weight cutting methods?*

Out of season (i.e., not training for a specific event/competition)

During training camp/preparing for competition

In the days leading up to weigh-in

In the hours before weigh-in

How long do you typically weight cut for?*
Less than 12 hours prior to weigh-in

12-24 hours prior to weigh-in

1-3 days prior to weigh-in

Up to 1 week prior

2 weeks prior

3 weeks prior

4 weeks prior

5 weeks prior

6 weeks prior

7 weeks prior

8 or more weeks prior

How many days does it usually take to make weight?*

Where do you get your information/seek advice for weight cutting?*
Registered dietician/nutritionist

Social media

Doctor

Teammates

Coach

Professional organisations

Other athletes

Friends

Magazines

Other:

What is your preferred method of weight cutting?*

Fasting

Food restriction

Drink restriction

Laxatives

Diuretics

Sauna

Plastic clothing (e.g., sweat-suit)

Intense exercise/increased training

Vomiting

Water loading

Salt bath

Other

No

Appendix 5. Questions About Weight-Related Coach and Peer Pressure

In my training gym coaches are urging Combat sport athletes to diet*

○	○	○	○	○
Totally disagree				Totally agree

In my training gym coaches attribute performance failure to athletes' weight*

○	○	○	○	○
Totally disagree				Totally agree

I feel pressured to weight cut before fights*

○	○	○	○	○
Totally disagree				Totally agree

Appendix 6. The Brunel Mood Scale

Please recall your most recent experience of weight-making for an event/competition. Below is a list of words that describe feelings. Please read each one carefully. Then cross the box that best describes HOW YOU FELT DURING THAT PERIOD. Make sure you answer every question.

		Not at all	A little	Moderately	Quite a bit	Extremely
1.	Panicky	❑	❑	❑	❑	❑
2.	Lively	❑	❑	❑	❑	❑
3.	Confused	❑	❑	❑	❑	❑
4.	Worn out	❑	❑	❑	❑	❑
5.	Depressed	❑	❑	❑	❑	❑
6.	Downhearted	❑	❑	❑	❑	❑
7.	Annoyed	❑	❑	❑	❑	❑
8.	Exhausted	❑	❑	❑	❑	❑
9.	Mixed-up	❑	❑	❑	❑	❑
10.	Sleepy	❑	❑	❑	❑	❑
11.	Bitter	❑	❑	❑	❑	❑
12.	Unhappy	❑	❑	❑	❑	❑
13.	Anxious	❑	❑	❑	❑	❑
14.	Worried	❑	❑	❑	❑	❑
15.	Energetic	❑	❑	❑	❑	❑
16.	Miserable	❑	❑	❑	❑	❑
17.	Muddled	❑	❑	❑	❑	❑
18.	Nervous	❑	❑	❑	❑	❑
19	Angry	❑	❑	❑	❑	❑
20.	Active	❑	❑	❑	❑	❑
21.	Tired	❑	❑	❑	❑	❑
22.	Bad tempered	❑	❑	❑	❑	❑
23.	Alert	❑	❑	❑	❑	❑
24.	Uncertain	❑	❑	❑	❑	❑

Appendix 7. Self-Regulation of Eating Attitudes in Sports Scale

Please recall your most recent experience of weight-cutting for an event/competition.

Do you feel capable of controlling what you eat when tempting food is put before you?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of controlling what you eat when a lot of food is easily available?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of resisting the sweet foods that you like the most?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of controlling what you eat when you are anxious or worried?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of controlling what you eat when you are irritable?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of controlling what you eat when you are depressed?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of eating with your training partners without depriving yourself?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of eating nothing at a meal using the pretext that your coach is present?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of eating a normal amount of food when you have a meal with your parents?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of making yourself vomit if you've just eaten cake at a birthday celebration?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of eating three meals a day without making yourself vomit, exercise to excess, or take diuretics or laxatives?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of eating high-fat foods without making yourself vomit, exercise to excess, or take diuretics or laxatives?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of eating a dessert without thinking of the consequences this may have on your next competition?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of eating french fries without thinking of the consequences this may have on your performance?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of eating sweets without thinking of the consequences this may have on your next competition?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Do you feel capable of eating a lot of food at a time without thinking of the consequence this may have of your performance?*

○ ○ ○ ○ ○ ○

Not at all Totally agree

Appendix 8. Eating Attitudes Test-26 Information Sheet

Use of the Eating Attitudes Test (EAT-26) may be able to help you determine if you need to speak to a mental health professional or a physician and get help for an eating disorder. Completing the EAT-26 will take you about 2 minutes.

The EAT-26 is the most widely used screening measure that may be able to help you determine if you have an eating disorder that needs professional attention. The EAT-26 is a measure of symptoms and concerns that are characteristic of eating disorders. In 1982, the test was updated and shortened to the current 26-item version, known as the EAT-26©. The EAT-26 is designed to be either self-administered or administered by health professionals, school counselors, coaches, camp counselors, and others. The EAT-26 is not designed to make a diagnosis of an eating disorder or to take the place of a professional diagnosis or consultation.

The EAT-26 alone does not diagnose an eating disorder. In fact, no test or screening instrument has been shown to be highly efficient as the sole means of identifying an eating disorder. Only a qualified health care professional can provide a diagnosis. However, the EAT-26 can be a first step in the screening process, with the second step being a consultation and evaluation with a qualified professional. The idea behind early screening assumes that an eating disorder identified in its early stages can lead a person to seek earlier treatment, thereby reducing the risk of serious physical and psychological complications. The EAT-26 can be a particularly useful tool for assessing eating disorder risk‖

All self-report measures require open and honest responses in order to provide accurate information. The fact that most people provide honest responses means that the EAT-26 usually provides very useful information about the eating symptoms and concerns that are common in eating disorders.

Appendix 9. Eating Attitudes Test

Please check a response for each of the following statements:	Always 3	Usually 2	Often 1	Some times 0	Rarely 0	Never 0	Score
1. Am terrified about being overweight.	□	□	□	□	□	□	
2. Avoid eating when I am hungry.	□	□	□	□	□	□	
3. Find myself preoccupied with food.	□	□	□	□	□	□	
4. Have gone on eating binges where I feel that I may not be able to stop.	□	□	□	□	□	□	
5. Cut my food into small pieces.	□	□	□	□	□	□	
6. Aware of the calorie content of foods that I eat.	□	□	□	□	□	□	
7. Particularly avoid food with a high carbohydrate content (i.e. bread, rice, potatoes,etc.)	□	□	□	□	□	□	
8. Feel that others would prefer if I ate more.	□	□	□	□	□	□	
9. Vomit after I have eaten.	□	□	□	□	□	□	
10. Feel extremely guilty after eating.	□	□	□	□	□	□	
11. Am preoccupied with a desire to be thinner.	□	□	□	□	□	□	
12. Think about burning up calories when I exercise.	□	□	□	□	□	□	
13. Other people think that I am too thin.	□	□	□	□	□	□	
14. Am preoccupied with the thought of having fat on my body.	□	□	□	□	□	□	
15. Take longer than others to eat my meals.	□	□	□	□	□	□	
16. Avoid foods with sugar in them.	□	□	□	□	□	□	
17. Eat diet foods.	□	□	□	□	□	□	
18. Feel that food controls my life.	□	□	□	□	□	□	
19. Display self-control around food.	□	□	□	□	□	□	
20. Feel that others pressure me to eat.	□	□	□	□	□	□	
21. Give too much time and thought to food.	□	□	□	□	□	□	
22. Feel uncomfortable after eating sweets.	□	□	□	□	□	□	
23. Engage in dieting behavior.	□	□	□	□	□	□	
24. Like my stomach to be empty.	□	□	□	□	□	□	
25. Have the impulse to vomit after meals.	□	□	□	□	□	□	
26. Enjoy trying new rich foods.	□ 0	□ 0	□ 0	□ 1	□ 2	□ 3	
Total Score:							