

DETERMINING A MATHEMATICALLY ACCURATE AND MEDICALLY SOUND WEIGHT CLASSIFICATION FORMULATION FOR WRESTLING

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Synopsis

Having discovered significant discrepancies in the amateur wrestling weight classifications resulting in discriminatory impacts, this study attempts to develop a mathematical formula to adequately allow all wrestlers to compete against opponents properly matched to skeletal muscle mass, not scale weight so that wrestling bouts are more competitive.

I. Using Antiques to Pair Wrestling Opponents.

Wrestling is humankind's oldest sport and the only sport documented in the Old Testament.⁵ The reason is obvious - Wrestling is one of humans' two instinctual sports (running the other).⁶ Wrestling is biologically programmed, what medical science calls "flight or fight" syndrome.⁷

Wrestling seeks to evenly match ("pair") opponents by age, gender, and weight.⁸ Where Wrestling goes (pardon the pun) off the mat is by weight, by using "Scale Weight," a mechanical weight scale.

This is flawed, because first, Scale Weight is not "True Weight" measured upon first arising. Weight continuously fluctuates due to both caloric and water intake. Wrestling refuses to acknowledge this reality, as in most national tournaments, weigh-in occurs in the evening before competition.⁹ Local tournaments will have a morning weigh-in, but only after breakfast.

Secondly, Scale Weight measures the body as if it were a single cylinder. However, the body consists of five different components, the torso and each separate arm and leg, this distinction being critical in distinguishing wrestlers' competitiveness.

But this is only half the tale. Medical science confirms men and women from different ethnicities and continents have different heights, weight, and body mass.¹⁰ This is due to ancestral and environmental influences, further influenced by social-economic disparities, and available dietary and exercise regimens, that Wrestling, more so than all other sports, is expected to neutralize.

II. Wrestling Nation Suffering From Ostrich Syndrome.

Yet, Wrestling fails to make these distinctions evident that the sport's international federation, United World Wrestling ("UWW"), recently reduced weight classifications that exacerbates significant discrepancies that results in discriminating against medium-range weight competitors.

Equally disturbing is that Wrestling fails to address the damaging tactic of "Cutting Weight" to reduce extracellular water to "get down to weight." The most common tactic for cutting weight is sitting (or even exercising) in the sauna for extended periods.¹¹

A 2015 study confirms the health risks of cutting weight.¹² The results were not surprising. Less-hydrated wrestlers of both sexes had a greater contraction time for all muscles and lower maximal radial displacement of muscle belly than those who were more-hydrated. Medicine confirms that years of cutting weight risks in long-term adverse health consequences.

III. Cutting Through the Fat to Get to Muscle Strength.

Even if Person A and Person B weighs the same, it means nothing if Person A is muscular built (that is, he has a higher Skeletal Muscle Mass ("SMM") than Person B. Scale weight does not distinguish between Person A and Person B's SMM and Body Fat Mass (BFM"). SMM is the component that determines Muscle Strength, the ability of muscle to overcome gravity. While there is considerable advances in physiology, measuring Muscle Strength is still an educated guess by the medical technician,¹³ and testing is not practical at tournaments. Muscle Strength is more successfully determined by SMM readings, which scale weight simply cannot provide.

Although Body Mass Index ("BMI") is the National Institute of Health's ("NIH") preferred weight analysis over scale weight,¹⁴ both the NIH and the Center for Diseases Control acknowledge BMI does not distinguish between fat or muscle. As a result, BMI readings can be misleading for the athletic Person A due to increased SMM notwithstanding Person A is in good physical health according to medical standards. Thus BMI is generally not applicable to athletes.

Hence, the authorities look to Multifrequency Bioelectrical Impedance Analysis that measures body water and calculates lean mass, skeletal muscle mass and body fat. Body Composition Analysis ("BCA") scales using alternating low and high-frequency electrical currents which are sent through the water in the body via contact with electrodes to measure impedance.

Presuming that most schools, sports clubs and tournaments would not be able to afford purchasing high-end BCA scales that start at US\$ 6,000, there are now multiple consumer versions, such as the InBody® H20N, currently selling at US \$329. These units report the Weight, SMM, BFM, BMI, Percent Body Fat (PBF), and Basal (or Resting) Metabolic Rate ("BMR"), which are sufficient to determine wrestlers' competitive weight.

SMM measures only muscle that can developed through exercise, expressly the weight of the muscles attached to skeleton responsible for posture and voluntary movement. For females, a healthy SMM range should be 40% of total body weight, for men, 45% to 50% of total body weight.

BFM is the total body weight less Lean Body Mass (bone weight). BFM is both surface level (subcutaneous or white fat cells) and internal (visceral or brown fat cells) making up one's weight.

PBF puts weight into context by showing how much of the weight is fat mass. Tracking changes in PBF enables the patient to focus on actual fat loss, not just weight loss, which can also come from SMM. BRM requires no explanation.¹⁵ Leading BCA providers adapt ACSM's *Guidelines for Exercise Testing and Prescription*, 10th edition which proposes various SMM and BFM ranges. The accepted ASCM SMM and BFM ranges obviously vary as age increases and are readily available to readers online at the ACSM website.

VI. Age and the Open Division.

Unfortunately, any weight evaluation for successful pairing requires acknowledging that Wrestling does not always segregate competitors by age. Instead, the UWW, USA Wrestling and other martial arts entities simply throw adult-age competitors into an non-age limit “Open” Division. The Lead Author despite being of age 67 (at time of publication), competes against opponents in their 20s.

This age discrepancy is vividly demonstrated by Japan’s female wrestling legend, 35-year old Kaori Icho whose bid for an unprecedented fifth consecutive Olympic gold medal was foiled by a 24-year old, fellow Japanese Risako Kawai. Icho lost their first match, got revenge in their second, but succumbed to her opponent, 11 years her junior, in their Olympic qualifiers. (Kawai went on to win the Olympic Gold upsetting USA’s 2016 Olympic gold medalist Helen Maroulis).

The Icho-Kawai result is predictable according to age-difference studies among wrestlers.¹⁶ An Ukraine study of 19 elite wrestlers divided into two age groups of 19-24 and 26-31, concludes a demonstrable connection between elite athletes’ age and stress resistance to psycho-emotional tension, primarily due to heart rate regulation in the older age group, as compared to optimal heart-rate reaction among the younger group. Both the Icho-Kawai rivalry and the Ukraine study simply affirms aging is inevitably accompanied by structural and functional changes in vital organs. It should come as no surprise that SMM declines in age, most notably by the 7th decade and greater in older adults.¹⁷

VI. Proposing a Standardized “Competitive Wrestling Weight” Formula.

The bottom line is that Wrestling requires what is referred to as the 5 S’s – Strength, Speed, Stamina, Skill and Psychology. What is relevant is SMM, confirmed by physiological studies profiling a successful wrestler.¹⁸ While successful wrestlers have higher dynamic and isokinetic strength than unsuccessful opponents,¹⁹ there is no significant difference between wrestlers regardless of their training levels for age, SMM and BFM (excepting heavy-weight wrestlers).²⁰

Accordingly, SMM is the only accurate measurement of anaerobic power and capacity. Because all athletes should be within the ACSM range, BFM is relevant only if the wrestler’s BFM’s weight is greater than the range, constituting extra amount of counter-weight the opponent has to resist.

Therefore, if we set $X = SMM + BFM$ then X is the wrestler’s competitive weight (“WCW”), provided BFM is within the ACSM acceptable range (“AR”) for the wrestlers’s age. But if BFM is greater than the ACSM acceptable range for the wrestler’s age, then the Excess BFM (“EBFM”) is added as a penalty. This formula is expressed in the following equation:

$$X = SMM + BFM + \{ (EFMB \text{ if } BFM > AR) \\ \{ 0 \text{ if otherwise} \}$$

where AR is the upper limit of the acceptable range of BFM for the wrestler’s age, and $EFMB = BFM - AR$. WCW is a reasonable and safer approach to successfully pairing compatible wrestlers, regardless of age, particularly when adult wrestlers are thrown into no-age limit Open Division, mitigating risk of injury when against younger age competitors.

VII. Why Weight Classification is Critical to Wrestling.

Why is this important?

To the uniformed spectator, Wrestling may appear as a contest of brute force. But in reality, Wrestling is the employment of various “holds” and “moves” to leverage the opponent’s total body weight to force him or her off-balance,²¹ to drive him or her onto the mat (“take down”) for the eventual fall (“pin”).²² There are hundreds of moves, classified as breakdowns, takedowns, escapes, reversals and countermoves; each scoring various points for the winner to win by “technical fall” if no fall is accomplished. The winner must “control” his or her opponent to earn these points. Multiple UWW Performance Analysis extracted from scoring cards at various international tournaments show that female wrestlers actually mix more moves to score more points than their male counterparts.²³

In conclusion, Wrestling requires the means to determine SMM less BFM if such is greater than the age accepted range, which can only be determined by BCA scales using BIA technology, instead of indiscriminately lumping everything into a single “weight.” This results in reducing injury risk while assuring wrestlers are truly paired due to their muscle strength, age and gender.

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