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Dietary restraint and emotional eating among elite/international combat sport athletes

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ABSTRACT

In one-on-one combat sport, weight classifications are enforced to promote fair fights and minimise injury risk. Most combat sport athletes try to fight at weight much lower than their natural weight necessitating use of weight loss strategies including restrained eating prior to competition. Previous research indicates that individuals self-reporting as high in dietary restraint also self-report a higher desire to emotionally eat, which if acted upon would compromise weight management goals. This mixed-methods exploratory study examined associations between dietary restraint and emotional eating among elite/international combat sport athletes. Nineteen elite/international competitors in Brazilian Jiu Jitsu and Mixed Martial Arts completed the emotional eating scale, a revised restraint scale, and a rapid weight loss questionnaire. A subsample of six participants then completed individual interviews to explore emotional eating, particularly during the lead-up to and post-competition. Quantitative findings via non-parametric tests found high scores in restrained eating associated with a greater urge to emotionally eat. Qualitative findings via content analysis of interview data identified three themes that helped understand this association, “emotions eliciting an urge to eat”, “outcomes of emotional eating”, and “resisting emotional eating”. Participants described a cycle of restrained eating pre-competition followed by an increased tendency toward emotional eating post-competition, with the extent of emotional eating influenced by the degree of restrained eating required and competition outcomes.

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Introduction

Weight making in sport describes the process of reducing body mass in events where aesthetics, power-to-weight ratios, or the requirement to meet a specific weight category limit are perceived to be of competitive importance (Matthews et al., 2019). Weight

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making is broadly classified into chronic (months and weeks leading into an event) and acute (days and hours leading into an event) phases of weight loss (Burke et al., 2021). In combat sports, athletes compete according to their weight classification so that opponents of similar size and strength are paired against one another (Artioli et al., 2010a). Athletes are often under significant pressure to gain a theoretical advantage by competing in weight classes below their day-to-day body weight against smaller opposition (Lakicevic et al., 2021). In seeking this perceived advantage, many combat sport athletes follow acute weight loss procedures in the week prior to weigh-in (Langan-Evans et al., 2022), typically losing $\geq 5\%$ of body mass (Franchini et al., 2012). As a result, acute weight loss or weight-making is an ingrained practice in combat sports, with some athletes losing up to 5% of their body mass before competition (Reale et al., 2018).

The theory of restrained eating points to emotional eating due to intense dieting, known as restrained eating (Herman & Polivy, 1983). RE refers to the consistent, cognitively mediated effort to restrict eating for the purpose of weight control (Kong et al., 2013). Emotional eating has been defined as the “tendency to overeat in response to negative emotions such as anxiety or irritability” (van Strien et al., 2007, p. 106). The lifestyle of elite/international combat sport athletes exposes them to many stressful events, with a concurrent expectation to remain in tight control of their body weight and as such dietary intake, a very close approximation to RE. The limited capacity theory developed by Kahneman (1973), shows how an individual’s cognitive capacity to achieve both regulation of emotions and of food intake could push them beyond their limit and result in one or the other being regulated less effectively.

Baumeister et al. (2007) suggest behaviours requiring self-control are less effective when people regulate serial tasks, in other words, poor self-control tends to occur after a person has been engaging in effortful regulation on one task and is then presented with a second task. Behaviours requiring repeated acts of self-control will also use resources and subsequently could reduce the availability of resources. In support of this contention, there is evidence to show that when individuals attempt to regulate their emotions, for example by suppressing an unwanted unpleasant emotion, this leads to higher food consumption (Evers et al., 2010).

Research has examined the relationships between restrained eating and weight-loss maintenance, showing that individuals typically gain the weight back over time, indicative of self-control depletion (Schaumberg et al., 2016). However, there is agreement that whilst acts of self-control are effortful, better self-regulation occurs when the outcome is deemed worth the effort, that is, people allocate sufficient resources to maintain self-control (Beedie & Lane, 2012). Devonport et al. (2020) suggested that the restraint and self-control theories can help to understand why having a highly controlled diet for the combat sport athlete may bring about emotional eating and compromise weight management goals.

Participants in the present study are classified as elite/international athletes in accordance with criteria identified by McKay et al. (2022). As full-time athletes and those competing in Olympic, World, European, and even the later stages of national competition, they are discouraged from eating certain foods during their training and competitive seasons. Therefore, as restrained eaters, they may experience urges and cravings for prohibited foods, especially when feeling deprived. This may be particularly notable around the acute weight loss phase, which for combat sport athletes occurs in close temporal proximity to weigh-in and competition.

Elite sport is associated with intense emotional experiences (González-García et al., 2020), particularly around competition, and as such, throughout an athletes career the potential for emotionally elicited food cravings is high. Therefore, the aims of this exploratory mixed methods study were to investigate experiences related to dietary restraint, emotional eating, and rapid weight-making among elite/international combat sport athletes. Specifically, the study aimed to explore the relationship between dietary restraint and the urge to eat in response to unpleasant emotions (resulting from events experienced within or beyond sport). In line with previous research (Lakicevic et al., 2021; Matthews et al., 2019), frequent use of rapid weight loss methods around competition was expected. During interviews, athletes' experiences of emotional eating pre- and post-competition (and thus varying requirements for dietary restraint) were explored.

Methods

Research design

This study utilised a sequential, exploratory mixed methods design which is appropriate when there is little or no knowledge of a phenomenon (Almeida, 2018). There were two distinct phases: quantitative followed by qualitative (Creswell et al., 2003). The rationale being that quantitative data and subsequent analysis would identify if there was an association between self-reported dietary restraint and desire to emotionally eat. Interviews and subsequent analysis would then help to explain or elaborate on the quantitative results obtained by exploring participants' views in greater depth, specifically in relation to emotional eating around competition (Creswell et al., 2003).

Participants

Purposive sampling was utilised to recruit participants who were competing in combat sports at an elite/international level as experienced athletes are considered to have a high level of experiential knowledge and awareness (Greenwood et al., 2014). This group can be identified as "elite/international" using McKay et al.'s (2022) classification framework. This recruitment strategy matches participants to the aims and objectives of the research, thereby improving the rigour of the study and trustworthiness of the data and results (Campbell et al., 2020).

Participants ($N = 19$; 9 females and 10 males) were elite/international combat sport athletes involved in Brazilian Jiu Jitsu (BJJ: $n = 12$; 7 female, 5 male) and Mixed Martial Arts (MMA: $n = 7$; 2 female, 5 male). Their age ranged between 23 and 35 years ($M = 28.37$, $SD = 3.69$). When asked to self-identify ethnic group, 12 were White, two Pardos, two multiracial, two Black-African, one Pretos, and one Black. Participants possessed an average of 10.32 years ($SD = 3.02$) of experience in their sport and all had recent experience in international competition. Six athletes from the original 19, then participated in semi-structured interviews. The six athletes had a mean age of 27.67 ($SD = 2.94$) and were competing in BJJ ($n = 5$) and MMA ($n = 1$). Optimum sample sizes in qualitative research are widely debated (Braun & Clarke, 2021; Sim et al., 2018). The sample size of six high-performing combat sport athletes allowed for in-depth engagement in rich data (Moran et al., 2011) with the recruitment of experienced participants strengthening the

information power and quality of the data collected (Braun & Clarke, 2021; Fusch & Ness, 2015; Malterud et al., 2016). As such, informed by data quality, recruitment ceased following six interviews.

Measures

Emotional eating

The Emotional Eating Scale (EES; Arnow et al., 1995) is a 25-item scale with three subscales, measuring the urge to eat in response to: (1) anger/frustration; (2) depression; and (3) anxiety. Participants were asked to report the extent to which feelings led to an urge to eat, measured using a 5-point Likert scale with responses ranging from 0 “no desire to eat” to 4 “an overwhelming desire to eat.” The EES has demonstrated good internal consistency, construct validity, and discriminant validity in overweight and obese binge eating and normal weight nonclinical samples (Ricca et al., 2009; Waller & Osman, 1998).

Restrained eating

Perceptions about dieting to achieve or maintain a desired weight were measured using the Revised Restraint Scale (RRS; Herman & Polivy, 1980). It consists of two subscales that measure weight fluctuations and concern for dieting. Four questions regarding weight fluctuations examine specific aspects of weight loss/gain, for example, “How many pounds over your desired weight were you at your maximum weight?” Concern for dieting was examined using six questions where participants indicate how they generally feel regarding dieting behaviours on a 4-point Likert scale (i.e., 0 = rarely, 1 = sometimes, 2 = usually, 3 = always) for questions such as “Do you give too much time and thought to food?”. The Likert scale 0 = “not at all”, 1 = slightly, 2 = moderately, and 3 = very much, was used for questions such as “How conscious are you of what you’re eating?”

Rapid weight loss methods

Weight and diet history as well as rapid weight loss behaviours were measured on the Rapid Weight Loss Questionnaire (RWLQ; Artioli et al., 2010b). Participants were asked to think carefully about how they engage in weight-making behaviours leading up to competition with an emphasis on competitions over the last 6 months. Questions assessed how often 14 rapid weight loss behaviours were used before competition (e.g., “fasting -not eating all day”, “restricting fluid ingestion”, or “saunas”), with participants responding on a 5-point Likert scale with the following anchors “Always”, “Sometimes”, “Almost never”, “Never”, and “I don’t use anymore”. The higher the score, the more aggressive the weight management behaviour. Sound discriminant and convergent validity as well as test-retest reliability have been reported in samples of judo athletes (Artioli et al., 2010b). Six additional questions asked about usual weight-cutting patterns around competition (e.g., “how many days do you usually cut weight before competition?” and “how much weight do you usually cut before competition?”), and the frequency and extent of weight loss and gain (e.g., how many times did you cut weight to compete last season?).

Interview

Semi-structured interviews were used to explore participant's experiences of emotional eating and allowed the interviewer or interviewee to deviate from the interview guide at any point to pursue research participants' perspectives and experiences more fully (Bryman, 2016). The interview began by exploring athletes' general experiences of emotional eating via questions such as "What emotions trigger emotional eating for you?", and "How difficult do you find it to resist emotionally eating or stop if you start?" The second part of the interview focused on an examination of emotional eating around competition with questions such as "Is there a greater need to resist emotional eating during certain performance phases? Please explain?" and "When do you experience emotional eating the most?" Interviews took place at a location chosen by the interviewee and lasted between 45 and 60 min. All interviews were audio recorded and transcribed verbatim, resulting in 31 pages of single-spaced interview text.

Procedure

Following approval from the University [name redacted for review] ethics committee, participants were invited to take part in the present study by the first author, a competitive international combat sport athlete, and thus well placed to undertake purposive sampling of athletes competing in combat sports at a high level. Prospective participants provided their e-mail contact to the first author and were thereafter sent a link to an online survey which started with an informed consent form. Having completed the informed consent form, participants provided demographic and background information (e.g., age, ethnicity, competitive level, sport type, sport experience), followed by completion of the questionnaires (EES, RRS, RWLQ) assessing study variables. On completion of all questions, participants were then invited to indicate whether they would be willing to take part in a follow-up interview that explored emotional eating around competition phases.

Data analysis

Regarding quantitative data, descriptive statistics (i.e., means, standard deviations, frequency analysis, and Cronbach alpha and McDonald's omega coefficients where appropriate) were calculated for the study variables using SPSS version 28.0. Reliability values of 0.70 or higher are considered acceptable. Spearman correlation coefficient (ρ) was calculated to examine bivariate correlations of the study variables. The effect size of the correlations was interpreted as follows: values between 0 and .19 = no meaningful correlation, values between .20 and .39 = low correlation, values between .40 and .59 = moderate correlation, values between .60 and .79 = moderately high correlation, and values equal or higher than .80 = high correlation (Zhu, 2012).

Qualitative analysis of interview data involved reading several times each transcript to gain a sense of the data. This was then followed with open coding, whereby categories were developed from the data that represented similarities, variations, and differences within and across interviews, known as the constant comparative method (Corbin & Strauss, 2008). The resulting categories were then refined during the process of axial coding to identify relationships between categories thereby offering more precise accounts of emotional eating (Corbin & Strauss, 2008).

Results

Descriptive statistics are reported by sport type and gender as such values are useful for further researchers and practitioners. Correlation data are presented for the sample in one group.

Emotional eating

Descriptive statistics and reliability values for the emotional eating subscales are reported by sport type and gender in [Table 1](#). Reliability values demonstrated acceptable internal consistency other than Anxiety which was close. Overall, participants reported highest scores for urge to eat in relation to depressed feelings.

Dietary restraint and weight-cutting patterns

Participants' dietary restraint, weight-cutting patterns as well as frequency and extent of weight loss and gain are presented in [Table 2](#). They reported large weight fluctuations over their desired weight, with a maximum weight cut of 30 pounds prior to competition, and a maximum weight gain of 25 pounds within a week following competition.

Most participants reported being very much (40%) or moderately (45%) conscious of what they eat and reported dieting usually (30%) or always (10%). Forty percent reported giving too much time and thought to food usually (35%), or always (5%). Fifty-five percent of the athletes reported sometimes eating sensibly around others and making up for it alone. Twenty percent reported always having feelings of guilt after overeating. However, they reported that a weight gain of five pounds does not affect their life at all (40%) or only affects slightly (50%).

Weight loss methods

As expected, the use of rapid weight-making methods was prevalent among the participants (see [Table 3](#)). In addition to dieting, the most commonly used strategies were increased exercise with 42% reporting engaging in it always or sometimes (32%), restricting fluid ingestion (42%), sauna, and intentionally training in a heated room. Least often used were vomiting, diet pills, diuretics, use of winter or plastic suites, and fasting. Emotional Eating, Restrictive Eating, and Weight Loss Methods Associations.

As [Table 4](#) shows, positive correlations were observed between features of restrictive dieting and emotional eating. Specifically, weight fluctuations were positively associated with the urge to eat in response to feelings of anger and anxiety (moderate correlations),

Table 1. Means, standard deviations, Cronbach alpha (α) and McDonald's omega (ω) values for the emotional eating subscale by gender and sport type (boxing excluded).

Emotional Eating Subscales	Total (N = 19)				Female (n = 9)		Male (n = 10)		BJJ (n = 12)		MMA (n = 7)	
	M	SD	α	ω	M	SD	M	SD	M	SD	M	SD
Anger/frustration	1.19	0.74	0.83	0.80	0.95	0.47	1.41	0.88	0.92	0.49	1.66	0.88
Anxiety	1.08	0.62	0.74	0.67	0.80	0.51	1.32	0.64	0.85	0.56	1.46	0.56
Depression	2.51	1.12	0.87	0.87	2.62	1.17	2.40	1.13	2.18	1.06	3.06	1.08

Table 2. Weight fluctuations and weight management in preparation for and after competition

	Total (N = 19)				Female (n = 9)				Male (n = 10)			
	Min	Max	M	SD	Min	Max	M	SD	Min	Max	M	SD
Maximum number of pounds over desired weight	0	40	14.37	12.05	0	40	12.00	11.91	0	40	16.50	12.40
Maximum weight ever lost within one month	0	30	13.32	8.01	5	30	11.56	7.37	0	28	14.90	8.62
Maximum weight gain within a week	0	22	9.68	7.01	0	20	7.56	6.31	3	22	11.60	7.37
Weight fluctuation in a typical week	0	4	2.68	1.25	0	4	2.22	1.30	1	4	3.10	1.10
Maximum weight cut to compete in whole career	8	30	18.11	7.74	8	30	14.33	6.95	10	30	21.50	7.06
Number of times cutting weight to compete last season	0	8	2.26	1.88	0	4	1.56	1.42	1	8	2.90	2.08
Weight usually cut before competitions	0	25	9.79	7.29	0	20	7.33	5.89	2	25	12.00	8.00
Number of days to cut weight for competitions	3	60	30.47	21.12	14	60	38.78	20.92	3	56	23.00	19.30
Age started cutting weight for competitions	13	32	21.00	5.12	13	32	20.56	6.25	14	29	21.40	4.17
Weight usually regained in week following a competition	2	25	9.95	6.60	2	20	8.00	5.36	2	25	11.70	7.36

Note: Weight presented in pounds.

as well as with feelings of depression (low correlation). Positive correlations were also observed between concern for dieting and urge to eat in response to feelings of depression (moderately high correlation, $\rho = .69$), as well as in response to anxiety and anger (low correlations).

The urge to eat in response to anxiety and depression was positively associated with different weight-making methods. Specifically, an urge to eat in response to depression correlated moderately to using winter/plastic suits during the whole day/night (.52) and spitting (.43). An urge to eat in response to anxiety showed low correlations with laxatives (.36), increased exercise and sauna (both .35). Weight fluctuations showed moderate to high correlations with most weight making methods ranged from .20 (vomiting) to .79

Table 3. Use of weight loss methods as reported by elite/international combat sport athletes (N = 19).

Method	Always	Sometimes	Almost never	Never used	Do not use anymore
Gradual dieting	15	3	1	0	0
Increased exercise	8	6	2	2	1
Restricting fluid ingestion	8	6	4	1	0
Sauna	5	11	2	0	1
Heated training rooms	5	6	4	3	1
Spitting	3	2	3	10	1
Training with rubber suits	2	5	6	5	1
Skipping one or two meals	2	5	6	5	1
Laxatives	2	4	2	9	2
Fasting	2	3	5	9	0
Diuretics	2	2	3	9	3
Using winter or plastic suits during whole day/night	1	2	6	8	2
Diet pills	1	1	1	12	4
Vomiting	1	1	0	14	3

Table 4. Spearman correlation coefficients between study variables ($N = 19$).

	1	2	3	4
1. Anger				
2. Anxiety	.63 [§]			
3. Depression	.32*	.26*		
4. Weight fluctuations	.43 [#]	.44 [#]	.33*	
5. Concern for dieting	.32*	.21*	.69 [§]	.22*

Note: Correlation *low, #moderate, §moderately high, †high.

(spitting). Low or no meaningful correlations were observed between concern for dieting and weight-making methods.

Qualitative data

The main themes (see Figure 1) identified following axial coding were “emotions eliciting an urge to eat”, “outcomes of emotional eating” and “resisting emotional eating”, which offered insight into emotional eating as experienced by combat sport athletes. Within Figure 1, “n” values identify how many participants referred to each subordinate theme. In presenting and discussing data, emphasis is placed on resisting emotional eating, notably, findings highlighted in Figure 1 by bold text boxes. This is because these insights were reported by all participants and offer novel contributions to existing literature. Findings pertaining to emotions eliciting an urge to eat parallel those attained from general populations (e.g., see Devonport et al., 2019), and therefore do not offer novel contributions. Outcomes of emotional eating show many similarities with data attained from general populations (e.g., see Frayn et al., 2018), with some novel outcomes/concerns presented regarding performance and sponsorship.

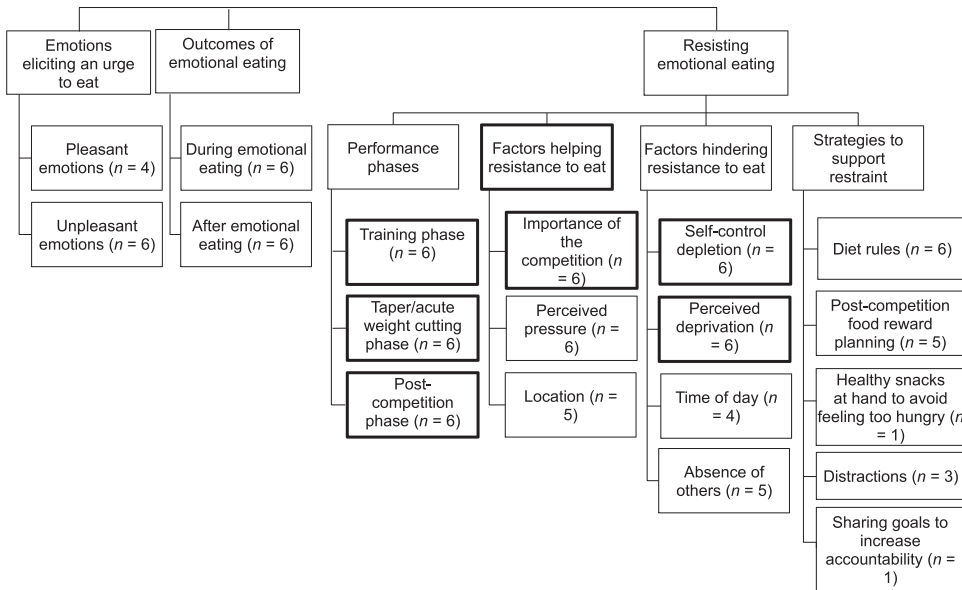


Figure 1. Superordinate and subordinate themes identified by combat sport athletes.

Emotions eliciting an urge to eat

All participants described experiencing, and often acting on an urge to eat in response to unpleasant and/or pleasant emotions: “Personally, for me quite often its sadness, so if I feel sad or overwhelmed with something that’s when I’ll feel an urge to eat, or to eat more” (Participant #2). Eating in response to pleasant emotions was often linked to the use of food as a reward in celebrating in some way; “I also tend to go crazy if I’m celebrating something also, if it’s someone’s birthday for instance ... I would give myself permission to eat what I want and then end up overeating” (#5).

Outcomes of emotional eating

Participants described short-lived pleasant affective outcomes during emotional eating, which quickly gave way to unpleasant feelings including regret, disappointment, guilt, worry, and panic; “When I’m eating, during it, it feels great, makes you feel better doesn’t it, but then obviously after then you feel bad and have regret” (#2).

Participants noted that having succumbed to an urge to emotionally eat, this loss of restraint extended to control over food choice and portion size. When emotionally eating, participants reported selecting foods high in sugar and/or fat such as chocolate, cookies, or convenience foods such as pizza which they labelled as “bad” or “crap” foods; “Whenever I start eating bad food, I find it really hard to eat in moderation, I’m like well I might as well eat loads now because I’ve already eaten this” (#6), offering insight into the possible behavioural consequences of (perceived) excessive emotional eating, “if I overdo it, I will feel like I need to be sick” (#4).

Unpleasant emotions following emotional eating were experienced by all participants, and often resulted from concerns regarding weight making; “the fear of not being able to make weight is always there” (#3); “the main consequence of emotional eating for me is missing weight, it’s definitely more serious now if I were to miss weight because I’ve got a lot of support from multiple sponsors who expect me to win” (#6).

The concerns of Participant 5 extended beyond concerns regarding weight-making, to the effects of “bad” food choices on performance:

During it [emotional eating] I’d feel a sense of panic of it affecting my performance and I know I shouldn’t be doing it, so it feels like a bad thing ... it’s like a self-fulfilling prophecy that says I’ve had a dominos [pizza] you know so maybe I’m not going to perform well in training in the morning. I don’t really know if that’s true but it’s just like it’s sort of getting into your head about eating.

Resisting emotional eating

This theme presents factors perceived as helping or hindering when seeking to resist the urge to emotionally eat. Bold boxes (see [Figure 1](#)) represent factors that will be explored using illustrative quotes as these carry implications that may be drawn upon for interventions intended to help support nutritional, weight-management and performance goals.

All participants provided accounts of the need (and application) for high self-control and restraint in respect of calorie intake and food type leading up to competition, particularly during the acute weight loss phase. *Motivation* for weight-making was noted by all participants as facilitating resistance to emotional eating; “having a specific weight to

make by a specific time plays a big part in resisting. At the end of the day the will to compete is greater for me than my desire to eat" (#3).

Linked to this motivation, variations in the demands of weight-making during the three key performance phases therefore influenced resistance to emotional eating. The following quote illustrates this during the training phase; "if you're way back in the training phase then it's like you can forgive yourself [for emotional eating] because you know you've still got a month left or whatever, so you've still got enough time to make up for it" (#1). However, it was acknowledged that this could lead to overeating:

I'm like I've got to make the most of this because I won't be allowed to eat crap during those times because I have a tournament coming up. As a result, I will end up eating way more than I should (#6).

By contrast, during the weight-making/taper phase, participants consistently reported this to be the performance phase with greatest need for resistance to emotional eating. As such this carried more significant consequences for an individual should they fail to resist emotional eating; "if it [*emotional eating*] happens when it's edging up to competition, it's like ah f**k, what have I done and obviously there's the fear that you've going to miss weight and erm yeah I'd feel annoyed with myself" (#1). Whilst reflecting on the importance of resistance to emotional eating during the weight making phase, there was acknowledgment of how difficult this could be; "before the competition, the motivation for the tournament and the pressure to make weight helps motivate me to resist emotionally eating, but it can be very hard" (#6).

In describing their experiences, requirements for self-control in the weight-making phase appeared to increase participant's sense of *perceived deprivation* regarding certain food types, and this appeared to hinder resistance to emotional eating: "I look up where I want to go and eat, and basically eat with my eyes" (#3), "that's the thing isn't it when you're restricting yourself and like you just need to just like binge" (#1), and "you aren't satisfying that need [to eat what you want], so that makes you more angry" (#4).

Engaging in dietary restraint also appeared to deplete self-control over time, and so also hindered resistance to emotional eating: "I'm always having to consciously make an effort so if I was really down about something I would just stop making that effort, I would overeat" (#5). In this example, the combined self-regulatory demands of maintaining control over diet and emotions appeared to reduce the capacity for resisting emotional eating. There were many instances when participants described difficulties in restricting the amount of food consumed that they perceived as "bad foods" during emotional eating. In an illustration of this, Participant #6 noted that it was "very difficult [*to stop emotionally eating when started*], I haven't really figured that out" and that "whenever I start eating like bad food, I find it really hard to eat in moderation like I'm well, I may as well eat loads now because I've already eaten this." However, she also noted that by contrast "if I haven't been restricting my foods too much, I don't find there's any issue." The latter quote reinforcing the observation that over time restrained eating can deplete self-control.

A combination of perceived deprivation and depleted self-control were most often described as contributing towards disinhibited eating post-competition, at a time when the demands for, and thus motivation for weight making was reduced; "there's more

motivation [to avoid emotional eating] pre-comp, like afterwards you just like go mad, almost a reward kind of thing and also the outcome of the competition" (#5); "sometimes you reward the weight cut rather than the competition" (#3). Irrespective of emotions experienced post competition, all participants described decreased resistance to emotional eating at this point; "if you've won your emotions are mega happy and you want to go out, but if you've lost you just kind of want to be in your hotel room and order rubbish food rather than going out to eat" (#1); "for the next week it's incredible how much you're putting away, sometimes I'm putting away 5000 or 6000 calories in like a day. I just think, I don't know how I've done that, but you do it" (#2). However, the significance of defeat was considered influential by some participants; "the harder the loss the more I fall off the wagon diet wise, especially if I've been dieting for a while for the competition and it's one I really wanted to win" (#6).

Discussion

The present mixed methods study investigated dietary restraint, emotional eating, and rapid weight loss among high-level combat sport athletes. Participants reported large weight fluctuations pre- and post-competition, with 30 pounds being the largest pre-competition weight cut and 25 pounds the greatest weight gain within one-week post-competition. Quantitative data indicate most participants reported being conscious of what they eat and engaging in dieting. These findings are consistent with previous research whereby the weight classification systems result in dietary restraint and preoccupation with body weight, notably leading up to competition (Franchini et al., 2012), followed by overeating, particularly immediately after competition (Matthews et al., 2019). Qualitative data lent support to these findings with all participants describing a cycle of weight gain, at least on occasion, post competition. They all described being acutely aware of what and how much they ate, particularly during the pre-competition weight-making phase, experiencing unpleasant emotions if they perceived themselves as consuming excessive calories and/or nutritionally poor foods.

To make weight, as with previous research (e.g., Lakicevic et al., 2021; Matthews et al., 2019), rapid weight loss methods were used (or previously used) by all participants. Common strategies used were increased exercise including intentionally exercising in a heated room, restricting fluid ingestion, and going to the sauna. The practice of rapid weight loss by severe reductions of food and fluid intake as well as sweat induced dehydration is prevalent in combat sports (Khodaei et al., 2015). Strategies reportedly least often used included vomiting, diet pills, diuretics, and fasting.

Findings from the present study indicated that athletes self-reporting as high in dietary restraint also self-reported a stronger urge to eat in response to emotions. Specifically, weight fluctuations and concern for dieting (features of restrictive dieting as measured by the RRS; Herman & Polivy, 1980) both showed positive correlations with an urge to eat in response to emotions. Of note are the moderately high correlation between concern for dieting and urge to eat in response to feelings of depression. Moderate correlations were observed between weight fluctuations and the urge to eat in response to feelings of anxiety and anger. Indeed, this supports previous literature where numerous studies have shown that negative emotions may stimulate increased food consumption (Devonport et al., 2019; Macht & Simons, 2011).

The RRS (Herman & Polivy, 1980) typically captures unsuccessful dieting, with individuals identified as restrained eaters through use of this scale being susceptible to overeating in situations where various factors interrupt restriction (Herman & Polivy, 2004). As described in the limited capacity (Kahneman, 1973) and self-control (Baumeister et al., 2007; Baumeister & Vohs, 2016) theories, a requirement to regulate emotions and food intake could push athletes beyond their regulatory capacity and result in one or the other being regulated less effectively. As such experiencing intense emotions may present a factor that interrupts food restriction. When athletes are invested in competing at a high level, intense emotions can be produced before, during, and after performance from scenarios such as making mistakes, interpersonal conflict, performance goals, or injury (Balk & Englert, 2020). These intense emotions have the potential of interrupting food restriction.

Furthermore, Lowe and Levine (2005) proposed that restrained eaters may be eating less than they want, as opposed to less than they need, a term called “perceived deprivation”. They contend that restrained eaters, are in a chronic state of perceived deprivation, and this psychological state may contribute to the effects seen in experimental studies (Lowe & Levine, 2005). This effect being that restrained eaters tend to overeat when they feel as though they have surpassed their diet boundary (Herman & Polivy, 1983; boundary model of eating), described as the “what the hell effect”. That is, following perceptions of a dietary violation (intake of a prohibited food or too much food), restrained eaters abandon their diet and overeat, so-called counterregulatory eating (Urbszat et al., 2002).

The restraint and strength model of self-control theory along with these findings can help us to understand why prohibiting certain foods and having a controlled diet for the athlete may bring about unwanted negative outcomes with regard to food intake (Devonport et al., 2020). The controlled eating experienced by combat sport athletes is a very close approximation to restrained eating, with emphasis on weight loss and reduced food intake varying through the different competition phases, thus presenting a factor that could interrupt restriction. Qualitative data offers insight into the “what the hell effect” among participants whereby all noted that once they had violated a dietary boundary, such as eating chocolate, they then all had experience of overeating, for example consuming a family pack of cookies as opposed to one. All participants then expressed fear of not making weight. As such, in a high-performing sport context, deviation from a carefully planned nutritional intake programme may carry consequences for mindset and performance, both in training and competition (Devonport et al., 2020).

During interview, participants described a range of strategies they used to maintain restrained eating, particularly in close temporal proximity to competition. Strategies included use of dietary rules, planning post-competition food rewards, ensuring they had healthy snacks available to fend off excessive sensations of hunger, seeking distractions from hunger, and sharing nutritional goals with others to increase accountability. However, we have no means of establishing how effective these strategies were. Indeed, there is reason to postulate that some strategies may be counterproductive. For example, strict dietary rules, such as calorie restrictions, or restriction of food types place a restrictive intake norm on an individual. Research indicates that individuals often go on to violate strict dietary rules (Herman & Polivy, 2005). As such, there would be value in working with combat sport athletes to explore effective and sustainable

means of regulating nutritional intake in the build-up to competition, but even more so after competition when the incentive for weight-making has passed. During the post-weight-making period athletes can deviate from their strict diet regime to such an extent that their fat mass exceeds their pre-weight-making fat mass. There is also evidence that weight cycling may lead to “fat overshooting” and further weight gain in later life, exposing athletes to the deleterious health consequences associated with this (Morehen et al., 2021).

Practical applications

Qualitative data offer insight into strategies that athletes utilised to support eating restraint, and it is here where there are possibilities for future intervention work. For example, the use of emotional eating diaries, and mindful eating (Devonport et al., 2022). Identifying and recognising emotions that appear to elicit unhelpful eating behaviours may be of value to combat sport athletes. We recommend that athletes maintain an emotional eating diary over at least one week noting: (a) any emotions they are experiencing at the point they recognise a food craving, (b) what they want to eat, (c) their level of hunger, and (d) whether the craving is acted upon. This information could help athletes become aware of emotionally elicited food cravings, in particular cravings of food types (or quantities) that would breach their dietary goals, and whether this requires management.

Where emotional eating does appear to be unhelpful, practitioners could help athletes to reflect upon the notion that emotional eating presents one of many possible emotion-focussed coping strategies (Macht & Simons, 2011). For example, in a study by Parkinson and Totterdell (1999), participants qualified emotional eating as a controlled (i.e., deliberate) affect-regulation strategy similar to other distraction-oriented behavioural strategies such as “doing enjoyable things” or “tidying up”. Athletes could consider strategies other than emotional eating that they have previously used, or could use, to manage emotions as desired. By increasing an athlete’s awareness of their experiences of emotion and emotion-focussed coping and broadening the range of emotion-focussed coping strategies available to them, they become better able to select a suitable coping strategy for use at the appropriate time, leading to desirable outcomes.

In terms of strategies that may support restraint, mindful eating presents a strategy that may be considered. Mindful eating involves bringing full attention to the process of eating, to taste, smells, thoughts, and feelings that arise during a meal, as well as internal cues of hunger and fullness. To practice mindful eating, athletes could be encouraged to slow down when eating, take time to savour and enjoy their food, and eat away from distractions (e.g., television, mobile phone), so that they can really focus on noticing food and changes to their body in response to eating. Noticing food and flavours can be encouraged at any time, even when the diet is being highly controlled. By encouraging athletes to be mindful of their food and bodies, intuitive eating can be reinforced, so that when the control is lifted, athletes can continue to use this to guide their unrestricted eating. Intuitive eating is characterised by food intake being led by physical hunger cues, in other words, eating when hungry and stopping when satisfied, and has been associated with fewer disordered eating practices (Tylka, 2006). As food cravings are common in those with highly controlled diets and are associated with poorer ability to

maintain a healthy weight (e.g., Elfhag & Rössner, 2005), interventions for athletes should also target food craving, particularly at times when control over their diet is lifted. It has been suggested that the greater self-control evidenced among more mindful individuals reduces impulsive eating in response to emotional stressors and cravings (Kristeller & Wolever, 2010).

Finally, where there is indication that an athlete responds to perceived diet violations with unhealthy compensatory behaviours such as purging, or where athletes feel that their eating may be out of control, it is important to signpost them to professional support. This can include speaking to a general healthcare practitioner, or a clinically trained psychologist specialising in supporting individuals with disordered eating practices. Alternatively, endorsed charitable organisations such as Beat Eating disorders found in the UK (<https://www.beateatingdisorders.org.uk/>) or similar organisations found worldwide (e.g., <https://www.feast-ed.org/>) provide a gateway to accessing professional support.

Study strengths, limitations, and future research directions

This study, to our knowledge the first in exploring perceptions of emotional eating and weight making in high-level combat sports, supports the notion that those high in restraint show increased tendency to emotionally eat, particularly in response to unpleasant emotions. A strength of this study is the use of a mixed-methods approach which gave insight into the complex relationships between factors associated with weight making. One limitation of the study is the relatively small sample size, common in studies involving high-level athletes. A second possible limitation of the present study, in that the first author was herself a high-level combat sport athlete. Whilst this facilitated access to high-level participants, it may be that they did not disclose rapid weight loss strategies deemed socially undesirable to a fellow competitor. It is plausible that strategies such as the use of diuretics, laxatives, and vomiting are used more commonly than reported based on: (a) published research in comparative combat sport contexts illustrating use of these strategies (Crighton et al., 2016), (b) the notion by one participant that as a result of overeating “I will feel like I need to be sick”, and (c) the finding that weight fluctuations were positively associated with the use of diuretics and laxatives.

Future researchers should seek to conduct a large-scale comparative analysis using balanced groups of participants across gender and sports, and objective measures of eating behaviours to increase our understanding about how perceptions of and experiences with restrained and emotional eating may differ across high-level combat sports. Unlike many sports, elite/international combat sports do not have seasonal fixtures. Instead, their competitive calendar is determined by governing bodies, media corporations, promotional companies, and managers. Consequently, the number of times they are required to make weight may vary, as might the lead in time for weight making. For example, a training camp which marks the start of the competition phase can be short (2–6 weeks) or long (up to 4 months) in duration depending on the standard of the athlete (Ruddock et al., 2021). Future research should account for the influence of such weight making considerations on dietary restraint and emotional eating.

A further recommendation is for research exploring the influences/pressures around weight making that elite/international combat sport athletes experience within the

sporting context. This includes an examination of how knowledge is gained in respect of nutrition and weight-making, and whether weight-making strategies vary by gender, weight classification, and level of experience. In seeking to understand weight-making behaviours among this population, a longitudinal study undertaken across several competition cycles is advocated so as to ascertain when weight-making behaviours initiate, intensify and cease.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

Data not available – participant consent. The participants of this study did not give written consent for their data to be shared publicly, so due to the sensitive nature of the research supporting data are not available.

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