

# Weight Cycling Practices and Long-term Health Conditions in a Sample of Former Wrestlers and Other Collegiate Athletes

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**ABSTRACT:** *Weight cycling (repeated episodes of weight loss and regain) has been shown to reduce the resting metabolic rate in some chronic dieters. Concerns have been raised that wrestlers' repeated patterns of weight loss and gain may reduce metabolic rates and increase long-term health risks. We conducted this study to assess previous weight loss practices, current body weight, and incidence of chronic disease in a sample of male athletes who earned athletic letters in intercollegiate sports at the University of Wisconsin-Madison between 1950 and 1988. Survey questionnaires were mailed to 79 ex-wrestlers and 153 nonwrestling athletes, with responses from 60 wrestlers (76%) and 104 nonwrestlers (68%). We found no significant differences in weight gained after graduation (10.2 pounds for wrestlers and 8.6 pounds for nonwrestling athletes), current exercise practices, incidence of chronic disease, prevalence of obesity, and current dieting rates in this sample of former college athletes. Collegiate wrestlers gained an average of 16 pounds during the off-season. Most wrestlers reported that they lost between 3 and 11 pounds per match and that they used a combination of five or more weight loss techniques. Most frequently reported techniques included increasing exercise, restricting food, exercising in a hot environment, using a steam room or sauna, restricting fluids, and exercising in a rubber or plastic suit. Fewer*

*wrestlers than nonwrestlers reported that they smoked tobacco. The health effects of changes in proportions of fat-free body mass after weight cycling were not addressed in this survey. The hypothesis that numerous cycles of weight loss and regain among wrestlers may result in long-term weight gain and/or increased risk of chronic disease was not supported by the results of this survey.*

**R**epeated episodes of weight loss and regain (weight cycling) have been associated with reduced resting metabolic rate (RMR), altered patterns of body fat distribution, and increased rates of weight gain (3,7,13). These changes may be harmful because they have been associated with increased risk of chronic diseases such as coronary heart disease (11). Previous weight cycling practices of former college wrestlers may lead to increased rates of obesity, high blood pressure, and coronary heart disease that are higher than those of former athletes from other collegiate sports. This descriptive study was conducted to assess the weight loss practices and current prevalence of chronic disease associated with weight cycling and obesity in a sample of former collegiate wrestlers and other collegiate athletes.

Weight cycling has been a common practice among high school and collegiate wrestlers (1,9,10,15,16,19,20,22). While such practices have been associated with reduced RMR in adolescent athletes (17), there has been little, if any, systematic study of the long-term health implications of these practices. Brownell et al (5) reviewed the metabolic and health effects of weight loss practices of athletes, including wrestlers, and predicted that wrestlers may experience enhanced food efficiency and

possibly increased susceptibility to obesity in later life. They recommended studies of weight changes in wrestlers to verify those predictions. Gunderson and McIntosh (8) found a greater incidence of self-reported obesity and indicators of chronic disease in a sample of ex-collegiate wrestlers. In contrast, Melby et al (12) compared RMR between 12 weight cycling collegiate wrestlers and 13 weight stable wrestlers before, during, and after a 6-month wrestling season and reported that participation in numerous cycles of weight loss and regain over the course of several months did not lower RMR.

## Methods

We mailed questionnaires to 232 former athletes from the University of Wisconsin at Madison. The sample consisted of all of the 79 ex-athletes who: (1) earned letters in wrestling, (2) graduated between 1950 and 1988, and (3) had addresses listed in a current sports alumni directory (listed alphabetically by year of graduation). Our control group consisted of 153 former athletes. Each time a former wrestler was identified for our sample, we selected controls by picking the next two athletes who graduated in the same year and earned the same number of letters in nonwrestling sports.

We sent a follow-up letter to nonresponders to encourage their participation in this study. Sixty wrestlers (76%) and 92 nonwrestlers (60%) returned useable surveys. The nonwrestlers in our sample included athletes who earned letters in football (n=19), basketball (n=10), crew (n=10), baseball (n=9), track (n=8), swimming (n=6), golf (n=6), gymnastics (n=4), hockey (n=3), fencing (n=3), tennis (n=2), cross-country (n=2), soccer (n=2), and combinations of football with track, golf, or crew (n=8).

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We compared groups to identify differences in weight, body mass index (BMI), and smoking status via standard t-tests (14). All other comparisons were done with chi-square statistics.

We used each athlete's self-reported height and weight to calculate body mass index (BMI, also known as Quetelet index, measured as kg/m<sup>2</sup>) and categorized athletes as underweight, appropriate, overweight, or obese (less than 19.5, 19.5 to 24.4, 24.5 to 29.4, and greater than 29.4 kg/m<sup>2</sup>, respectively). Body mass index is commonly used as an indicator of body fatness because the correlation of BMI with body fat, as determined by direct measures of body density, is between 0.7 and 0.8 (4). We also assigned rankings according to the estimated severity of wrestlers' weight loss techniques. A rank of 1 was assigned to weight loss methods that are normally recommended by nutrition experts, a rank of 2 indicates that the technique may contribute to dehydration, and 3 indicates a technique for which the likely consequences are more drastic, such as acute dehydration.

It may be unreasonable to expect detectable changes in chronic health conditions among younger athletes who have had only 3 to 20 years elapse since the end of the collegiate competitions. Therefore, we split our sample into younger (younger than 40 years) and older (40 years or older) groups to analyze the prevalence of chronic disease.

## Results

### Body Weights

Wrestlers weighed less than nonwrestlers at the time of graduation from college and at the time of the survey (Table 1). However, body mass index values were similar for wrestlers and nonwrestlers at both times and there was no difference between wrestlers and nonwrestlers in the amount of weight that had been gained since graduation.

There were no differences between sports in the proportions who were underweight, appropriate weight, overweight, or obese at the time of graduation ( $X^2(3) = 3.83, p = 0.28$ ) or at the time of the survey ( $X^2(2) = 1.86, p = 0.40$ ) (Table 2). Both wrestlers and nonwrestlers had experienced significant upward shifts in the proportions who were in the overweight or obese categories ( $X^2(6) = 26.57, p = 0.001$  for wrestlers and  $X^2(6) = 42.76, p = 0.001$  for nonwrestlers). There was no difference in the proportions of wrestlers and

Table 1.—Mean Body Mass Index (BMI) Values and Body Weights of Wrestlers and Nonwrestlers

	Wrestlers' mean weights	Nonwrestlers' mean weights	Probability
BMI at graduation	25.4	25.1	0.204
BMI in 1990	26.9	26.2	0.523
Weight at graduation	78.4 kg	85.8 kg	0.003
Weight in 1990	83.0 kg	89.7 kg	0.007
Mean weight gained since graduation	4.49kg	3.75 kg	0.58

Table 2.—Proportions of Athletes Who Were Rated in Various Weight Categories According to Body Mass Index

	Wrestlers		Nonwrestlers	
	n	percent	n	percent
<b>During wrestling season</b>				
Underweight	5	8.5	*--	--
Appropriate weight	45	76.3	--	--
Overweight	6	10.2	--	--
Obese	3	5.1	--	--
<b>At graduation</b>				
Underweight	1	1.7	5	5.5
Appropriate weight	24	40.0	40	44.0
Overweight	32	53.3	37	40.7
Obese	3	5.0	9	9.9
<b>In 1990</b>				
Underweight	0	0	0	0
Appropriate weight	14	23.3	29	31.9
Overweight	36	60.0	52	57.1
Obese	10	16.7	10	11.0

\*Data on weight during sport seasons were not collected for nonwrestlers in this survey.

nonwrestlers who reported a problem in maintaining their weight at the time of the survey (32% of wrestlers and 28% of nonwrestlers;  $X^2(1) = 0.19, p = 0.67$ ). When asked if they had a weight problem in college, 29% of wrestlers vs 8% of nonwrestlers said they had experienced weight problems ( $X^2(1) = 11.39, p = 0.001$ ).

### Current Weight Control Practices

There was no difference between the proportions of wrestlers and nonwrestlers who were dieting at the time of the survey (10% and 20%, respectively;  $X^2(1) = 2.59, p = 0.11$ ). Of those who were dieting, there were no detectable differences in the diet-

ing methods used ( $X^2(12) = 10.94, p = 0.53$ ). The type of diet most frequently mentioned by both groups was a low-cholesterol diet (reported by two wrestlers and four nonwrestlers in response to an open-ended question).

### Other Lifestyle Practices

Fewer wrestlers than nonwrestlers had ever been cigarette smokers (15% and 29%, respectively;  $X^2(1) = 4.29, p = 0.04$ ). However, the number of years of smoking did not differ for wrestlers and nonwrestlers who reported that they had been smokers (14.3 years for wrestlers and 13.1 years for nonwrestlers,  $t(34) = 0.29, p = 0.77$ ).

Exercising on a regular basis (at least 30 minutes, three times per week) was reported by 77% of wrestlers and 72% of nonwrestlers ( $X^2(1) = 0.32, p = 0.57$ ), and there were no significant differences in the number of athletes who listed aerobic forms of exercise in their regular routines (62% and 51%, respectively;  $X^2(1) = 2.58, p = 0.11$ ).

### Wrestlers' Weight Loss Practices

Over half of the wrestlers in this study indicated they had "almost always" lost weight in order to make weight for wrestling matches. The most frequently reported amount of weight lost per match was 9 to 11 pounds (4.1-5 kg). When asked for their largest weight loss in 1 week to "make weight" for a match, wrestlers reported losing a mean of 13.2 pounds (6.0 kg) with a range of 4 to 30 pounds (1.8 - 13.6 kg). There was a significant difference of 16 pounds (7.3 kg) between the wrestlers' mean weight during the wrestling season and the usual weight during the off-season ( $t(1) = 9.04, p = 0.0001$ ). Forty-eight percent of wrestlers indicated that their highest off-season weights had occurred during the summers.

Wrestlers were considered to be yo-yo dieters if they reported losing weight for more than half of their matches. Nonwrestlers who reported losing weight more than six times while in college were considered yo-yo dieters. Yo-yo dieting in college was reported by 68% of the wrestlers and only 2.2% of the nonwrestlers. Furthermore, 81% of the nonwrestlers reported that they never attempted to lose weight while they were in college, but only 5% of wrestlers did not diet in college. The prevalence of yo-yo dieting was the same for those who graduated between 1950 and 1969, as for the younger wrestlers who graduated in the 1970s and 1980s ( $X^2(4) = 1.56, p = 0.81$ ).

The most common weight loss technique used by wrestlers during their college years (Table 3) was restricting food intake (37%), followed by increasing exercise (22%). Seventy-three percent reported using a combination of five or more techniques for weight loss.

There appeared to be a trend toward increased severity in the weight loss technique used most often by younger wrestlers ( $X^2(2) = 8.23, p = 0.016$ ). Only 4% of the wrestlers who graduated in the 1950s and 1960s ranked as their first use a technique of severity 3, while 23% of the wrestlers who graduated in the 1970s and 1980s

Table 3.—Wrestlers' Weight Loss Techniques

Technique	Severity Index*	Users		Ranked First	
		1950s & 60s grads	1970s & 80s grads	1950s & 60s grads	1970s & 80s grads
Restricting food intake	1	25	30	15	8
Increasing exercise	1	24	31	5	8
Restricting fluids	2	19	28	3	3
Spitting	2	10	3	0	0
Taking saliva stimulants	2	7	1	0	0
Exercising in hot environment	3	20	31	1	8
Exercising in rubber suit	3	5	28	0	4
Sitting in a steam room	3	21	27	1	1
Taking laxatives	3	2	0	0	0
Vomiting	3	0	1	0	0
Other (unspecified)	1	0	0	0	0
None	0	1	1	0	0

\*Weight loss techniques with higher severity ratings are more likely to cause severe dehydration.

did so. Also, of graduates from 1950 to 1969, 26% reported reducing food intake as their #1 ranked technique, while only 12% who graduated between 1970 and 1988 did so.

### Health Problems

There were no significant differences ( $X^2(5) = 9.35, p = 0.10$ ) in the number of health problems reported by wrestlers and nonwrestlers (Table 4). When athletes were divided into categories by age (40 and older vs under 40), more older than younger

athletes had developed health problems ( $X^2(4) = 12.62, p = 0.01$  for wrestlers;  $X^2(4) = 33.60, p < 0.001$  for nonwrestlers). When looking only at athletes who were 40 and older, more nonwrestlers (68%) than wrestlers (42%) had developed health problems ( $X^2(1) = 5.23, p = 0.02$ ). In addition, more of the older nonwrestlers (49%) than the older wrestlers (23%) had developed heart problems (hypertension, angina, heart attack, heart disease, high cholesterol, high triglycerides, and/or stroke;  $X^2(3) = 8.02, p = 0.05$ ). There were no significant

Table 4.—Health Problems Reported by Wrestlers and Nonwrestlers, by Age

Condition	Wrestlers (n=60)		Nonwrestlers (n=92)	
	under 40	40 and older	under 40	40 and older
High cholesterol	0	4	3	12
Hypertension	0	4	0	10
Hemorrhoids	0	6	0	7
Arthritis	0	4	0	5
High triglycerides	0	2	1	4
Gout	0	3	0	3
Digestive disorders	0	1	1	3
Kidney disease	0	1	0	3
Heart attack	0	0	0	3
Gall stones	0	0	0	3
Depression	0	1	0	1
Heart disease	0	1	0	1
Angina	0	0	0	1
Cancer	0	0	0	1
Respiratory problems	0	0	0	1
Diabetes	0	0	0	1
Stroke	0	0	0	0
Other	0	1	0	1
		(joint problems)		(multiple sclerosis)

differences in chronic disease prevalence between younger wrestlers and younger nonwrestlers.

## Discussion

Long-term memory of body weight is a reliable measure of previous weight (6). The magnitude of weight lost during cycling in our study (mode = 4.1 - 5 kg) is consistent with other reports of wrestlers' practices to lose weight. In two studies of college-age wrestlers, mean losses of 4.8 kg from preseason to midseason (12) and 3.4 kg from midseason to postseason (18) were reported. More severe losses were reported among 14 weight cycling high school wrestlers who lost between 5.9 and 6.8 kg in a week.

Wrestlers' practices to lose weight have been a subject of concern for the American College of Sports Medicine (1) and the American Medical Association (2). However, the hypothesis that former wrestlers have increased risk of obesity and chronic disease is not supported by the results of this study. When compared to former athletes from other sports, wrestlers in this sample had no more prevalence of self-reported obesity and weight control problems. Heart disease was less prevalent in wrestlers 40 years and older, than other athletes of the same age. Former wrestlers were less likely, however, than other athletes to have smoked tobacco, and smoking rates may be important in evaluating the practical significance of associations between wrestlers' weight loss practices and chronic disease rates.

Wrestlers who use rapid weight loss techniques may experience severe dehydration leading to a decrease in the volume of fluid being filtered by the kidneys (13). Wrestlers in this study reported no more problems with kidney disease than nonwrestlers, but further research is needed to specifically address the possible long-term consequences of dehydration in wrestlers.

Studies that use more precise indicators of body composition, RMR, renal function, and chronic disease risk factors such

as blood cholesterol levels and arterial blockage would more clearly identify the long-term health effects of weight cycling in wrestlers. In our study, athletes from sports other than wrestling were not asked about weight gains or losses during the athletic season. It is likely that athletes from certain sports such as football and rowing would have experienced some deliberate or concomitant changes in body weight during periods of competition. Further research is needed to make comparisons among sports for such variations in body weight among athletes from different sports.

In this sample of former athletes, wrestlers who graduated in 1970 or later were more likely to have used drastic weight reduction methods than the wrestlers who graduated in the 1950s and 1960s. It is possible that the more severe weight cycling practices of former wrestlers in this sample were too recent to produce a detectable pattern of long-term health risks in a sample this size. Similarly, our study did not address the potential for harm in weight cycling practices among adolescent athletes who may be more susceptible because they are growing at a rapid rate. Such determinations are beyond the scope of this study, but may warrant investigation in future research. There is no evidence in this study to suggest that athletic trainers need to discontinue reasonable and prudent weight loss recommendations for young adult wrestlers.

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