

Abstract

This mixed methods study aimed to investigate weight-cutting practises of female taekwon-do athletes internationally and explore their experiences of ‘making weight’. A survey of weight-loss practices and eating behaviours was completed by 103 taekwon-do athletes from 12 countries which illustrated that 72.5% of athletes engage in both acute and chronic weight-loss practices prior to competition and that there were higher levels of disordered eating within this athletic population than non-weight cutting athletes. Semi-structured interviews were conducted with five international level competitors; thematic analysis of the interviews identified that the women in general felt weight-cutting was ‘horrible – but worth it’ and the women believed that: 1) weight-cutting is unpleasant, difficult and challenging, and 2) weight-cutting provides a competitive advantage. The implications of this study are that weight-cutting is widespread amongst high level competitive female taekwon-do athletes and this is unlikely to change given the perceived advantages. Efforts are needed to make sure the women are knowledgeable of the risks and are provided with safe and effective means of making weight.

Keywords: Weight cutting, Taekwon-do, Disordered eating, Weight category sports, Female athletes

Introduction

It is well documented that combat athletes use a variety of both acute and chronic strategies to achieve temporary body mass loss in a process known as ‘making weight’, to compete within a lower weight category, with the intention of gaining a competitive advantage over their opponents (Burke et al., 2021; Khodaei et al., 2015). Food restriction and increased

physical activity are methods frequently used to achieve this aim, although more aggressive and harmful ‘rapid weight loss’ (RWL) techniques are also commonplace (Artioli et al., 2016). These strategies have been demonstrated to cause a whole host of negative psychophysiological effects (Kasper et al., 2019) and resulted in several deaths (Barley et al., 2019). Specific to females, prolonged periods of low energy availability may be a risk factor for menstrual disorders linked to stress, extreme exercise and/or body mass reduction (Meczekalski et al., 2014; Nazem & Ackerman, 2012). The majority of the previous research on making weight in combat sports explores the type of strategies employed and physiological effects through quantitative approaches and predominantly focuses on male populations (Cheah et al., 2019; Langan-Evans et al., 2022). A number of limited qualitative investigations combine both male and female athletes within their studies of wrestling, judo and taekwon-do (Pettersson et al., 2012;2013; Sitch & Day, 2015), however there is a lack of research on elite-level female athletes. The aim of this mixed-methods study was to collate the types of making weight strategies used by female taekwon-do athletes, their perception of the impact of such practice on them physically and mentally and the rationale for such choices.

Method - Quantitative

Recruitment and Participants

Eight International Taekwon-do Federation (ITF) associations affiliated to the British Taekwon-do Council were contacted via email and social media platforms requesting permission to disseminate an on-line questionnaire to their members. Criterion for participation included; (1) females aged ≥ 18 years (2) competed at least once at national or international ITF taekwon-do championships. Once approval had been granted, details of the

research and an electronic link to the questionnaire were posted on each individual association's social media pages, which generated 80 responses. In addition, individual taekwon-do athletes known to the lead researcher were also contacted via social media and invited to take part in the study, resulting in a further 23 responses. Ethical approval was granted from the University of Huddersfield ethics panel. All participants provided written informed consent prior to data collection.

Questionnaire

A modified version of the RWL questionnaire (Artioli et al., 2010) was used for the targeted audience. The questionnaire included questions on demographic and background information, weight history and dietary patterns, responses were recorded with a combination of short and long answers, and multiple-choice options. Methods of body mass loss questions were measured by a six-point Likert scale. Typical questions included; 'have you ever lost weight to compete?' and 'please state how often did you use each one of the following methods to lose weight before competitions?' The questionnaire was created in Google Forms and disseminated as described above. The first page of the questionnaire contained the participant information sheet and consent form, whereby a check box option was used to provide consent before proceeding with the questionnaire. Additionally, the Eating Attitudes Test 26 (EAT-26) (Garner et al., 1982) was administered. The EAT-26 is one of the most widely used self-report tests for symptoms of eating disorders. Respondents are required to select an answer from 5 options (always, usually, often, sometimes, rarely, and never) that are given a numeric value (0-5). Typical responses include; 'I avoid eating when I am hungry', and 'I feel that food controls my life'. The total of the all responses provides the individual's EAT-26 score, with a score of ≥ 20 considered symptomatic of disordered eating behaviour (Abbott et al., 2020;2021).

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77 **Data Analysis**

78 This study used a mixed-methods design, therefore responses to open-ended questions were
79 read several times by the lead author to analyse the content of the data and establish meanings
80 and an understanding of the participants' statements to reach data saturation. Following
81 organisation of the dataset, themes and patterns were identified. Categorical responses were
82 analysed for frequency and the results presented below.

83

84 **Method - Qualitative**

85

86 **Recruitment Process and Participants**

87 In total, 5 female athletes were interviewed from the taekwon-do ITF England national
88 team. Initially, the lead researcher, also a member of the ITF England team, sought
89 permission from the head coach to approach adult female members to gauge their interest in
90 participating in the study. Purposeful sampling was used to select within this group those
91 athletes who declared they had experienced making weight prior to a competitive event. Of
92 the 4 female team members who were invited to participate in the study, 3 accepted and 1
93 declined. Due to the limited number of current female team members, a further 4 former
94 England national team members that no longer attended squad training sessions were
95 approached via a social media platform's messaging service. These former team members
96 were all known to the lead researcher and 2 of these members were suggested by the assistant
97 coach, specifically since they were known to have prior experience with making weight. All 4
98 of these former members initially agreed to participate, however 2 withdrew prior to being
99 interviewed. Recruited participants were aged 21-48, all athletes were experienced taekwon-

do practitioners (13-21 years training) with 2-17 years competition experience at both national and international level.

Semi-structured Interviews

The interview guide was developed by the first author and structured around the following themes; 1) taekwon-do and competition history, 2) body mass loss behaviours, 3) advice on body mass loss and 4) experiences of body mass loss for competition. A pilot interview was conducted and following this no substantial changes were made. Data from the pilot interview produced useful information and therefore was included in the analysis. Interviews were conducted at convenient locations for participants and lasted between 24-63 minutes. Prior to the interview, participants were required to sign a consent form and reminded the interview would be tape recorded as well as their right to withdraw from the research process at any time.

Analysis

Interviews were transcribed verbatim by the first author and identifiable data anonymised. Given the small population of female ITF England team members, participants are potentially at risk of being identified from the data provided (King & Horrocks, 2010). Therefore, participants were advised of this possible issue and a copy of the transcript forwarded to each participant enabling them to notify the researcher if they wished for specific quotes to be excluded from the analysis. Data was analysed thematically following guidance from Braun and Clarke's (2006) six-step process; (1) familiarisation, (2) initial coding, (3) searching for themes, (4) reviewing themes, (5) defining/naming themes and (6) producing the report. The process was undertaken firstly by the first author and then repeated by another of the authors.

Any disagreements were discussed and a final set of themes derived. Excerpts were taken from the data set to provide meaningful quotes for each of the themes and sub-themes.

Results – Quantitative

Participant Characteristics

In total, 103 participants completed the online questionnaire, one respondent was withdrawn from the data as they did not meet the age criteria. The final sample consisted of 102 female taekwon-do athletes affiliated to the ITF and recruited from the United Kingdom ($n = 77$) and 11 non-UK countries ($n = 25$) including Australia, Estonia, Hong Kong, Ireland, Italy, Norway, Slovenia, South Africa, United Arab Emirates, Ukraine, and the United States of America. Athletes were aged 18-59 years, with body-mass 39-115 kg and grade level 7th Kup - 6th Dan (4th belt – 16th belt in the taekwon-do grading system). Athletes lost between 0.5kg-15kg over 2-120 days prior to the competition.

Weight Making Strategies and Influencers of Making Weight Strategies

Seventy-four athletes (72.5%) declared using body mass loss strategies prior to competition, the preferred methods (i.e., always/sometimes) of those athletes that reduced body mass were increasing exercise 86.5% ($n = 64$) and gradual dieting (losing weight in 2 weeks or more) 83.7% ($n = 62$). Of the 64 (86.5%) participants that stated using increased exercise for body mass loss, when asked “what type of exercise did you do?”, 61 (95.3%) of participants provided details of the types of exercise they used. One type of cardiovascular exercise or more was the preferred method for increasing exercise 73.8% ($n = 45$).

Athletes that reported using gradual dieting (losing weight in 2 weeks or more) 83.7% ($n = 62$) were asked how gradual dieting makes them feel, 58 participants provided additional information, 65.5% ($n = 38$) reported at least one negative emotion, 24.1% ($n = 14$) reported positive emotions and 10.3% ($n = 6$) reported a combination of negative and positive emotions. Negative emotions most frequently cited were fatigue, tiredness, weakness/loss of strength and low mood. Positive feelings around body mass loss were mainly due to the process being gradual i.e., “did it smart enough to feel ok” and “I always did it gradually over a month so felt ok”. Athletes that experienced a combination of emotions made statements such as, “feels good but is hard” and “can be stressful”, and “this was a really hard challenge” and “my body felt clean, strong but sometimes fatigued”.

Over half of the athletes (52.7%, $n = 39$) reported skipping one or two meals a day with carbohydrates being the most restricted macronutrient. Fluid restriction (deliberately not drinking) was reported by 40.6% ($n = 30$) of athletes and mainly carried out either on or one-two days prior to the weigh-in day. The majority of athletes stated they had never used techniques like spitting 95.9% ($n = 71$), enema and/or colonic irrigation 94.6% ($n = 70$) and vomiting 94.6% ($n = 70$). Table 1 presents a summary of the weight-loss strategies used for body-mass reduction.

(Insert Table 1)

Athletes rated the amount of influence each individual had on their making weight strategies, the most influential sources (i.e., quite/very influential) were, coach/trainer, other taekwon-do competitor and training college. Nutritionist/dieticians and physician/doctors were amongst the least influential sources (see Table 2).

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174 (Insert Table 2)

175

176 Eating Attitudes Test (EAT-26)

177 The EAT-26 test (Garner et al., 1982) was used as a screening tool to identify a risk of

178 disordered eating; of the 102 participants that completed the questionnaire, 36.2% (n = 37)

179 scored ≥ 20 (at risk of disordered eating). Of the 74 athletes that lost body mass to compete,180 39.2% (n = 29) had scores ≥ 20 whilst 28.6% (n = 8) of athletes that did not lose body mass to181 compete scored ≥ 20 . In addition, of the 74 athletes that lost body mass to compete, 33.7% (n

182 = 25) declared making weight before age 18.

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184 Results – Qualitative

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186 Thematic analysis led to the researchers identifying an overarching theme “confliction – it’s

187 horrible but it’s worth it’, and two main themes (1) making weight is an unpleasant, difficult,

188 and challenging process and (2) perceived competitive advantage, as outlined in the table

189 below.

190

191 (Insert Table 3)

192

193 To achieve body mass reduction for international competitions the majority of athletes stated

194 that they utilised gradual dieting (>2 weeks) combined with increased physical activity,

195 typically within 1-3 months prior to a competitive event. Athletes stated that their making

196 weight strategies were based on past experiences, personal preferences, timescales,

197 sustainability, and motivational levels. To further facilitate body mass reduction, some

athletes reported RWL practices i.e., fasting, fluid restriction, saunas, sweat suits and laxatives/diuretics, which tended to be used when they failed to see a desired decrease and particularly during the final 24-hour period prior to weigh in. The most problematic factor for athletes were the consequences of significant alterations to their normal dietary habits required to achieve their target weight category as discussed below.

Theme 1: Making Weight is an Unpleasant, Difficult, and Challenging

Process

The athletes revealed that whilst they did take part in making weight, it was an uncomfortable process, with details of how it impacted them explained through the sub-themes of; physical effects, disturbance to psychological state and obsessive behaviour.

Physical Effects

Alterations to normal eating patterns and the use of more extreme body mass loss methods contributed to the negative physical effects described by the athletes. In relation to altered dietary habits, a reduction of energy intake and restriction of usual foods consumed were aspects found to be problematic. All athletes showed displeasure when restricting certain foods, whereby they felt deprived at not being able to consume what they described as “nice foods”, “junk food”, “bad foods” and “treats”. When energy intake was reduced, feelings of fatigue, tiredness, hunger, exhaustion, and weakness were reported, making them feel physically drained and lethargic, this was in particular during the fasting period prior to the official weigh in.

Positive outcomes that co-exist with negative aspects in relation to their physical health were mentioned by some athletes. Exchanging their usual diet for healthier alternatives initially

made some athletes feel physically better, although they articulated how they considered it to be unsustainable for prolonged periods of time.

Psychological Disturbances

During the making weight process, most athletes reported experiencing some psychological alterations to their mood. The main source of stress centred around being on schedule with their body mass loss goals. Anxiety levels were heightened when athletes failed to see a reduction, making them feel demotivated and demoralised. One participant expressed how this affected her; “very depressed, really fed up, really angry to the point where you just sort of think, crikey I’m working my backside off and getting nowhere, what’s the point!”. Several athletes found it frustrating not being able to eat the foods they enjoyed which negatively affected their mood, feelings of anger, jealousy, ‘being grumpy’ and having no patience with others were reported.

The few days prior to weigh in was an increasingly stressful time, in addition to competitive stressors the fear of not making weight was an extra concern frequently mentioned by the athletes. They became anxious and nervous, one athlete commented, “It is a worry as you get nearer to it [the weigh-in], it’s on your mind 24/7”. Mood state changed once athletes had successfully completed the weigh in, athletes expressed great relief once the weigh in was over and all the effort of making weight appeared to be worth it. One athlete commented that she felt proud when she achieved her weight category goal, “all my hard work has paid off”. Another athlete described it as “a box that needed ticking” and how she felt it was an achievement to accomplish her weight category.

Obsessive Behaviour

Athlete statements demonstrated obsessive behaviour around body mass management, constant monitoring of energy intake and body mass losses caused them to feel overwhelmed, frustrated, and demoralised. Habitually checking their progress became a daily focal point for some athletes and a time-consuming component of pre-competition preparation.

Obsessive weighing intensified the more that athletes struggled to lose body mass, with one athlete reporting weighing herself at least three times a day to record any extra body mass gained after each meal. Outside of the competitive period three athletes claimed to resume normal eating behaviour, for the other two athletes, one ate excessively post-competition to compensate for being deprived of the foods she liked during the making weight period. In contrast, the other athlete continued weighing herself regularly during the non-competitive season to ensure she did not regain too much body mass, stating “I’m always conscious of my weight”.

Theme 2: Perceived Competitive Advantage

The main concept of this theme is central to the athletes’ belief that a physical advantage will be gained by reducing their body mass to compete in a lower weight category than their natural fighting weight. The decision to make weight was described as an autonomous process driven by the athletes’ perception of gaining a physical advantage over their opponent, therefore affording themselves the best opportunity to perform well and be successful. Placing themselves at the higher end of a weight category, rather than being at the lower end of a heavier category was the optimal goal. The sub-themes level playing field and part of the culture describe the rationale for gaining a perceived advantage.

Level Playing Field

Statements from the athletes showed they strongly believed that competing at their natural weight placed them at a great disadvantage. Being equally matched to their opponents in terms of stature was of great importance, all athletes mentioned how their opponent's height, or a combination of height and weight were fundamental characteristics in their decision to compete in a lower weight category and potentially gain an advantage. Athletes also acknowledged that heavier opponents posed some difficulties when sparring; being fearful or apprehensive about injury were not concerns, the disadvantage arose from altering the way they fought against their opponent.

Part of the Culture

Making weight was viewed by the athletes as a sport specific demand within the competitive environment, although they did report that competition level influenced their decision to engage in this process or not. A greater importance was placed on making weight for international competitions, where athletes viewed it as standard practice, a behaviour that most athletes engaged in to gain an advantage for competitive sparring bouts. Whilst losing body mass presented various challenges to the athletes, they were all prepared to make weight for international competitions.

In regard to national competitions, some athletes did not consider making weight to be significantly beneficial. Fewer categories at these events meant the amount of body mass they needed to lose to compete in a lower category was too great and they were also familiar with the opponents they would compete against, whereas international competitions created uncertainty about their opponents. A quote from one athlete summarises why the athletes are prepared to make weight for competition. When asked if she worried about the consequences of what she was doing, she replied;

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299 I don't think you do at the time, all you can see is getting out there and being as best
300 weight you can be, to be in that best advantage for that category, and try and win a
301 medal, you don't really think about the long term.

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Discussion

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305 The majority of the 102 female taekwon-do athletes that completed the on-line questionnaire
306 engaged in some form of weight-cutting. This is consistent with other previous studies of
307 males and females in combat sports (Barley et al., 2019). The predominant weight-loss
308 strategies reported in our study were gradual dieting and increased exercise, which is
309 consistent with other studies including male and female taekwon-do athletes (Brito et al.,
310 2012; Cheah et al., 2019; da Silva Santos et al., 2016; Fleming & Costarelli, 2009). Our
311 findings showed extreme rapid weight-loss methods such as fasting, deliberate dehydration
312 via fluid restriction were less frequently reported with the majority using much more gradual
313 methods. The choice of strategies, according to the interviews, appeared to be determined by
314 athletes past experiences, learning from previous mistakes and experimenting with the
315 various strategies, suggesting that athletes develop weight-loss regimes based on the
316 effectiveness of reducing body-mass and what works best for them. However, those who
317 answered through the survey stated they were more inclined to seek advice from
318 coaches/trainers, other taekwon-do competitors and training colleagues rather than those
319 working in a professional capacity such as nutritionists/dieticians, physicians/doctors, and
320 physiotherapists. As suggested by Cheah et al. (2019), the choice of influencer can impact the
321 athletes' choice of strategies. While athletes continue to seek advice from those involved in

combat sports this may continue to promote unhealthy and potentially harmful practices, thus re-enforcing the habits and behaviours that exist within the culture of combat sports.

The athletes who were interviewed described physical (e.g., fatigue, tiredness, weakness and loss of strength,) and psychological (e.g., low mood, frustration and anxiety) disturbances but they also reported positive symptoms of determination, feeling energised and feeling mentally strong and how substituting their normal diet of “bad or unhealthy foods” to more “healthy foods” made them feel physically healthy. Possible explanations for the different emotions experienced by the athletes may be linked to the different phases of the weight-cutting process, the amount of body-mass losses required, the extent to which they struggle to lose weight and the effectiveness of their chosen strategies. It is therefore apparent that weight-cutting is a unique and complex process affecting athletes' physical and psychological health on a wide continuum.

A further finding from our study showed 39.2% of surveyed athletes that weight-cut for competition were at risk of disordered eating behaviour. This aligns with existing literature documenting that elite female athletes and athletes in weight-sensitive and weight-categorised sports are risk factors for disordered eating behaviour (de Bruin & Oudejans, 2018; Kraus et al., 2018; Smolak et al., 2000) which can lead to clinical eating disorders (Beals, 2000). In our study, due to the significant alterations to normal dietary behaviour in order to make-weight, it was anticipated that weight-cutting athletes may score higher for a risk of disordered eating. However, some non-weight-cutting athletes (28.6%) were also identified as at risk of disordered eating, therefore it cannot be assumed that weight-cutting alone places athletes at a greater risk of disordered eating behaviour. Whilst there is a substantial amount of literature documenting disordered eating behaviour in female athletes, there is a lack of

existing literature relating to female combat athletes, therefore our study adds to current knowledge and highlights the need for more research amongst female populations in combat sports. The questionnaire data showed over a third of surveyed athletes reported weight-cutting before the age of 18, the youngest being 12. This highlights the need for future research amongst female adolescent populations and the need to increase awareness and educate athletes of all ages on best practices for healthy weight-loss through professional sources.

Our study shows that irrespective of the negative effects to physical and psychological well-being, weight-cutting behaviours are widespread in competitive taekwon-do and gaining a perceived physical advantage over an opponent is the driving force for athletes engaging in weight-cutting. Although athletes had a desire to win their sparring bout, the emphasis was not placed on winning but more on being equally matched to their opponent, therefore giving themselves the best chance of performing successfully. It may seem to the general population, and possibly athletes that do not require weight reduction for their sport, to be a detrimental and perplexing approach to pre-competition preparations, however these practices are historically commonplace and normalised within the context of most competitive combat sports (Connor & Egan, 2019; Hall & Lane, 2001; Langan-Evans et al., 2011).

Whilst interviewed athletes' attitudes towards weight-cutting are inherently negative, statements indicate the desire to reach their target weight outweighs the unpleasant process of weight-cutting. Athletes displayed a sense of accomplishment and relief when reaching their weight-loss goal, giving them a sense of pride and preparedness which they perceived to positively affect their mental state. As stated by one athlete "when I've made weight and I'm lighter, I feel like I've already achieved, already won, which puts me in a really good sort of positive mind-set".

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373 **Strengths and Limitations**

374 By using a mixed-methods approach, combining qualitative and quantitative methods from
375 both paradigms allowed for the collection of a variety of data (Creswell & Plano Clark,
376 2018), increasing the credibility for the study. Conducting semi-structured interviews and the
377 questionnaire with athletes of varying ages, body-mass, grade level, experience and
378 competitive level, and the distribution of the questionnaire internationally allowed for a wider
379 population to be reached, thus enhancing generalisability. However, the majority of
380 questionnaire responses were from higher level grades leading to an under-representation of
381 lower grade athletes. The first author, as an insider-researcher shares an athletic identity and
382 similarity of experiences with participants, thus, establishing acceptance, trust and rapport
383 leading to a willingness of participants to disclose and share detailed accounts of their
384 experience. Although, this can be viewed as a limitation, with researchers own perceptions
385 and experiences influencing the interview structure and analysis, (Dwyer & Buckle, 2009) it
386 was thought this allowed the athletes to be more open and honest.

387

388 **Clinical Implications and Conclusion**

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390 A high percentage of female ITF taekwon-do athletes utilise both acute and chronic weight-
391 loss strategies, with some athletes at risk of disordered eating behaviour. Furthermore,
392 athletes experience both negative and positive emotions during the weight-cut and experience
393 conflicting values in pursuit of achieving their weight-loss goal. This information may be
394 beneficial to athletes, coaches, and those with responsibility for the mental health of athletes
395 and suggests the need to educate, raise awareness and promote healthy nutritional practices
396 leading to safer methods of weight management. Increasing knowledge of professionals with

responsibilities for athletes in taekwon-do may also be important so that they can recognise those athletes at risk from eating disorders and provide the necessary skills to either support them or signpost them on to a mental health care provider. A coach or trainer who is eating disordered informed or certified is better able to detect and support the recovery of athletes with eating disorders (Convisher et al., 2018).

To our knowledge this is the first mixed-methods study to examine weight-cutting strategies and experiences amongst female ITF taekwon-do athletes. This study provides an understanding of how individuals perceive the weight-cutting process and the associated physiological and psychological stressors they encounter, furthermore, an insight into female taekwon-do athletes awareness of the types of weight-loss strategies available to them and the rationale for their choice of strategy has been achieved. Studies examining the experiences of female martial arts competitors are limited, indeed qualitative papers across all combat sports and genders are lacking, therefore our study contributes to existing research in this field, however, more studies across all combat sport populations are needed.

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