

Current practices in weight making sport

Carl Langan-Evans, Ben Crighton, Andreas Kasper, Dan Martin and Dr George Wilson highlight some of the body mass loss practices employed by athletes across a range of sports and demonstrate the impact that this has on psychophysiological health.

All combat and a number of non-combat sports follow differing degrees of weight categorisation (see Table 1) and there are also a number of aesthetically judged sports where it is considered advantageous to have the lowest fat mass possible, including gymnastics, body building, bikini modelling, etc.

The rationale for weight categorisation is to promote fairer competition between competitors of equal size/body mass and stature/height (Langan-Evans *et al.*, 2011). However, many weight categorised athletes lose large amounts of body mass to gain a competitive advantage in either height, limb length or power to mass ratio. Several studies have shown these athletes employ short duration or 'rapid weight loss' (RWL) techniques, whereas others maintain low energy availability over prolonged periods of time. As such, a recent article has called for RWL to be banned (Artioli *et al.*, 2016) and others have highlighted the dangers of consistently reduced energy availability (Mountjoy *et al.*, 2014). This article highlights some of the body mass loss practices employed by athletes across a range of sports and demonstrate the impact that this has on psychophysiological health.

Professional horseracing

Perhaps the most challenging weight making sport is professional horseracing as, unlike combat sports, weight verification occurs only a few minutes (rather than several hours) prior to competition, meaning there is no opportunity to rehydrate or restore muscle glycogen. Furthermore, jockeys are required to have their body mass re-verified upon completion of the race, with any body mass gain in excess of 2lb resulting in sanction. Such regulation leads to jockeys competing in a high-risk sport with compromised physical and cognitive faculties.

Excessive periods of low energy availability combined with the use of RWL dehydration techniques to facilitate weight making amongst jockeys are commonplace, with methods including the use of saunas, salt baths, laxatives and self-induced vomiting. Using such hazardous practices on a frequent basis influences multiple facets of health including low bone mineral density, hormonal disruption and impaired psychological profiles.

Recent work by our Research Group has devised a high protein, moderate carbohydrate diet, with calorie intake equivalent to resting metabolic rate which is made specific to the lifestyle demands of jockeys (Wilson *et al.*, 2015). This approach enabled significant fat mass loss whilst maintaining fat free mass. Whilst this evidence-based approach to weight management has worked for many jockeys,

low energy availability and dehydration are still the most common weight-making strategies due, in part, to the strong cultural and organisational influences within the sport (Martin *et al.*, 2017).

Mixed martial arts

Mixed martial arts (MMA) is unique in that it allows athletes to utilise techniques from a number of combat sports (including striking and grappling) and has existed with its current ruleset since 2001. A culture has developed within the sport whereby athletes are 'cutting' larger amounts of body mass than has previously been documented in any other sport, in part due to the long timeframe (24+ hours) between weigh-ins and competition. Many athletes combine a number of RWL methods including novel techniques, such as water loading and the use of rubbing alcohol or other substances on the skin in order to increase sweat rate (Crighton *et al.*, 2015).

Two MMA athletes in the flyweight division have died and several athletes have been forced to retire due to health problems as a result of their body mass losses. Recently, two MMA athletes were forced to withdraw from championship title fights within the largest current promotion in the sport, the Ultimate Fighting Championship (UFC), as both were admitted to hospital due to 'weight cutting issues' the day before weigh-in.

Our Research Group has recently provided an insight into the weight cutting process via a British Broadcasting Corporation (BBC) documentary *The Weight Cut: Extreme Weight Loss*, highlighting the methods these athletes use to lose body mass. We have also recently observed and documented the renal and hormonal implications of utilising these RWL practices, which, in brief, showed acute kidney damage, vastly altered hormonal profiles and rebound hyperphagia.

Taekwondo

Taekwondo is a striking Olympic combat sport of which there are up to 10 kg gaps between weight categories in both male and female divisions. To achieve these weight category limits there is widespread practice of losing body mass and this is performed in both acute and chronic timeframes as weigh-ins are held the day before (up to 24 hours) competition.

There have been a limited number of studies conducted that have examined the prevalence and magnitude of body mass loss practises in Taekwondo athletes of varying age divisions and competitive levels (Ferreira da Silva Santos *et al.*, 2016). Collectively these studies have demonstrated that both male and female

Taekwondo athletes achieve their target body mass by a means of both chronic low energy availability and acute dehydration, where athletes lose 1-6 kg (1.1-9.3%) of body mass to compete.

Recently our Research Group has examined these practices in a cohort of Taekwondo athletes competing in the elite Cadet (10-13 years old), Junior (14-17 years old) and Senior (18+ years old) divisions of the British National Championships. The study showed both an increasing prevalence and magnitude of body mass loss congruent with the increasing weight category gaps across the age divisions. Senior athletes in the Olympic divisions reported losing up to 18% of body mass and utilising RWL methods such as diuretics, laxatives and self-induced vomiting. Research investigating the psychophysiological effects of these practices is limited.

Judo/wrestling

The weigh-in for both wrestling (Freestyle/Greco-Roman) and judo is conducted the day before competition. Judo is unique in comparison to many of the other combat sports given that a random weigh in is also conducted 1 hour preceding the start of competition and athletes found to have a body mass higher than 5% of their weight category are disqualified.

Due to the death of a judo athlete in 1996 and three wrestlers in 1997 there has been a plethora of research examining the body mass loss practices of judo and wrestling athletes across a number of populations (Alderman *et al.*, 2004; Artioli *et al.*, 2010). Current research has highlighted that both judo and wrestling athletes utilise acute means of body mass loss (in excess of 5% in many cases) mainly through RWL techniques, which involve acute dehydration in limited timeframes (as little as 3 days). Given the large volume of research in these demographics there have been a number of attempts to introduce protocols to reduce these practices. Numerous studies have examined their psychophysiological effects including marked changes in biochemical lipid and endocrine function, inverted iceberg profile of mood states (POMS) and decreased performance in sports-related tasks such as grip strength and jumping power.

Boxing

Boxing is contested in both amateur and professional governing bodies with differing rulesets regulating the two codes. In amateur boxing, athletes are required to weigh-in on the day of each bout of a competition (not less than 3 hours prior), whereas in professional boxing promotions weigh-ins are held the day before. As such, the body mass loss practices of both amateur and professional boxing athletes are disparate based upon the timescale given to recover prior to competition.

Recent research by Reale *et al.* (2017) highlighted that amateur boxers in the 2015 Australian National Championship reported habitually losing $3.6 \pm 2.1\%$ of body mass utilising RWL via exercise induced dehydration techniques, which, in contrast to the aforementioned sport practices, is relatively low. Despite this, studies have shown the negative impact that as little as 3% exercise induced dehydration can have on boxing-related tasks and profile of mood states.

Research into the body mass loss practices of professional boxers is extremely limited. A case study reported from our Research Group (Morton *et al.*, 2010) has characterised these practices in a professional boxer, which included chronic low energy availability (including total energetic and fluid restriction 48 hours prior to weigh-in) and extreme dehydration methods including exercise in a sweat suit. The case study introduced an alternative approach to body mass loss to achieve target weight, which was similar in approach to Wilson *et al.* (2015), which required the loss of fat free mass, yet allowed the athlete to make weight without the need to acutely dehydrate.

Conclusion and a call for action

What is clear is that across a range of weight categorised sports there is a systematic culture of losing body mass, utilising

techniques that are detrimental to psychophysiological health and performance. Each sport presents a uniquely different cultural approach to these practices, however, and, as such, interventions employed to tackle these issues need to be approached on an individualised basis (Langan-Evans *et al.*, 2011). There is a considerable requirement for a wider breadth of research across a number of weight categorised sports to help identify the issues some athletes face on a daily basis and to create strong messages that will ultimately influence policies and procedures. ■

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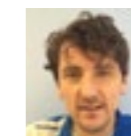
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Table 1. Classifications of various weight categorised sports

Professional Boxing		Amateur Boxing		Judo		Taekwondo		Wrestling (Freestyle)		Wrestling (Greco-Roman)	Karate		Weightlifting		Lightweight Rowing		Mixed Martial Arts (MMA)	Professional Horseracing (UK)
Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male Only	Male	Female	Male	Female	Male	Female	Male & Female	Male & Female
-47.6 kg	-46.3 kg	46-49 kg	45-48 kg	-60 kg	-48 kg	-54 kg	-46 kg	-57 kg	-50 kg	-55 kg	-60 kg	-50 kg	-56 kg	-48 kg	Crew average	Crew average	-52.2 kg	Flat racing
-48.9 kg	-47.6 kg	-52 kg	-51 kg	-66 kg	-52 kg	-58 kg	-49 kg	-61 kg	-53 kg	-60 kg	-67 kg	-55 kg	-62 kg	-53 kg	70 kg	57 kg	-56.7 kg	50.8 kg
-50.8 kg	-48.9 kg	-56 kg	-54 kg	-73 kg	-57 kg	-63 kg	-53 kg	-65 kg	-55 kg	-63 kg	-75 kg	-61 kg	-69 kg	-58 kg	-77 kg	-63 kg	-61.2 kg	to 63.5 kg
-52.2 kg	-50.8 kg	-60 kg	-57 kg	-81 kg	-63 kg	-68 kg	-57 kg	-70 kg	-57 kg	-67 kg	-84 kg	-68 kg	-77 kg	-69 kg	-72 kg	-69 kg	-65.8 kg	
-53.5 kg	-52.2 kg	-64 kg	-60 kg	-90 kg	-70 kg	-74 kg	-62 kg	-74 kg	-59 kg	-72 kg	+84 kg	+68 kg	-85 kg	-69 kg	no rower	no rower	-70.3 kg	Jump racing
-55.2 kg	-53.5 kg	-69 kg	-64 kg	-100 kg	-78 kg	-80 kg	-67 kg	-79 kg	-62 kg	-77 kg	-105 kg	-90 kg	-94 kg	-75 kg	72.5 kg	59 kg	-74.8 kg	63.5 kg to
-57.2 kg	-55.3 kg	-75 kg	-69 kg	+100 kg	+78 kg	-87 kg	-73 kg	-86 kg	-65 kg	-82 kg	+105 kg	+90 kg	-105 kg	-90 kg	incl. single	incl. single	-77.1 kg	76.0 kg
-58.9 kg	-57.2 kg	-81 kg	-75 kg		+87 kg	+73 kg	-92 kg	-68 kg	-87 kg	-87 kg			-105 kg	-90 kg	72.5 kg	59 kg	-79.4 kg	
-61.2 kg	-58.8 kg	-91 kg	-81 kg				-97 kg	-97 kg	-72 kg	-97 kg			-105 kg	-90 kg	incl. single	incl. single	-83.9 kg	
-63.5 kg	-61.2 kg	+91 kg	+81 kg			+80 kg	+67 kg	-125 kg	-76 kg	-130 kg			-105 kg	-90 kg	72.5 kg	59 kg	-88.5 kg	
-66.7 kg	-63.5 kg												-105 kg	-90 kg	72.5 kg	59 kg	-93.0 kg	
-69.9 kg	-66.7 kg		48-51 kg										-105 kg	-90 kg	72.5 kg	59 kg	-102.1 kg	
-72.6 kg	-69.9 kg		57-60 kg										-105 kg	-90 kg	72.5 kg	59 kg	-120.2 kg	
-76.2 kg	-72.6 kg		69-75 kg										-105 kg	-90 kg	72.5 kg	59 kg	+120.2 kg	
-79.4 kg	-76.2 kg												-105 kg	-90 kg	72.5 kg	59 kg		
-90.9 kg	-79.4 kg												-105 kg	-90 kg	72.5 kg	59 kg		
+90.9 kg	+79.4 kg												-105 kg	-90 kg	72.5 kg	59 kg		

Weight categories highlighted in bold are those included in the Olympic Games. All weight category information has been pertained from the relevant world governing body.