



Disturbing Weight Cutting Behaviors in Young Combat Sports Athletes: A Cause for Concern

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INTRODUCTION

Problematic weight cutting behaviors in combat sports have been addressed in the scientific literature since the 1930s (1). Indeed, given the available evidence it may be the case that making weight/weight cycling [i.e., rapid weight loss (RWL) prior to weigh-in followed by rapid weight gain prior to competition] has been practiced in combat sports since weight divisions have been introduced. These practices have led to several fatalities (2), which occurred as a consequence of making weight rather than any sports-related injury. Unfortunately, RWL-related deaths still persist into recent times (3). Existing literature has detailed patterns of weight cycling (e.g., methods, magnitudes, frequency, and prevalence) in adult combat sport athletes across various sports, with data revealing RWL is ubiquitous with prevalence reaching 90% in some combat sports (4). However, less is known about the weight making behaviors of child and adolescent combat sport athletes.

ALARMING TRENDS

In the wake of the tragic deaths of three adolescent American wrestlers attempting to make weight in 1997 (2), several papers have been published on this matter in young athletes, causing concern among scientists in the field. As is the case for adult athletes, most adolescent athletes in weight-class sports compete in weight classes below their “natural” (or “walk around”) body weight (5). For example, upon examination of a large cohort ($n = 822$) of judo athletes from various regions of Brazil (4), researchers reported athletes start engaging in RWL as young as 4 years of age. Similar trends were found in Israel, where judo athletes again reported practicing RWL from as early as four (6). These findings align with previously obtained data detailed in a case study from the United States of a 5 year-old child partaking in RWL for a wrestling competition (7).

Aside from the age at which weight making may begin, of additional major concern are the methods employed by young combat athletes to achieve a desired weight. Studies have repeatedly shown that the tools utilized to achieve RWL are identical between young combat sport athletes and their adult counterparts. Specifically, the most commonly reported RWL methods are fluid and food restriction, increased levels of intense exercise, training in impermeable clothing, as well as frequent sauna use (5, 6, 8–10). Of concern, some studies reported that minor-aged combat athletes take laxatives (8, 9) and incorporate spitting (11) as part of their RWL strategy. The commonality of all these methods is the resulting temporary reduction in total body water, muscle glycogen levels and gut content (12–14).

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While RWL duration differs individually and among combat sports, the mutual feature of most weight making attempts is to maximize weight loss in the last few days prior to the official weigh in (15). Likewise, the magnitude of weight loss also differs individually and may depend on the weight class, however weight loss of ~1–6% of pre-weigh in body mass is common in young combat athletes (6, 9). Prevalence of RWL in this population ranges from 25 to 80% (6, 9–11, 16), with higher prevalence in older combat athletes (94%). Notably however, the frequency of RWL in young combat sport athletes is not well-described as only one study reported that adolescent judo athletes engage 2.2 times per year in RWL (6), but RWL is likely dependent on the number of competitions one participates in (4). As a consequence of RWL, junior wrestlers reported experiencing headache, dizziness, nausea, hot flashes, nose bleeds and to a smaller degree feverish, disorientation and increased heart rate, while 30% of junior boxers experienced fatigue and 21% experienced myalgia during RWL (8, 10).

RISKS OF RAPID WEIGHT LOSS FOR YOUNG ATHLETES

With dehydration being the most common method of RWL, interest in how this method impacts youth and adolescents' physiology is warranted. Young individuals have an immature sweating function compared to adults; as such they regulate body temperature by increasing peripheral blood redistribution rather than sweating (evaporative cooling) (17). Therefore, youth athletes are more likely than adults to experience a rise in core body temperature, particularly in hot environments such as saunas, increasing the risk of heat stroke.

In addition to the concerns associated with pre-competition acute weight loss, some young athletes go even further, striving not to gain weight between competitions in order to remain in a specific weight class for a period of 2 years or longer (6), thereby suppressing natural growth and development which normally occurs during childhood and adolescence. Young athletes require enough energy and other nutrients to grow, with peak bone and height velocity occurring around the age of 12 in girls and 14 in boys, and first menses in female athletes occurring around ~14 years (18). Energy deficiency in the growth phase, not only stunts growth, but may impact additional metabolic systems and physical performance (19). Furthermore, young athletes have a particular need for micronutrients (e.g., iron, calcium, or vitamin D) due to the rapid growth experienced during this time (20).

DISCUSSION

To those unfamiliar with the world of combat sports, it would seem counterintuitive to intentionally deprive oneself of food and fluids prior to engaging in combat sport competition. Nevertheless, as has been repeatedly shown, RWL is highly prevalent and indeed deeply embedded in the culture of combat sports, which consequently leads to situations where athletes who may have not wanted to engage in RWL, do so in order to avoid a perceived disadvantage (21). Although evidence as to whether

RWL prior to- and increased body mass (BM) at the time of competition is a key determinant of success in combat sports remains somewhat equivocal overall, BM regain post-weigh-in may be beneficial in grappling sports (e.g., judo, wrestling) where the goal is to manipulate an opponent's body and impose one's own body weight (22). Conversely, increased BM is noted to likely be less beneficial in striking sports, where success depends more on tactical executions of movement, footwork, speed, and successfully landing blows to an opponent's body (10, 23).

Data indicate that young combat athletes are strongly influenced by their coaches to engage in RWL, with very few athletes seeking advice from health professionals such as physicians or nutritionists (6, 11). This environment of influence mirrors the case in adult combat sport populations (24). In the absence of evidenced based education programs or professional intervention, it is evident that RWL practices are routinely passed from coach to athlete, and from athlete to athlete, with such practices centered on tradition rather than well-informed evidenced based methods (6). It is of particular concern that individuals with poor nutrition and medical understanding are advising athletes to partake in RWL (25), even when it is recognized these practices can result in acute and chronic complications ranging from mild, transient health disturbances to substantial performance decrements and even death.

Optimal nutrition is particularly important during childhood and adolescence, when dramatic changes in fat-free mass occur, which when combined with physical activity requires a substantial intake of energy alongside protein and other nutrients (26). Body size adjusted metabolic rate is the highest in infants, which then decline by about 3% per year until reaching adult levels at ~20 years of age (27). Indeed, absolute energy requirements in humans are at their highest during the late teens, declining slightly thereafter, and then remaining constant until the 50s. Junior athletes, like adults, may experience chronic low energy availability (LEA) resulting in relative energy deficiency, acutely and chronically impacting training and daily physiological functions such as menstruation, bone health, and lipid profiles (28). Interestingly, bone mineral density in wrestling and judo athletes who began RWL practices as juniors is higher than that of the general population (29). This may suggest the exposure to weight bearing activity and physical impacts typical of combat sports may have a larger effect on bone mineral density than that of repeated LEA. Note these findings do not allow one to conclude that chronic LEA does not impact bone mineral density, only that repeated episode of RWL may not be—in this specific context. Chronic LEA in junior athletes may still have significant consequences on bone metabolism, however further research needs to be done, as the effect of temporary RWL, combined with persistent LEA and weight cycling in juniors across the life span has not undergone detailed investigation.

The issue of RWL in combat sports as a whole is still a contentious one, although evolution in the literature and recommendations to curtail harmful practices continue (3). In adult athletes, modern guidelines have taken a pragmatic approach which aim to balance athletes' health and safety with their desire to recognize real or perceived benefits from acute and

chronic BM manipulation (12, 30). While these guidelines may suitably strike the correct balance in adult populations, additional considerations are warranted in regards to youth athletes. Until further research answers pertinent questions and revised guidelines for youths are published, parents, practitioners, coaches, and adult athletes should take a conservative approach when discussing potential BM loss or management strategies with young athletes whenever possible.

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NL, RR, EK, and HS contributed to conception and design of the study and wrote the first draft of the manuscript. NL, GD'A, AB, PD, and RR wrote sections of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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