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Rapid Weight Loss in Combat Sports: Health Risks, Performance Trade-Offs, and Evidence-Based Weight Management — A Scoping Review

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Abstract

Background: Rapid weight loss (RWL), commonly referred to as weight cutting, is a widespread practice in combat sports, where athletes attempt to qualify for lower weight categories before regaining body mass prior to competition. This practice combines chronic energy restriction with acute strategies to manipulate body water, glycogen stores, gastrointestinal contents, sodium intake, and body temperature, raising concerns regarding athlete health, performance, and safety.

Aim: To map the current evidence regarding the prevalence and methods of RWL in combat sports, its health and performance consequences, the relationship between post-weigh-in weight regain and competitive success, and evidence-based strategies for safer weight management.

Material and methods: This scoping review was conducted in accordance with the Joanna Briggs Institute methodology and the PRISMA Extension for Scoping Reviews (PRISMA-ScR). Peer-reviewed studies and consensus statements addressing boxing, mixed martial arts, wrestling, judo, taekwondo, Brazilian jiu-jitsu, kickboxing, Muay Thai, sambo, and other weight-category combat sports were included and synthesized.

Results: The evidence indicates that RWL is highly prevalent across combat sports. Common methods involve dehydration, energy restriction, heat exposure, and manipulation of diet and body fluids. Acute risks include dehydration, electrolyte imbalance, renal stress, acute kidney injury, impaired thermoregulation, endocrine disturbances, low energy availability, sleep disruption, fatigue, mood changes, disordered eating, and symptoms overlapping with concussion. Evidence linking rapid post-weigh-in weight regain with competitive success is inconclusive.

Conclusions: Rapid weight loss remains a highly prevalent but potentially harmful practice in combat sports. Safer weight management should emphasize long-term body mass planning, limiting acute weight loss, avoiding extreme dehydration and thermal or pharmacological methods.

Keywords: combat sports; rapid weight loss; weight cutting; dehydration; performance; acute kidney injury; relative energy deficiency in sport; weight management; scoping review

1. Introduction

Weight categories are intended to improve competitive equity and reduce mismatches in size, strength, reach, and leverage. In practice, however, many combat athletes do not compete at their habitual training body mass. Instead, they reduce body mass during the weeks and days preceding an official weigh-in, make the category limit in a transiently depleted state, and then attempt to restore fluids, carbohydrates, and body mass before the contest. This sequence is usually described as rapid weight loss (RWL) followed by rapid weight gain (RWG). Although terminology varies, RWL is often operationalized as the loss of approximately 5% or more of body mass within seven days, while acute weight loss refers more specifically to short-term manipulation of body water, glycogen-associated water, sodium, and gastrointestinal contents in the final hours or days before weigh-in [4–6].

RWL is not a marginal or isolated behavior. Surveys across judo, wrestling, mixed martial arts (MMA), boxing, Muay Thai, kickboxing, taekwondo, Brazilian jiu-jitsu, and sambo report high prevalence, with many samples showing that most competitive athletes have intentionally reduced mass before competition [6–13]. The magnitude and methods vary by sport, competitive level, sex, age, rules, and the interval between weigh-in and competition. Promotions that provide 24 hours or longer for recovery may unintentionally encourage larger losses because athletes expect that dehydration can be reversed before the contest. Same-day weigh-ins reduce the opportunity for large RWG but may also create danger when athletes continue to pursue aggressive cuts despite limited recovery time [5,13–15].

The perceived logic of weight cutting is straightforward: an athlete who qualifies for a lower category and regains more mass than an opponent may enter the contest with a size or strength advantage. Yet the physiological reality is more complex. Acute dehydration reduces plasma volume, increases cardiovascular and thermal strain, impairs renal perfusion, alters electrolyte and hormonal regulation, and can increase perceived effort. Severe energy restriction and glycogen depletion can impair training quality, recovery, mood, sleep, immune function, and repeated high-intensity performance. Moreover, aggressive cuts are often performed during the final taper, when the athlete should ideally be consolidating adaptation, reducing fatigue, and sharpening tactical preparation [4,5,16–22].

The performance literature is apparently contradictory. Some controlled studies and meta-analyses report little or no reduction in isolated strength and power after modest RWL and a recovery period, while other studies identify decrements in repeated efforts, anaerobic work, sport-specific actions, reaction, mood, or perceived readiness [26–29]. This discrepancy may reflect differences in the amount and rate of mass loss, method of loss, athlete experience, recovery duration, test selection, refeeding strategy, and ecological validity. A protocol that preserves a single laboratory measure cannot automatically be assumed to preserve decision-making, repeated exchanges, resistance to fatigue, or safety during a real bout.

The health-performance relationship must therefore be interpreted asymmetrically. A measurable performance impairment is evidence of harm, but the absence of impairment in a small study is not evidence that the method is safe. Renal stress, acute kidney injury, low energy availability, endocrine disruption, and disordered eating can occur even when short-duration performance appears preserved [16–19,25]. This distinction is especially important in adolescents, athletes with a history of concussion, athletes using diuretics or laxatives, and competitors who repeatedly cycle weight across a season.

The purpose of this scoping review is to map the breadth of evidence concerning RWL in combat sports and to integrate health, performance, behavioral, nutritional, and regulatory perspectives. The specific objectives are to: (1) describe the prevalence, magnitude, timing, and methods of RWL; (2) summarize acute and potential longer-term health risks; (3) evaluate performance trade-offs and the evidence concerning RWG and competitive outcomes; (4) identify vulnerable groups and contextual moderators; and (5) formulate an evidence-based framework for safer body-mass management.

2. Research materials and methods

2.1 Review design and reporting framework

This review was designed as a scoping review because the topic spans heterogeneous research questions, study designs, sports, methods of weight reduction, and outcomes. Scoping reviews are appropriate when the purpose is to map concepts, clarify definitions, characterize the available evidence, and identify knowledge gaps rather than to estimate a single pooled treatment effect [1–3]. The methodological structure followed Joanna Briggs Institute guidance, and reporting was aligned with the PRISMA extension for scoping reviews (PRISMA-ScR) [1,2].

The review question was formulated using the Population–Concept–Context framework. The population comprised adolescent and adult combat-sport athletes. The concept was intentional pre-competition body-mass reduction, including chronic weight descent, RWL, acute dehydration, and post-weigh-in RWG. The context included organized amateur, collegiate, Olympic, and professional combat sports with formal weight categories.

2.2 Eligibility criteria

Eligible evidence included peer-reviewed original studies, systematic reviews, meta-analyses, scoping reviews, consensus statements, and position stands published in English. Relevant combat sports included boxing, MMA, wrestling, judo, taekwondo, karate, Brazilian jiu-jitsu, sambo, kickboxing, Muay Thai, and related disciplines. Outcomes of interest included prevalence and methods of weight loss; hydration and renal markers; cardiovascular, thermal, endocrine, metabolic, immune, and musculoskeletal responses; sleep, mood, cognition, disordered eating, and concussion-related symptoms; physical or sport-specific performance; post-weigh-in recovery; weight regain; competitive outcomes; and regulatory or clinical recommendations. Studies focused only on obesity treatment, non-athletic weight loss, or sports without a weight-category context were excluded.

3. Research results

3.1 Evidence landscape

The evidence base contains questionnaire studies, laboratory and field experiments, case reports, prospective observational cohorts, qualitative studies, systematic reviews, meta-analyses, and professional consensus documents. The largest body of work addresses prevalence, magnitude, and methods. A smaller but growing literature examines renal biomarkers, endocrine and metabolic responses, psychological effects, sleep and recovery, disordered eating, concussion symptom overlap, and competitive outcomes. Female athletes, adolescents, athletes from lower-resource settings, and long-term follow-up cohorts remain underrepresented.

Across designs, the most consistent findings are that RWL is common, is often normalized as part of sport identity, is learned from coaches or other athletes, and is performed using multiple simultaneous methods. The most inconsistent findings concern whether post-weigh-in RWG produces a competitive advantage and whether modest RWL impairs isolated laboratory performance after recovery. This heterogeneity is central to interpretation and argues against a universal "safe percentage" that can be applied without considering method, recovery time, athlete health, environmental conditions, and monitoring.

3.2 Prevalence, magnitude, timing, and social transmission

Classic judo research demonstrated that intentional pre-competition weight reduction was widespread and frequently involved several kilograms of loss, repeated multiple times per year [7]. Subsequent multi-sport surveys showed similar patterns across combat disciplines, including fluid restriction, increased exercise, sauna exposure, training in impermeable clothing, reduced food intake, meal skipping, and occasional use of vomiting, laxatives, diuretics, and diet pills [8]. More recent systematic evidence confirms that weight-loss practices remain highly prevalent despite decades of warnings [6].

MMA is particularly notable because many professional events use weigh-ins approximately one day before competition. In professional and amateur samples, almost all athletes have reported intentional pre-bout weight loss, with professional competitors generally losing more than amateurs [9,10]. Common methods include water loading followed by fluid restriction, sweat suits, hot baths, sauna exposure, carbohydrate and fiber restriction, and intensified exercise. Small studies have reported average losses approaching 8% of habitual mass, while individual athletes may attempt considerably more [9,10,16].

Sambo studies show that high prevalence is not confined to MMA. Elite competitors frequently report gradual dieting, sauna use, and meal skipping, with a smaller proportion using hazardous methods such as vomiting, laxatives, diuretics, or diet pills [11,12]. The 2025 cross-sport study by Barley and colleagues further demonstrated that the method profile differs by discipline and that the use of multiple dehydration strategies is associated with larger losses [13]. Striking sports and MMA often allow longer recovery intervals than many Olympic combat sports, creating different incentives and risk profiles.

Weight cycling can begin early. A systematic review of youth Olympic combat sports found substantial RWL prevalence in children and adolescents, with reported rates varying widely by sport, age, and competitive level [14]. Early normalization is concerning because growth, bone accrual, neurodevelopment, hormonal maturation, and the development of eating behavior are still in progress. Young athletes may also have less autonomy to resist coach-directed weight targets and less capacity to recognize dehydration or heat illness.

Weigh-in timing acts as a structural determinant. A recent comparison of athletes exposed to less than 24 hours versus at least 24 hours between weigh-in and competition found larger losses and more extreme methods in the longer-recovery group [15]. This supports the concept of a regulatory “arms race”: when athletes believe others will exploit a long recovery period, they may feel compelled to cut even if they personally prefer not to. Qualitative evidence similarly indicates that RWL is sustained by shared norms, trust in experienced teammates, perceived professional identity, and fear of competitive disadvantage [23,24].

3.3 Acute physiological and medical risks

3.3.1 Dehydration, cardiovascular strain, and thermoregulation

The fastest component of most weight cuts is body-water loss. Athletes restrict fluid, increase sweat production through exercise or heat exposure, and sometimes manipulate sodium or water intake to promote diuresis. As plasma volume falls, heart rate and cardiovascular strain can rise at a given workload, while sweating capacity and heat dissipation may be compromised. The risk is amplified when dehydration is combined with sauna use, hot-water immersion, impermeable clothing, stimulant intake, sleep loss, or training in a warm environment [4,5,16].

Dehydration is not merely a numerical change on the scale. It alters circulation, thermal regulation, renal perfusion, perceived effort, and central nervous system function. A fighter may regain several kilograms after weigh-in yet remain incompletely rehydrated at the intracellular level, particularly when the cut was large, gastrointestinal tolerance is poor, or the recovery window is short. Body mass regain therefore should not be treated as proof of physiological restoration.

Water loading has attracted attention as a potentially less stressful way to increase water excretion before restriction. In a controlled study, water loading produced a modest additional loss without clinically important electrolyte abnormalities under supervised conditions [30]. However, this finding does not justify unsupervised extreme fluid intake. Excessive water consumption can produce hyponatremia, especially when intake is rapid, sodium intake is low, renal excretion is exceeded, or athletes misunderstand the protocol. The method should be considered optional, conservative, and professionally supervised rather than a routine requirement.

3.3.2 Renal stress and acute kidney injury

The kidney is a central organ in the risk profile of RWL. Dehydration reduces renal blood flow and concentrates urine, while intense exercise, heat stress, muscle damage, high-protein intake, creatine supplementation, non-steroidal anti-inflammatory drugs, and repeated cycles may add stress. A detailed MMA case study documented extreme weight making accompanied by dehydration, low energy availability, endocrine disturbance, and acute kidney injury [16]. Although a case report cannot estimate incidence, it demonstrates biological plausibility and the potential severity of poorly controlled practice.

A systematic review of kidney-related outcomes found that creatinine, blood urea nitrogen, and urine concentration commonly rise after RWL, supporting concern about acute renal stress [19]. More recent work in wrestlers reported an increased risk of acute kidney injury after rapid reduction [18]. These findings are clinically important because combat athletes may interpret reduced urine output, dark urine, nausea, dizziness, or weakness as normal features of “making weight” rather than warning signs.

Renal biomarkers require careful interpretation. Creatinine can increase with muscle mass, exercise, meat intake, creatine use, and reduced plasma volume, while cystatin C and urine markers may add useful information. Nonetheless, a pattern of large acute loss, oliguria, rising creatinine, marked urine concentration, heat exposure, and systemic symptoms should not be dismissed as an expected sport response. Continued cutting in that setting is medically unjustifiable.

3.3.3 Energy availability, endocrine function, and body composition

RWL is often preceded by several weeks of energy restriction. When dietary energy is insufficient relative to training expenditure, athletes may enter low energy availability and, in more severe or prolonged cases, the clinical spectrum of Relative Energy Deficiency in Sport (REDs). Consequences can involve endocrine, reproductive, bone, immune, metabolic, cardiovascular, gastrointestinal, and psychological function in both female and male athletes [16,34].

The MMA case described by Kasper and colleagues showed suppression or disturbance in markers related to endocrine and metabolic status during extreme preparation [16]. Supervised Muay Thai research also found changes in health markers and hormones during making weight, although controlled protocols may reduce the magnitude of risk [17]. These studies illustrate that the method and context matter: a moderate, planned reduction supported by adequate protein and micronutrient intake is not physiologically equivalent to severe restriction combined with dehydration and high training load.

Body-mass loss is not synonymous with fat loss. In the final days, much of the reduction derives from water, glycogen and its associated water, gastrointestinal contents, and potentially lean tissue. Repeated attempts to maintain a very low category may compromise training quality and increase weight cycling. Modern body-composition guidance warns against overemphasizing leanness or using body-composition testing in ways that shame athletes, encourage arbitrary targets, or ignore performance and health [35,37].

3.3.4 Immune function, recovery, muscle damage, and sleep

Weight cutting occurs during a period of accumulated training stress. Energy restriction, dehydration, sleep disruption, and thermal exposure can add allostatic load at the moment when recovery should be prioritized. Recent field evidence in wrestlers links combined slow and rapid weight reduction with altered recovery markers, fatigue, and selected adverse health or performance responses, while direct evidence on sleep remains limited [22].

In male freestyle wrestlers, a combined slow and rapid reduction period was associated with changes in heart rate, creatine kinase, fatigue, testosterone, mood, sleep-related measures, and anaerobic performance [22]. The pattern was not uniformly detrimental, which is important: athletes can partially adapt to structured preparation. Nevertheless, the presence of adverse health variables and reduced power reinforces the need to evaluate the whole athlete rather than a single successful weigh-in.

Sleep may deteriorate because of hunger, thirst, nocturia during water loading, late-night exercise, heat exposure, anxiety, and sympathetic activation. Poor sleep in turn worsens reaction, decision-making, pain perception, mood, and recovery. The combination is especially relevant to combat sports, where technical errors and delayed defensive responses can have immediate consequences.

3.4 Psychological, cognitive, and behavioral consequences

Psychological responses to RWL are heterogeneous. Athletes may report fatigue, irritability, tension, confusion, reduced vigor, preoccupation with food and fluid, or a sense of control and confidence when a planned cut proceeds successfully. In Brazilian jiu-jitsu athletes, one prospective study did not identify an additional effect of the observed RWL magnitude on mood or burnout beyond the competitive process itself [21]. This neutral finding is valuable because it prevents overstatement, but it should not be generalized to more severe cuts, different sports, female athletes, or individuals with eating-disorder vulnerability.

The social psychology of weight cutting helps explain why the behavior persists despite known risks. Athletes may believe that cutting proves discipline, professionalism, toughness, or commitment. Advice from successful fighters can carry more weight than medical guidance because it is perceived as practical and culturally legitimate. Qualitative research describes RWL as a socially reproduced practice rather than a purely individual choice [23,24]. Thus, education aimed only at the athlete may fail when coaches, teammates, managers, and promotion rules reward the behavior.

Disordered eating is a major concern. Prospective evidence in male and female combat-sport competitors found a relationship between disordered-eating risk and RWL practices [25]. The boundary between a sport-specific short-term strategy and a clinically significant eating disorder is not always clear, but warning signs include persistent restriction outside competition, binge–restrict cycles, purging, compulsive exercise, body-image distress, concealment, anxiety around eating, and inability to move to a more appropriate weight class despite recurrent health consequences.

Concussion assessment presents a specific clinical problem. Dehydration and weight cutting can produce headache, dizziness, fatigue, concentration difficulty, irritability, sleep disturbance, nausea, and slowed cognition—symptoms that overlap with concussion. In a survey of combat athletes, many reported worsening or prolongation of concussion-like symptoms during a weight cut [20]. This overlap can delay recognition, complicate return-to-play decisions, or lead athletes to normalize neurological symptoms. Hydration and recent weight-cut history should therefore be documented during concussion evaluation.

3.5 Performance trade-offs

3.5.1 Why findings conflict

Performance effects depend on the question being asked. "Does weight cutting impair performance?" is too broad because performance may refer to maximal strength, peak power, repeated-sprint ability, grip endurance, reaction time, technical accuracy, tactical decision-making, perceived exertion, or actual fight outcomes. Studies also differ in whether performance is measured immediately after the cut or after 3–36 hours of recovery.

The magnitude and composition of the loss are equally important. A 3% reduction achieved partly through lower fiber and gastrointestinal contents is not equivalent to a 7% reduction achieved primarily through dehydration. An experienced athlete following a standardized plan is not equivalent to a novice combining starvation, diuretics, and sauna exposure. These methodological differences explain why seemingly conflicting findings may all be valid within their own contexts.

3.5.2 Strength, power, and repeated high-intensity work

Mendes and colleagues found that RWL could impair selected performance outcomes and that chronic exposure to weight cycling did not provide reliable protection against the physiological stress of the cut [26]. Subsequent meta-analysis identified small reductions in maximal strength and repeated high-intensity effort immediately after RWL, while overall performance after RWG was not consistently different from baseline [27].

A separate systematic review and meta-analysis concluded that RWL up to approximately 5% of body mass within seven days did not significantly impair strength and power outcomes in Olympic combat-sport athletes [28]. An updated systematic review found a mixed pattern:

several studies reported no meaningful impairment, whereas others identified adverse changes in fatigue, mood, strength, power, technical kinematics, or blood and urine markers [29].

These results should be interpreted as conditional rather than permissive. First, strength and power tests capture only part of combat performance. Second, average effects can conceal vulnerable individuals. Third, many studies are small and involve athletes accustomed to cutting. Fourth, the capacity to complete a test after recovery does not indicate that renal, endocrine, neurological, or thermoregulatory status is normal. Finally, real competition can last multiple rounds and requires repeated decision-making under threat, not a single maximal effort.

3.5.3 Cognitive and technical performance

Combat sports require rapid perception, anticipation, inhibition, motor accuracy, and tactical adaptation. Dehydration, low carbohydrate availability, sleep loss, and hunger can undermine these functions even when maximal power is preserved. Technical performance may be especially sensitive because small errors in timing, distance, grip choice, guard position, or defensive reaction can determine the outcome. The evidence is less developed than the literature on strength and power, and future studies should prioritize ecologically valid tasks, multi-round simulations, and neurocognitive measures.

3.6 Rapid weight regain and competitive advantage

The premise of RWL is that post-weigh-in regain will create a meaningful size advantage. Observational data provide mixed support. In a dataset of approximately 1,400 MMA weigh-ins, greater RWG was associated with fight success [32]. However, other event-based research in Muay Thai and MMA has found that rapid weight change does not consistently predict winning once sport, sex, and event context are considered [33].

Competitive outcome studies are vulnerable to confounding. More experienced, higher-ranked, better-funded athletes may both cut more effectively and win more often. Weight regain does not measure lean tissue, reach, skill, tactical quality, or hydration status. A heavier athlete may enter the contest with a theoretical size advantage but also with residual fatigue, gastrointestinal discomfort, incomplete rehydration, or reduced durability. Therefore, associations between RWG and winning cannot be interpreted as proof that large cuts cause success.

The rational conclusion is not that size never matters, but that the marginal advantage of additional regain is uncertain and may be outweighed by risk beyond an individual threshold. The objective of evidence-based management should be to arrive at the weigh-in with the smallest necessary acute manipulation while preserving training quality and health—not to maximize the amount that can be lost and regained.

3.7 Vulnerable groups and contextual modifiers

Adolescents warrant the strongest protection. They are vulnerable to growth disruption, bone-health consequences, coercive coaching environments, and the early establishment of disordered eating. RWL should not be treated as a normal developmental skill. Youth programs should emphasize appropriate category selection, growth monitoring, nutrition education, and limits on acute loss [14].

Female athletes remain underrepresented in RWL research. Menstrual function, iron status, energy availability, pregnancy potential, and sex-related differences in body water and thermoregulation require individualized assessment. The absence of sex-specific data should not be replaced by assumptions that protocols developed in male athletes are directly transferable.

Athletes with kidney disease, cardiovascular disease, diabetes, sickle-cell trait, a history of heat illness, recurrent syncope, eating disorders, recent concussion, or use of nephrotoxic medication require medical evaluation. Non-steroidal anti-inflammatory drugs are particularly relevant because they may be used for training pain while dehydration is reducing renal perfusion. Diuretics and many "fat burners" also create medical and anti-doping risks.

The weigh-in interval changes what is recoverable. Same-day weigh-ins leave little time to correct dehydration and replenish carbohydrate; therefore, acute losses should be minimal. Longer intervals allow more recovery but also incentivize larger cuts. Environmental heat, travel, altitude, multiple bouts in a tournament, and limited access to food or toilets further modify risk. A single percentage cannot capture these interacting conditions.

4. Evidence-Based Weight Management

4.1 Principles

Evidence-based weight management begins months or weeks before competition and separates chronic body-composition change from acute scale manipulation. The safest category is generally the lowest category that can be reached repeatedly without severe restriction, recurrent dehydration, loss of training quality, endocrine or menstrual disturbance, persistent fatigue, or psychological distress. Consensus recommendations emphasize individualized planning by a multidisciplinary team rather than copying another athlete's protocol [31,34–36].

The athlete's health history, growth status, body composition, habitual mass variability, competition calendar, training load, travel, recovery interval, and prior response to cutting should determine the plan. A successful plan is not defined solely by making weight. It should also preserve training quality, sleep, mood, renal function, and the ability to rehydrate and compete.

4.2 Chronic weight descent

When fat loss is required, it should occur gradually during the training camp through a moderate energy deficit. Protein intake should be distributed across the day to preserve lean mass, while carbohydrate should remain sufficient to support high-intensity and technical training. Dietary fat and micronutrients should not be driven below physiologically appropriate levels. The exact macronutrient prescription depends on the sport, sex, body composition, and training phase, but severe last-minute restriction is not an acceptable substitute for planning [31,34,36].

Weekly monitoring should include body-mass trend rather than isolated daily values, training quality, resting symptoms, sleep, mood, menstrual function where relevant, gastrointestinal tolerance, and signs of low energy availability. An athlete who cannot remain within a manageable distance of the category without recurrent distress should move to a higher division.

4.3 Acute manipulation before weigh-in

Acute manipulation should be conservative and matched to recovery time. Evidence reviews commonly use approximately 5% of body mass as an upper boundary in studies of short-term performance, but this figure is not a universal safety threshold [27–29]. Losses near that magnitude may be inappropriate for same-day weigh-ins, adolescents, athletes with medical risk, or individuals who rely predominantly on dehydration. Larger losses reported in professional sport should be viewed as descriptions of practice, not clinical recommendations.

Lower-residue and lower-fiber food choices can reduce gastrointestinal contents without the same physiological cost as severe dehydration. Short-term carbohydrate reduction decreases glycogen and associated water, but it can impair high-intensity training if applied too early or too aggressively. Sodium and fluid strategies should be planned by qualified professionals and rehearsed in lower-stakes settings. Water loading can produce additional diuresis but should never involve uncontrolled intake or be used by athletes unable to monitor symptoms [30].

Extreme thermal exposure, prolonged exercise in impermeable suits, deliberate vomiting, laxatives, diuretics, unregulated stimulants, and complete food or fluid deprivation carry disproportionate risk and should be prohibited. Intravenous fluids should not be treated as a routine recovery tool; they carry medical and anti-doping implications and do not correct all consequences of energy and glycogen depletion.

4.4 Post-weigh-in recovery

Recovery should begin immediately after weigh-in with a staged plan that restores fluid, sodium, carbohydrate, and gastrointestinal comfort. Oral rehydration solutions are generally preferable to plain water because sodium and carbohydrate support fluid retention and absorption. The athlete should drink in repeated tolerable doses rather than consuming an excessive volume at once. The target should account for ongoing urine losses and the fact that not all ingested fluid is retained.

Carbohydrate restoration is essential when glycogen has been reduced. Easily digested carbohydrate-rich foods and fluids can be combined with moderate protein. Very high fat, fiber, or large solid meals immediately after weigh-in may slow gastric emptying and worsen nausea. Recovery nutrition should be individualized and rehearsed because gastrointestinal tolerance under stress varies widely [31,34].

Body-mass regain, urine color, thirst, symptoms, and—where available—urine-specific gravity or osmolality can inform recovery, but no single marker is definitive. An athlete who remains confused, collapses, cannot tolerate fluids, has persistent vomiting, severe muscle cramps, chest pain, very low urine output, or neurological symptoms requires urgent medical assessment, not further refeeding advice.

4.5 Monitoring and stop criteria

A written plan should specify who can stop the cut and which findings trigger cessation. Medical staff must have authority independent of coaches and promoters. Suggested stop criteria include syncope or near-syncope; confusion, ataxia, seizure, or altered behavior; chest pain or severe palpitations; persistent vomiting; inability to drink; minimal urine output; severe headache with neurological symptoms; signs of heat illness; suspected acute kidney injury; or a cut that is materially exceeding the rehearsed plan. The athlete should not be left alone during the final phase of a substantial cut.

5. Governance and Policy Options

Individual education is necessary but insufficient because weight cutting is partly produced by competition rules. Regulatory approaches include same-day or multi-stage weigh-ins, hydration assessment, limits on weight regain, certification of a minimum competitive weight, random checks, additional divisions, and sanctions for unsafe methods. Each option has limitations. Same-day weigh-ins may reduce the incentive for large cuts but can increase danger if athletes continue dehydrating. Hydration tests can be manipulated and may misclassify athletes. Regain limits require reliable scales, standardized timing, and clear enforcement.

The most promising approach is a layered system rather than a single test: preseason medical and nutritional assessment; minimum-weight or category certification where feasible; education of athletes, coaches, and parents; standardized access to qualified dietitians; weigh-in policies that reduce the benefit of extreme cuts; symptom-based medical authority; and systematic reporting of adverse events. Policies should be evaluated prospectively rather than adopted solely on theoretical grounds.

Culture change is also essential. Promotions, teams, and commentators often praise dramatic cuts as evidence of discipline while overlooking the medical burden. Safer norms require visible support for athletes who move up a category, sanctions for coaches who direct prohibited practices, and messaging that professional preparation means minimizing avoidable physiological disruption—not demonstrating how much suffering can be tolerated.

6. Discussion

This scoping review identifies RWL as a highly prevalent, culturally reinforced, and medically consequential practice. The evidence does not support a simplistic conclusion that every cut produces immediate performance failure, nor does it support the opposite conclusion that preserved performance proves safety. The most defensible interpretation is that performance responses are conditional and health risks increase with magnitude, dehydration dependence, heat exposure, energy deficiency, limited recovery, and individual vulnerability.

The apparent tolerance of experienced combat athletes may reflect familiarity with the process, better logistics, and selection of individuals who have not yet experienced a major adverse event. It should not be described as physiological immunity. Mendes and colleagues specifically questioned the idea that chronic weight cycling creates reliable adaptation [26]. Repetition may instead increase cumulative exposure to low energy availability, renal stress, disordered eating, and maladaptive normalization.

The evidence around competitive advantage is similarly nuanced. Some large MMA datasets suggest that greater RWG is associated with winning [32], while other event-based studies show weak or inconsistent relationships [33]. Even where an association exists, it does not indicate that the largest possible cut is optimal. The causal pathway is confounded by skill, resources, athlete ranking, category selection, and professional support. A smaller, better-managed cut may provide enough size benefit while preserving readiness.

One of the most important practical findings is the need to match acute-loss magnitude to the recovery interval. Athletes with several hours between weigh-in and competition cannot reliably replace large fluid and glycogen deficits. Athletes with 24–36 hours can regain more mass, but long recovery intervals encourage escalation across the field. Policy and practice must therefore be considered together. Individual counseling that ignores the incentives created by weigh-in rules places the entire burden on the athlete.

The review also highlights the limitations of percentage-based advice. A 5% cut achieved through modest manipulation of gastrointestinal contents, glycogen, and water under supervision is different from a 5% cut achieved by severe dehydration in a hot environment. Percent body mass does not capture rate, method, baseline hydration, lean mass, kidney function, age, sex, or recovery. Percentages can guide planning, but clinical decisions require context and symptoms.

Future research should include larger prospective cohorts with female and adolescent athletes, standardized reporting of habitual and pre-cut mass, objective hydration and renal markers, precise weigh-in and competition times, detailed recovery intake, and ecologically valid performance tests. Long-term studies are needed to evaluate kidney health, metabolic risk, bone health, endocrine function, and eating disorders after years of weight cycling. Natural experiments following rule changes would help identify which governance strategies actually reduce harm.

7. Conclusions

Rapid weight loss is entrenched across combat sports and is sustained by perceived competitive advantage, coach influence, teammate norms, and weigh-in structures. The health risks are most pronounced when athletes combine severe energy restriction, dehydration, heat exposure, pharmacological methods, and inadequate recovery. Acute kidney injury, low energy availability, endocrine disturbance, fatigue, sleep disruption, disordered eating, and concussion-symptom overlap deserve particular attention. Performance evidence is mixed: modest cuts followed by sufficient recovery may preserve selected measures of strength or power, but repeated high-intensity, technical, cognitive, and recovery outcomes can still deteriorate. Rapid weight regain is not a consistently proven cause of competitive success. Evidence-based management should prioritize sustainable category selection, gradual body-composition change, conservative and rehearsed acute manipulation, oral rehydration and carbohydrate restoration, independent medical oversight, and regulatory reforms that reduce incentives for extreme cutting. The central principle is that making weight is not the endpoint; the athlete must arrive at competition healthy enough to perform and safe enough to participate.

Disclosure

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Declaration on the Use of Artificial Intelligence

AI-assisted tools were used exclusively for linguistic refinement. The authors take full responsibility for the scientific content, interpretation of the data, and final version of the manuscript.

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