

Effect of weight restriction strategies in judokas

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Abstract

Objective/Background: Prior to and surrounding a Judo competition athletes manipulate Body Mass (BM) to gain a theoretical advantage when competing against a weaker opponent using a universally practiced tactic known as rapid weight loss (RWL). RWL is commonly used however there is scarcity of research examining its physiological effects which may include muscle damage and increased risk of injury among others. In addition, psychological effects related to body image, eating behaviours, and emotional responses were found to be attributed to weight restrictions strategies in Judo. The current study aimed to identify the methods used to lose weight, the reasoning behind doing so and the potential effects of those strategies. The physiological and psychological effects related to mental well-being and mood among elite judokas were investigated. *Materials and Methods:* 12 elite Judo athletes volunteered for this investigation (n = 12, 7 females, 5 males; aged = 20 – 28 years). Qualitative data was gathered with semi structured interviews and was analysed through inductive thematic analysis. *Results:* Key themes identified were that participants were intrinsically motivated to compete, partake in dehydration, starvation, and hot baths as the main methods of RWL. This negatively affected mood and mental wellbeing causing maladaptive eating behaviours and BM issues. *Conclusions:* It was evident that a variety of extreme methods used for RWL can have an adverse effect on athletes both physically and psychologically. However, this can be mainly attributed to the lack of knowledge concerning safe weight loss strategies since athletes were receiving guidance and advice from coaches and teammates instead of health professionals.

Keywords: Elite, Judo, Rapid Weight Loss, Physiological, Psychological, Effects

Introduction

Judo is a practiced Olympic sport, in which athletes are split into separate weight and gender categories, with the purpose of theoretically constituting an equal match between athletes (Artioli et al., 2016; Lakicevic et al., 2020; Reale et al., 2016). Research has shown that many judokas start using various weight loss strategies at an early age around 12 years old and interestingly they are encouraged by their coaches. However, such strategies can be risky for their health particularly in relation to their nutritional status and may also decrease their athletic performance (Berkovich et al., 2019). A large UK based study showed that RWL is highly prevalent amongst judokas, however there is not adequate research findings regarding its effects (Malliaropoulos et al., 2017).

It has been found that athletes must reach a weight restriction which leads to an equal match in anthropometric characteristic that include body mass (BM), as a representative of body size, agility and strength (Artioli et al., 2016; Lakicevic et al., 2020). However, leading up to and surrounding a competition athletes manipulating BM, in order to gain a theoretical advantage, when competing against a smaller and weaker opponent (Artioli et al., 2016; Lakicevic et al., 2020; Reale et al., 2016). In order to achieve manipulation of BM, the majority of Judokas use a universally practiced tactic known as Rapid Weight Loss (RWL) (Dubnov-Raz et al., 2015; Khodae et al., 2015; Reale et al., 2016). This is also evident in combat sports such as boxing, taekwondo and mixed martial arts (MMA) and is commonly known as ‘weight cutting’ (Barley et al., 2019; Khodae et al., 2015; Sundgot-Borgen & Garthe, 2011). It has been found that 60-80% of athletes partake in weight loss, attributed to the ingrained weight cutting practice and sporting culture within combat sports (Barley et al., 2019; Dubnov-Raz et al., 2015; Reale et al., 2016).

Furthermore, athletes will experience fluctuations between RWL and weight re-gain throughout the course of the competition season (Reale et al., 2016). However, the magnitude of weight loss varies in range depending on different sporting disciplines combined with, the duration of time between weigh in and the commencement of the competition (Barley et al., 2019; Reale et al., 2016). With this in mind, an athlete’s weight making strategies should be individually tailored to ensure that specific characteristics and sporting requirements are achieved (Barley et al., 2019).

Participants aiming to manipulate their BM use variety of harmful weight loss methods (Connor et al., 2020). These can include severe prolonged periods of energy intake and fluid restriction, increasing sweat loss

through enlarged heat exposure attributed to the use of rubber suits while exercising and saunas (Artioli et al., 2016; Connor et al., 2020). With the addition of the use of abusive medical methods such as laxatives, diuretics and vomiting (Artioli et al., 2016; Connor et al., 2020). All of these methods are frequently used concurrently or alone, within the week commencing prior to weigh in and progressively intensifies in severity two days preceding weigh in (Khodaei et al., 2015). However, this can negatively affect electrolyte balance, in particular calcium and therefore, reduce bone mineralisation resulting in an increased risk of stress fractures (Birto et al., 2012). According to a recent study, RWL can lead to significant muscle damage as findings have shown that myoglobin (Mb) ($p < 0.001$), creatine kinase (CK) ($p < 0.001$), aldolase (ALD) ($p < 0.001$), hemoglobin (Hb) ($p < 0.001$) and hematocrit (Hct) ($p < 0.005$) significantly increased during a RWL phase (Roklicer et al., 2020). In conjunction with additional consequential health conditions, in particular muscle injuries, cardiovascular implications, or loss of life (Khodaei et al., 2015). Evidence of this is reported in an article by Crighton, Close and Morton (2015) stating that in 2013 a Brazilian MMA fighter passed away due to attempting to lose 20% of BM within 7 days, through the use of a sauna. On the other hand, a recent study investigating the LE PANSE method which is based on hormonal peaks combined with individualised training plans and medical attention demonstrated positive outcomes after following this method for 10 months amongst elite judo athletes. More specifically, findings showed that participants increased their bone density, decreased fat mass, and preserved their muscle mass (Le Panse et al., 2020).

It is highlighted that extreme weight loss predominately occurs in lighter weight categories than in heavy weight counterparts and can begin at the age of between 9-14 years (Artioli et al., 2016; Brito et al., 2012; Garthe, 2011). At this age it has been reported that an association between the extremity of weight management behaviour and initial start of RWL occurs and continues throughout an athlete's competitive years (Artioli et al., 2016; Brito et al., 2012; Grathe, 2011). Research has found that this results in athletes experiencing acute hyperthermia and dehydration. Which leads to augmented risk of stroke and ischemia heart disease (Artioli et al., 2016; Barley et al., 2019; Grathe, 2011).

In addition, RWL also leads to acute and chronic hormonal imbalance in conjunction with the promotion of bone loss and suppressed immune function, increasing the likelihood of athletes becoming more susceptible to infections (Artioli et al., 2016; Reale et al., 2017). Along with, negatively affecting bone density, the rate in which growth and maturation occurs and blood glucose regulation during adolescent years (Barley et al., 2019; Grathe, 2011). Therefore, increasing the risk of injury which is evident in Judo. Malliaropoulos et al. (2017) exhibited an exceedingly high predominance of 89% of judo athletes participating in RWL which is reported to be greater than contrasting combat sports.

Distinguishing the psychological effects of RWL is conceivably of greater difficulty, as it is suggested that psychological states and mood are negatively affected due to weight cutting practice (Caulfield & Kargeorghis, 2008; Pettersson et al., 2012). Mood is defined as a set of feelings, which commonly involve multiple emotions that differ in intensity and duration (Lane & Terry, 2000). Whereby, differences in or several types of mood can occur endogenously or regarding an event (Caulfield & Kargeorghis, 2008). However, it is reported that mood can result in imperative implications for psychological and physical wellbeing (Caulfield & Kargeorghis, 2008). As well as detrimental consequences for health, cognitive function, and triumphant interpersonal relationships (Caulfield & Kargeorghis, 2008).

In addition, mood is reported as a coherent predictor of performance in combat sports due to successful athletic performance correlating with positive emotional health (Hall & Lane, 2001; Koral & Dosseville, 2009). Thus, suggesting that athletes who experience a reduced amount of anger, depression, confusion together with fatigue and an increase in vigour, are more likely to be successful (Koral & Dosseville, 2009). However, the amount of BM lost and methods used prior to the competition could have potentially influenced the mood that was obtained by the athletes on the day of the competition (Koral & Dosseville, 2009).

Furthermore, mood related penalties of extreme weight loss and control leads to athletes within weight classified sports, becoming increasingly more vulnerable to developing eating disorders (Caulfield & Kargeorghis, 2008). This is attributed to persistent exposure within an environment whereby severe weight loss is normalised (Caulfield & Kargeorghis, 2008). Accompanied by prolonged periods of self-induced dehydration, extreme dieting, and reoccurring fluctuations in weight, triggering eating disorders and maladaptive eating behaviours (Caulfield & Kargeorghis, 2008; Hall & Lane, 2001). It is highlighted that disordered eating behaviours occur in both gender categories, with a total of 10 – 15% of males participating in weight classified sports practicing harmful weight loss and 37% of female athletes developing an eating disorder, due to competing within a specific weight category for their sport (Sundgot-Borgen & Grathe, 2011; Turocy et al., 2011).

However, eating disorders are dependent on a variety of different factors such as an athlete's personality, body dissatisfaction, and external pressure to lose weight prior to a competition (Sundgot-Borgen & Grathe, 2011). Coincides with, an early commencement of sport specific training, over training or injuries and the influence of coaching behaviour (Sundgot-Borgen & Grathe, 2011). A study conducted solely with judokas in Spain showed some alarming results particularly in relation to female participants as they exhibited higher anxiety and more eating disorders symptoms compared to the male judokas (Escobar-Molina et al., 2015).

There is scarcity of qualitative sport specific research focused on the development experiences of elite judo athletes. In addition, there is limited research examining the methods and procedures that are in place to prevent the negative influence of weight restriction strategies. Therefore, this study aimed to identify the methods used to lose weight, the reasoning behind doing so and their potential effects; investigate the physiological and psychological effects related to mental well-being and mood among elite judokas.

Methods

Participants

The data was gathered from a sample of elite Judo athletes (n = 12, 7 females, 5 males, aged = 20 - 28 years). Three out of the 12 subjects currently trained at elite level, whilst the remaining eight withdrew from the sport, during the time of data collection. To allow for a balanced viewpoint in relation to the present projects research questions, differences in participant's weight class and gender were collected (Pettersson et al., 2013). Participants were considered elite following Swann et al. (2015) who described an elite athlete as a person with extensive sport specific knowledge, with a greater ability to remember, identify and manipulate appropriate information within their specialist sport. Additionally, all participants in this study meet the criteria to be defined as "expert" athletes due to the widely accepted 'ten-year rule' for participating and competing at elite level in Judo (Swann et al., 2015). Participants had in total 12 British championship medals, 2 European Cup medals, participation in Youth Olympic Games, Commonwealth Games and World Cup competitions.

Design

A qualitative methodology was used for the purpose of gaining a greater in depth understanding of the physiological and psychological effects that occur due to weight restrictions in sport. This was achieved using a semi structured interview, consisting of 10 main questions. All predetermined questions used within the interview guide were composed to ensure that all crucial concepts regarding the research question were addressed. For instance, research from Artioli et al. (2016) outlining the main methods used to achieve RWL and Barley et al. (2019) focusing on performance and health consequences in combat sports were used. Along with, psychology research conducted by Hall and Lane (2001), indicating a high prevalence of increased anger, confusion, depression, fatigue, and reduced vigour, associated with RWL. Combined with, Caulfield & Kargeorghis (2008) research into extreme weight loss and/or weight control leading to athletes becoming increasingly more vulnerable to developing eating disorders, helping to form the interview guide.

These questions investigated the motivation and challenges regarding competing within Judo, the methods used to lose weight in order to compete within a specific category, and how this may impact the subject's mood. Along with, the possible effects on performance and allows for the identification of any potential long-term physical, and psychological effects attributed to competing within Judo. Finally, the interview questions allowed for any previous or current procedures in place to be outlined preventing negative physical or psychological impacts occurring.

The researcher conducted three pilot interviews with elite Judo athletes prior to the commencement of the initial interviews and the feedback gained were then used to assess and enhance the interview guide. Furthermore, the interview guide encompassed opened ended questions in an order of themes, to allow for a greater rapport and increased comfort between the researcher and participant (Longhurst, 2016). This also allowed for prompts or probing to be used in order to gain more in-depth thoughts and responses, along with the clarification of key points (Longhurst, 2016). Coupled with Patton (1990) interview guidelines to ensure the interviewer's statements were unbiased when responding to the participant. Therefore, instead, how/why questions were used in order to gain more information when required (Longhurst, 2016).

Procedures

The study was granted ethical approval by the University's Research Ethics and Integrity Committee. The researcher recruited participants with a poster on social media, from which participants were then emailed an information sheet, outlining the criteria for participation in the study. Along with, the nature of the project and the relevant information regarding confidentiality and anonymisation of the data. The participants that volunteered for the study then signed a written consent form prior to the commencement of the interviews. The interview questions were then sent to the participants ahead of the interview to allow for familiarisation of the types of questions and themes of the interview. This technique conveys a richer and denser data from the participants due to a greater length of time when considering their responses to the interview questions (Burke & Miller, 2001). In addition, the interviews were conducted online through Cisco Webex (Cisco Systems, Inc. Version 41.4.1) and each interview lasted between 15 – 45 minutes.

All interviews were also audio recorded and transcribed verbatim using Otter.ai software app (Los Altos, California, USA, Version 2.1.47.633). Transcriptions were then re-assed by the primary researcher to verify the recordings. This was also carried out to ensure each participant was asked the identical sequence of questions which started off simple to begin with in order to reduce nerves for both the participant and the researcher. Followed by more in depth, emotional and vulnerable questions with the intention of gaining a greater insight into the participants thoughts towards the physical and psychological effects of weight restrictions in Judo. The main themes highlighted were developmental experiences, the severe methods used for RWL such

as starvation, dehydration, and hot baths. Along with, issues related to RWL. In addition, pseudonyms have been used throughout the text to provide anonymity to coaches or other participants mentioned during the interview.

Data Analysis

Data analysis was carried out using inductive analysis in regards to the methodology by Edwards et al. (2002). Accompanied by, thematic analysis which was used to identify common patterns, themes and problems (Braun & Clarke, 2006). Whereby, during the initial reading of the transcripts the search and identification of key words or similar sentences was conducted and coded. Along with, further inductive inference. Subsequently, the analysed results were then sent back to the participants, whereby triangulation consciences were met in regard to an introductory set of codes (Pettersson et al., 2013). With the aim of establishing credibility and trustworthiness regarding the study findings through the use of stakeholder checks (Patton, 1990). This methodology resulted in the coding or raw quotes and themes within the transcribed interviews, whereby subsequently the corresponding sub themes and then main themes were then matched. Additionally, the grounded theory approach was conducted through use of memo writing to elaborate categories and therefore generating themes and theories on the basis of data (Khan, 2014). Resulting in the construction of theory as opposed to population representativeness, to achieve the most favoured data analysis (Khan, 2014).

Trustworthiness

Triangulation was used within the methods and analysis of this study, therefore ensuring trustworthiness. As it allowed for athlete’s experiences and personal views to be gained (Longhurst, 2016). In conjunction with, reliability checks conducted by independent researcher and the primary researcher reaching a final agreement regarding themes and sub themes, as a representative of the content within the transcribed interviews (Galli & Vealey, 2008). Thus, in turn reducing the probability of biased results derived from incorrect conclusions and contingencies (Pettersson et al., 2013). In addition, to further enhance trustworthiness participant checks were carried out by emailing the participants the entire transcribed interviews, allowing for comparison of results of their perceived experiences (Galli & Vealey, 2008). From which all athletes concluded and expressed their assuredness of presentation of analysis.

Results

After the analysis of the data, the participant statements allowed for the identification of a variety of different theme as discussed in the methodology through the use of inductive thematic analysis (Braun & Clark, 2008; Pettersson et al., 2012). The results gathered from the data are presented to the reader in Table 1 outlining the main and sub themes identified from the conducted interviews.

Table 1. Main and Sub Themes of the Inductive Analysis

Main Themes	Sub Themes
Developmental Experiences	Motivation to Compete Reason for Withdrawal
Severe Methods used for RWL	Starvation Dehydration Hot Baths
Issues Related to Rapid Weight Loss	Controversial Performance Benefits Negative Emotions & Struggle Long Term & Maladaptive Eating Behaviours Lack of Education & Support

Developmental Experiences

According to the analysis, the majority of the participants were intrinsically motivated to participate and compete in Judo. This was due to a variety of reasons primarily the feeling that occurred from winning or the competitiveness of the individual athlete. Accompanied by the ability to recognise and identify self-improvements.

‘I think I just kind of really enjoyed the kind of atmosphere of it... and I'd say I'm just really competitive. So and that helped. So when I was getting the kind of results, which I thought was nice, that was something that made me happy.’

Participant 6

‘I like to win. I like to be good. I think that's what motivated me most was just being able to do something that I loved.’

Participant 2

‘I like the sport, I feel you get what you get out of it, what you put in so you can see constant improvements all the time... it pays off, hard work pays off in judo.’

Participant 8

One participant stated that they experienced depression as a result of being unable to successfully balance college, work commitments and Judo at once. However, it was intriguing to discover that the absence and neglect from the participant’s coach aided in the withdrawal from Judo.

‘I tried to go to college. And then I tried to train and work, so I tried to do three things at once. Everything got a bit much. I got depressed as f**k.’

Participant 2
'B didn't help you and was a p***k about it like, I tried to go to him for help and basically he said instead of being able to burry my head into training or do something like that and get my mind off of things. He took me off the programme.'

Participant 2
In addition, another participant indicated that weight cutting was the predominant reason for withdrawal from Judo due to worries regarding personal health risks and increasing amounts of pressure to make weight resulting in emotional distress.

'I think in the end that was probably why I quit. Because it was too hard to you felt like you were doing yourself quite a bit of harm by trying to cut the weight. And you knew that you were letting, people down if you actually didn't make the weight'.

Participant 3
Severe Methods used for Rapid Weight Loss

All participants highlighted that during their participation in Judo they resorted to severe and extreme methods of weight loss such as starvation, dehydration, and significantly hot baths. Despite differences in the magnitude of weight loss required, it was found that weight cutting typically occurred during the two weeks, week or days prior to competition weigh in. During this period the participants would drastically intensify their dieting behaviour, whilst also increasing exercise and thermal stress.

'I remember having to cut a lot of weight and we were having a bath with intense heat. And then when I got up, I had to lie on the floor for like 10 minutes because I thought I was going to faint.'

Participant 11
'At the time was like basically not really eating carbs. But like that was for about a year when I was trying to go to the Commonwealth Youth Games. Then I also was just like, doing a bit of running and then like sweating off and sweat baths.'

Participant 5
'When I was younger, I didn't have knowledge of how to lose weight quickly, or how to cut weight safely. I'd do it very dangerously, and I'd end up sleeping with a sauna suit on, with an onesie on top on top of me. And I'd wake up in the night and I'd be absolutely sweating and I'd end up just losing all of my water weight or a night before a competition I'd either starve myself and then go in a sauna/steam room.'

Participant 9
Moreover, one participant felt that she wasn't understood by family members and instead of receiving empathy or support she received admiration. Despite struggling and having to starve herself before completing a difficult training session and competition, which left the participant feeling extremely angry.

'I had like an apple, a tin of tuna and an egg or something for my dinner. And my granny was like, Oh, I so envy, your self-control that you can just have that for your dinner. And that made me so angry... I still remember that clear as day because I was like your admiring my self-control. When I'm like putting myself through things that my body probably shouldn't be going through and doing things so extremely. And it's not good for me physically or mentally, but you're admiring it.'

Participant 10
Issues Related to Rapid Weight Loss

Responses provided from the participants express very different views regarding the effects of weight cutting on performance in Judo. Several participants believed that their performance remained "unaffected" due to being "used to it." As well as, being somewhat "surprised" at their performance abilities and success subsequent to extreme RWL. Additionally, one participant emphasised gaining a competitive strength advantage over opponents.

'I didn't feel difference after rehydrating and eating after weigh in'

Participant 2
'I honestly don't really think it affected my performance that much. I remember always being surprised, how good I felt like considering, the day before, I would have not eaten or drank anything been in the sweat bath. And then by the actual day of the competition, just feeling fine, strong.'

Participant 5
'It helps performance so say, I'm 60 kilos. And fighting 63 would be the next weight up for me. Most of those girls are going to weigh like 66 kilos by the time I fight them on the day because they're also cutting weight. So just for a strength reason.'

Participant 8
Whereas numerous participants expressed that RWL had extremely negative effects on performance. This was largely derived from a lack of energy and fatigue, resulting in slower cognitive function.

'I think it would effect, my performance quite a bit because I wouldn't be full of energy, so I'd always be really fatigued...and sometimes on the mat I'd get thrown, I just wouldn't be able to pick myself back up... then I try and throw them and just get overpowered.'

Participant 9
'I think very negatively. Because you not only like you've not been really been in the mood thinking like ready for this competition, because all you've been thinking about is cutting your weight. I feel like when you've been cutting weight really badly... it's as if your brain was like, half a second slow.'

Participant 11
Moreover, all participants described feeling significantly negative emotions during weight loss prior to a competition. One participant in particular emphasised "It's the only bit about the sport that makes you hate the

sport a little bit.” In addition, it was also highlighted that training beforehand was found to be an “exhausting” and daunting task for athletes due to lack of energy.

‘I’d be broken, I used to be like, why have I done this to myself?’

Participant 3

‘In the run up to the competition, just feeling so weak and like I remember being in training and just being like, I just have to get through this to like, burn the calories and lose the weight, having not had enough to eat beforehand.’

Participant 5

‘I used to push myself to breaking point all the time, and half the time, sometimes I’d be sick... I just forced myself to do it, I just thought of I’d only take a small portion of my day doing this. And once it’s over, it’s over.’

Participant 9

Furthermore, the majority of participants struggled to consume energy or fluids due to the extreme methods of weight loss used. Leaving many athletes “feeling sick” following weigh in and then “guilty” when eating normally outside of competitions causing a variety of bodyweight and food related challenges.

‘You’re hungry but the making sure you get the water is the hardest part. So I would like force myself to drink water. And I would like feel sick to my stomach.’

Participant 4

‘I’d been cutting for competition for a bit...you’d almost feel guilty for going back to eating normally, because you knew that you could have to cut again. And you’d compare yourself to the way you looked when you were when you had been cutting weight.’

Participant 12

Additionally, one participant felt “judged” from her friends at school as they were unable to understand her reasoning behind limiting food and drink intake. Which negatively impacted her psychologically leading to a large amounts of build-up anger and hatred.

‘The main thing that I hated was, like, obviously being at school and like, I’m eating my stupid little salad for lunch, like can’t explain it to people. Or I often had a friend and she had a birthday party. And it was the day before a competition. So I went to this party and didn’t eat or drink anything. Because I had to weigh in in the morning. And just stuff like that. But like yeah, having to explain it to your friends. And they’re like, it’s clearly not healthy. You feel somewhat judged.’

Participant 5

Several participants suffered from long term psychological impacts surrounding body mass due to the association with specific weight categories. Leading to unhealthy fixation and obsession with their weight despite discontinuation with the sport. As well as an “all or nothing mind set towards food” attributed to cutting weight for competition and then not, causing maladaptive eating behaviours.

‘I think I’m more conscious of my weight and what I’m eating all the time, just because it’s something I’ve always done. I think that’s maybe the biggest thing is the constant effect of knowing how much you weigh and weighing yourself.’

Participant 6

‘Especially with my cutting weight and stuff like that when I was competing Judo, I would weigh myself three, four times every day. And it took me quite a while to break out of cycle even after I’d stopped doing judo.’

Participant 7

‘I don’t think anything physically. And mentally I don’t weigh myself anymore because, the number on the scales affects me too much. Yeah. So instead of a normal person being like, Oh, I weigh 60 kilos, that’s fine. I’m like oh, that’s over 57’s so that really bothers me. So I don’t bother anymore.’

Participant 12

Interestingly, despite all participants’ taking part in frequent weight cutting prior to a competition, none of the participants have been professionally educated on the subject. Instead, one participant stated “I feel like it’s sort of an issue that doesn’t get talked about much. You learn how to do it for word of mouth, from other players and coaches.” Due to weight cutting being seen as a “taboo subject.” One participant reinforced this by emphasising “that’s the culture, I think it’s something everyone does. But nobody questions it..., it’s just like a continuous cycle.” Despite, negative consequences.

‘Oh terrible, absolutely awful when I was that age you see all the top-level senior players. I remember I remember going to like, GB camp. And people telling me like, how much they were cutting stupid amounts, two weeks before the worlds. I was like, if the top players are doing that then that’s what I need to do to be like the top-level player.’

Participant 7

‘It’s just because everyone around you is doing that and the coaches do, encourage it, yeah some of them do encourage it.’

Participant 11

Furthermore, despite prevalent issues surrounding RWL, all 9 participants that have withdrawn from the sport concluded receiving no support physically or psychologically. Whereas, participants currently training and competing within Judo revealed that elite athletes currently have “access to... psychologists, nutritionist, and performance lifestyles helped me manage... my judo career.” Although, access to all support networks has become a recent development and is dependent on the level of the athlete. Since no support or education is currently provided for children or adolescents. Further, enhancing this issue two participants spoke passionately regarding the lack of support and education suggesting the following:

‘I’ve thought about this a lot. I would either have hydration tests at weigh in so that no one can cut water weight. Or I would say, teenage players are going to cut weight regardless, you can tell them not to, they’re still going to do it.’

So, give them some proper nutrition advice, and tell them warning signs like girls, if you're not getting your period, that's not okay. You need to get that checked out... I would want there to be more awareness and help.'

Participant 5

'I think there probably should be something for just club level coaches to discuss safe ways of losing weight and talking about your mental health whilst cutting weight. And because like your body just as going through stuff that it doesn't like and it's hard physically and mentally...I think possibly more talk about your mental health whilst trying to cut weight or just safer ways and less extreme ways to do it would help.'

Participant 10

Discussion

The main findings from this study were that the majority of the participants are intrinsically motivated to train and compete, however for several participants university and social life were of more importance. In regards to the methods of weight cutting starvation, dehydration and significantly hot baths were predominantly used, leading to emotional decline as well as insignificant energy stores. Although, impacts of RWL on performance were found to be controversial whereas findings regarding the difficulty to consume fluid and food following weigh in were unvaried. In addition, lack of education or knowledge surrounding safe weight cutting practice, and an unhealthy obsession with BM among athletes were also primary subject matters.

The lead findings of this study correspond to previous literature outlining that intrinsic motivation is the most self-determined construction of motivation (Ryan & Deci, 2000; Sheehan et al., 2018). This refers to performing an activity in order to obtain pleasure and satisfaction originated from participation (Ryan & Deci, 2000; Sheehan et al., 2018). Rather than due to external commitment and internal pressure (Reale et al., 2016). Previous qualitative research carried out by Reale et al. (2016) also illustrates that athletes receive a sport identity and associate a real athlete feeling with weight cutting, relating to current findings.

Moreover, research highlighting that time commitments alongside parental pressure, coincide with greater amounts of participation in organised physical activity (Mahoney & Vest, 2012). Ultimately undermining family function and detracting from educational requirements or similarly causing classroom burnout (Mahoney & Vest, 2012). Thus, resulting in psychiatric disorders in particular depression and anxiety which are associated with internal stress (Melman et al., 2007). Leading to overscheduling of commitments and perceived time stress which was reported in this study as many of the participants were unable to coincidentally balance all commitments. Additionally, previous research has also addressed the effects of coaching behaviours upon withdrawal from sport (e.g., Andronikos et al., 2019). Rottensteiner et al. (2013) highlighted similar findings to the present study, in relation to one participant in particular reporting that athletes that withdrew, viewed their coaches as discouraging and controlling. When compared to athletes that continued with sport participation (Rottensteiner et al., 2013).

Conforming and further substantiating research describing the various methods used for RWL. Reale et al. (2016) highlighted an increased in the likelihood of RWL among athletes who lack a considerable understanding of nutrition, resorting to extreme dehydration and fasting to accomplish weight loss. Therefore, reinforcing the current findings within this investigation. Additionally, Sundgot-Borgen & Garthe (2011) reported 94% of weight classed athletes use dieting or severe methods of RWL preceding a competition. Together with, earlier research reporting the most drastic amount of weight loss of between 2- 10% of body weight occurs preceding every competition and most commonly the day or 2-3 days prior to weigh-in (Lakicevic et al., 2020). This is substantiated by the findings of the current study.

In addition, the use of saunas or increased sweat response through the completion of exercise within a sweat suit was prevalent among the participants. Therefore, emphasising previous literature which showed that this method of RWL is predominately used by combat sport athletes known as 'drying out', thus allowing athletes to instantly rehydrate after weigh-in (Khodaei et al., 2015). Although, it has also been suggested this method of weight loss will enhance thermal strain, literature surrounding this method is limited due to a lack of methods that cause thermal strain being comprised within surveys (Barley et al., 2019). In addition, one participant reported completely cutting out carbohydrates from their diet for a prolonged amount of time which was evident in a study by Brito et al. (2012) that shows athletes predominantly utilise carbohydrate restriction in comparison to fat restriction. However, precise diet aspects were not investigated, therefore further research is required into the efficacy of varied diets used in an attempt to make weight for a competition (Barley et al., 2019).

As illustrated in the results it is evident that the majority of participants reduced and partake in RWL for a competitive advantage. Which reinforces findings in previous literature (Artioli et al., 2016; Barley et al., 2019; Franchini et al., 2012). However, potential performance effects of RWL remain controversial. This is attributed to a variety of factors such as the method of weight loss used, the duration between weigh in and commencement of the competition, nutritional aspects and performance tests (Artioli et al., 2016; Franchini et al., 2012). Additionally, Koral & Dosseville (2008) report unfavourable effects on performance regarding force, power, and skilfulness. Which was highlighted by several participants. Relating to findings reported by Barley et al. (2019) indicating that repeated effort of performance was reduced for MMA athletes following 24 hours of dehydration prior to competition. However, unlike in MMA the time between official weigh in and competition can range from between 2 – 20 hours depending on the level of competition in Judo (Barley et al., 2019; Reale et al., 2016). Although, similarities in findings are limited due to differences in official weigh in and competition.

Furthermore, a reduction in a large amount of BM has been documented to reduce muscle strength (Birto et al., 2012). Thus, relating to the results found within this investigation to a certain extent. Although, in contrast several participants expressed being unaffected by RWL irrespective of the duration and recovery period subsequent to RWL (Artioli et al., 2016). Instead, participants felt a greater amount of strength in comparison to opponents following RWL. Indicating, the need for further research regarding the relationship between strength and performance effects attributed to RWL. Moreover, the majority of participants emphasised feeling fatigued when competing. This is supported by Ørtenblad et al. (2013) illustrating that acute reductions in energy intake, decrease glycogen concentration which has been proven to induce fatigue due to impairing excitation-contraction coupling within muscle cells. Combined with, prolonged periods of energy restriction negatively effecting lipid and carbohydrate metabolism and downregulate enzymes essential to anaerobic glycolysis (Westman et al., 2007). Thus, in turn increasing the likelihood of impaired high intensity exercise performance which is imperative in Judo, for successful throwing techniques that require both power and speed (Fortes et al., 2017). Therefore, reinforcing participant responses.

Additionally, dehydration negatively effects exercise performance as it results in a decrease in blood plasma and sequentially total blood volume (Cheuvront & Kenefick, 2014). Therefore, reducing cardiovascular function, thermoregulatory capacity and muscle blood flow (Cheuvront & Kenefick, 2014). However, a contrasting study illustrated that despite a reduction in haemoglobin mass, aerobic performance remains unaffected in combat athletes (Artioli et al., 2016). This was evident across several participants within the present study. For example, Franchini et al. (2012) stated that within 3-4 hours following weigh in and prior to the commencement of the competition athletes are able to recover anaerobic performance to pre weight loss values. Therefore, RWL is likely to have no or minimal impact on performance which is consistent with the present study findings.

In addition to, conforming and further substantiating previous literature highlighting that frequent dietary restraint and extreme weight cutting results in physical and subsequently psychological distress (Pettersson et al., 2012). Resulting in, decreased blood flow within the telencephalon along with a decrease in conduction speed of nerve impulses, resulting in negative metacognitive performance (Kempton et al., 2011). Therefore, reducing oxygenation of the upper cerebral areas in turn diminishing attention and anticipation of skills attributed to RWL (Kempton et al., 2011). Which evidently occurred for participants as one in particular emphasised slow cognitive function due to RWL. However, contrasting studies demonstrated that weight loss prior to a competition is deemed as an essential part of the sport, and is regarded as a necessary component of an athlete's mental preparation (Pettersson et al., 2012; Sundgot-Borgen et al., 2013).

Moreover, athletes recognise that it is essential subsequent to weigh in to replenish electrolytes, carbohydrates and total body fluid as a means to recover prior to competing. However, the majority of participants found it difficult. Barely et al. (2019) demonstrate that this is attributed to gastrointestinal discomfort following weigh in, as a result of gastric emptying rates influencing the total amount of body water which enters the bloodstream from the small intestine (Barley et al., 2019). Which in turn is reported in previous literature to increase the likelihood of negative performance outcomes in comparison to dehydration (Reale et al., 2018). Therefore, reinforcing present findings while emphasising that ingestion of fluid and electrolytes alongside carbohydrate intake needs to be considered. Although, there is limited research surrounding efficient rehydration and refeeding strategies following weight cutting, particularly within combat sports (Barley et al., 2019). Thus, potentially explaining the difficulty for participants and emphasising the need for further research.

Nevertheless, weight loss prior to a competition contributes to the demand upon athletes to lower their BM, resulting in a disordered eating culture (Sundgot-Borgen et al., 2013). Whereby, it is suggested that athletes that diet and reduce BM to improve performance increase the probability of developing an eating disorder (Sundgot-Borgen et al., 2013). Findings which relate to the majority of the participants. In addition, several of the participants explained feeling guilty for indulging or eating normally outside of competition season. Further, research carried out by Franchini et al. (2012) support this by emphasising 10 - 20% of athletes lack the ability to control themselves while eating, which then magnifies to 30 - 40% seceding weigh in, thus indicating a symptom of eating disorder. This is mainly attributed to the constant attention directed towards the control of BM, in turn enhancing the likelihood of binge eating, bulimia and anorexia (Filaire et al., 2007). Particularly, among female athletes which is evident within this investigation. However, there is evidence to suggest that disordered eating behaviours and body dissatisfaction are more prevalent among elite level athletes (Franchini et al., 2012; Kantanista et al., 2018). Due to sporting environments potentially precipitating or increasing the likelihood of an eating disorder whilst also legitimising it (Caulfield & Karageorghis, 2008). Relating to current findings.

Following this, earlier research carried out by Bär & Markser (2013) illustrated that overtraining and weight control, endangers mental wellbeing, social relations and can increase feelings of guilty alongside depression. Similarly, a variety of studies indicate that athletes participating in RWL demonstrated a reduction in vigour, concentration, short term memory and self-esteem (Degoutte et al., 2006; Franchini et al., 2012). Thus, enhancing anger, fatigue, isolation, and depression which was highlighted by one participant during school leading to reduced self-esteem, attributed to judgment from friends resulting in frustration and isolation due to being unable to attend social events.

Furthermore, as illustrated in the results all participants expressed a significant lack of support. Specifically, during adolescence years until presently surrounding the effects of weight loss psychologically while also physically which is evident in earlier research. Although, similar to findings by Brito et al. (2012) instead of seeking professional guidance the majority of athletes depend on coach, trainers or teammates for RWL techniques and advice. Therefore, highlighting the importance of behaviour and guidance of authority figures and accomplished teammates, influencing younger athletes to ensure favourable changes in diet occur (Pettersson et al., 2013). For this reason, it is recommended in previous research with the aim of minimising stress upon athletes and enhancing their pursuit of excellence that nutritional education and understanding surrounding weight making practice is paramount for those surrounding an athlete (Franchini et al., 2012; Pettersson et al., 2013).

In addition, one of the participants emphasised the need for further nutritional advice, hydration tests and awareness – suggestions that support previous literature. For example, Franchini et al. (2012) highlighted the importance of hydration tests preceding weigh in alongside individualised weight making strategies composed of specific athlete requirements and characteristics of their sport. Together with, gradual weight loss of approximately 1kg per week and emphasise carbohydrate ingestion, therefore the majority of weight loss should occur from fat substrates (Franchini et al., 2012). In conjunction with, Artioli et al. (2010) suggesting that a minimum competitive weight should be determined at the commencement of each competitive season. Therefore, preventing athletes from competing within a weight category requiring greater than 1.5% of BM being lost per week.

Limitations and Future Research

It should be recognised that only Judo athletes were interviewed within this study. This therefore limits the information gathered as interviewing coaches alongside athletes, would have provided the researcher with a greater insight and comparison of opinions. In particular, regarding accessible support provided from coaches and professionals surrounding RWL methods and mental wellbeing. Furthermore, incorporating interviews of athletes within a variety of different sports should be considered to identify prevalent issues among weight restricting sports.

Moreover, future research should aim to investigate a variety of differences of views regarding athletes, coaches and the International Judo Federation accompanied by other sports. In addition, a mixed methods research approach would be beneficial to identify physiological effects, by measuring athlete's body weight whilst simultaneously conducting interviews and questionnaires in regard to mood and mental wellbeing.

Conclusion

To conclude, is it evident that a variety of extreme methods used for RWL which in adversely affects athletes both physically and psychologically. Even though the influence on the performance outcomes following RWL do not appear to be clear for athletes, the potential negative psychological effects related to their wellbeing were highlighted. One of the main reasons that may explain the issues associated with RWL can be attributed to the lack of knowledge regarding safe weight loss strategies. Athletes tend to receive advice and guidance from coaches and teammates rather than experienced professionals. As such, meticulous attention should be given to the young athletes who compete at elite level to detect any alarming signs at early stages and offer appropriate support according to their needs. Therefore, emphasis should be placed on expanding the existing knowledge and providing guidance through educational programmes to reduce the potential negative impact of RWL. Finally, organisations may need to consider adopting stricter rules in relation to weight loss practices in an attempt to better monitor this situation in the future.

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