

# Wrestling USA

www.wrestlingusa.com

October 15, 2005

VOL. XLI, NO. 3

\$5.00



\*\*\*\*\*AUTO\*\* 3-DIGIT 086  
SUBSCRIPTION EXP. OCTOBER 15, 2005 00283  
MATT BRZYCKI 01991  
EXERCISE PRESCRIPTION  
1 DAYNA LN  
LAWRENCEVILLE NJ 08648-1583



## Research for Wrestlers

By Matt Brzycki

**S**cientists conduct enormous amounts of research and with the demand of "publish or perish" looming over their heads, submit it to peer-reviewed journals for publication. Every now and then, studies are published that are specific to wrestling. This article will examine seven of those studies.

### TOURNAMENT WRESTLING

In a study that was published in *Medicine and Science in Sports and Exercise*, the effects of typical weight-loss techniques were examined in a simulated wrestling tournament. The subjects in the study were 12 varsity wrestlers from Penn State. They represented all 10 Olympic freestyle weight classes with the exception of heavyweight.

During the week prior to the two-day "tournament," the wrestlers lost 4.63 - 6.75% of their body weight. By the first match, they regained about 1.8% of their body weight (from eating foods and drinking fluids). The "tournament" consisted of five matches: three on the first day and two on the second. Each match lasted five minutes and was refereed and scored.

Prior to the period of weight loss, baseline testing was done twice (once in the morning and once in the afternoon). Testing was also done immediately before and after each of the five matches. The tests included measurements of heart rate, "fatigue rating," blood samples, anthropometrics, reaction/movement time, strength, power and limb speed.

Here are some of the findings:

During baseline testing, heart rates averaged 67.25 beats per minute (bpm) in the morning and 72.90 bpm in the afternoon. Post-match heart rates were highest after match 3 (183.0 bpm) and match 5 (180.0 bpm). Pre-match heart rates also were highest before match 3 (84.16 bpm) and match 5 (74.6 bpm).

Fatigue was significantly higher for matches 3, 4 and 5 with average ratings of 6.92, 7.33 and 7.58, respectively (on a scale of 1 - 10 with 10 being maximum fatigue). Pre-match fatigue was greatest prior to match 3 (2.8) and match 5 (2.54). As you might suspect, pre-match fatigue was rated the lowest prior to match 1 (1.21). As a side note, the

baseline rating was 0.63 in the morning and 1.0 in the afternoon.

Post-match levels of lactic acid and blood glucose were significantly higher than pre-match levels. Again, no surprise there. But the high lactate levels underscores the anaerobic nature (short-term, high-intensity efforts) of a wrestling match. It is also apparent that glycogen stores become depleted as a tournament progresses.

With the exception of match 1, all pre-match levels of testosterone were lower than at baseline. By the end of the study, the wrestlers had levels of testosterone that were roughly the same as pre-pubescent boys. The researchers felt that these abnormally low levels of testosterone could be an indication of overtraining.

Surprisingly, reaction time was faster after each match than before. The researchers felt that this may have been due to a "warm-up effect" and/or heightened arousal.

Pre- and post-match "bear hug" strength was significantly lower for matches 4 and 5 than at baseline.

All measures of grip strength were significantly lower throughout the "tournament" than at baseline.

Despite the fact that baseline testing was done 3 - 4 weeks after completion of the regular collegiate season, the wrestlers still showed signs of being dehydrated.

In short, the study found that after a seven-day period of weight loss, elite collegiate wrestlers showed relatively few negative effects in the first match of a tournament. As the tournament progressed, however, the ramifications became more apparent.

### RAPID WEIGHT LOSS

A study that was published in the *International Journal of Sports Medicine* looked at the impact of food restriction on the performance and psychological profile of 11 elite judo athletes who were preparing for a national competition (in France). Though these are judo athletes, they train and compete in ways that are similar to wrestlers.

On average, the athletes had been practicing judo for 10 years and trained 6 - 9 hours per week. All of them competed in weight classes that were less than 161 pounds. The athletes were tested before and after seven days of food restriction (in order to make weight). The researchers found that after seven days of food restriction, the judo athletes had . . .

- a loss of grip strength (especially in the left hand)
- a significant loss of mechanical power during 30 seconds of vertical jumping (but not during seven seconds of vertical jumping)
- a significantly higher amount of confusion, anger, fatigue and tension (which mirrored the changes that are seen from overtraining)

During the seven-day period of food restriction, the athletes consumed an average of 2,101 calories and lost about 7.9 pounds (or about 4.9% of their weight). This intake of calories was about 928 less per day than they had been consuming. Of the 7.9 pounds that they lost, about 2.15 came from fat and the rest from water and lean-body mass (muscle tissue). During the period of food restriction, they consumed a very low amount of carbohydrates (236.5 grams per day) and - except for vitamins A and E and thiamine - their intake of vitamins and minerals was well below recommended levels.

### WEIGHT LOSS AND GROWTH

A study that appeared in the *Journal of Applied Physiology* involved 9 wrestlers and 7 active adolescent males. All subjects were tested three times: (1) in mid-November, 1 - 2 weeks before the first wrestling match; (2) in late February to mid-March; and (3) in early June to mid-July.

During the season, the wrestlers consumed about 1,500 calories per day (which was far fewer than the non-wrestlers); during the post-season, the wrestlers consumed about 2,750 calories per day (which was about the same as the non-wrestlers). As expected, their caloric intake was highest on Sunday (the day after competing) and dropped in a linear manner so that it was

lowest on Friday (the day before competing). It was determined that the wrestlers did not consume enough calories to meet the combined requirements of growth, resting metabolic activity and training. The researchers felt that the wrestlers were in a constant state of "undernutrition" throughout the week. However, this condition did not appear to slow bone growth and maturation.

On average, the wrestlers lost about 6.16 pounds (or about 4.8% of their body weight) from Monday to Saturday to make weight. On average, they lost about 9.9 pounds (or about 7.4% of their body weight) of their pre-season weight to make competitive weight. Their in-season measurement of lean-body mass was about 2.42 pounds less than their pre-season measurement.

From pre-season to late season, the wrestlers' peak torque (force) and peak power decreased significantly for elbow flexion, elbow extension, knee flexion and knee extension. The researchers felt that the loss of strength and power was likely due to the loss of lean-body mass. During the season, none of the wrestlers did any strength training and this may have influenced their loss of power as well. All measures increased significantly in the post-season. In fact, their post-season levels exceeded their pre-season levels.

## **WEIGHTLIFTERS VERSUS WRESTLERS**

In a study that was published in the European Journal of Physiology, researchers compared the bone and muscle development of 19 Olympic-style weightlifters to that of 17 collegiate wrestlers. A control group of 24 untrained men also participated in the study, none of which were involved in an exercise program. All of the individuals weighed about 121 - 172 pounds. On average, the weightlifters had been training as weightlifters for 5.5 years and the wrestlers had been training as wrestlers for 5.9 years. All of the weightlifters and wrestlers had competed in regional or intercollegiate tournaments in the year prior to the study.

With respect to percentage of body fat, there was no significant difference between the weightlifters (9.69%) and wrestlers (9.09%). As you might guess, the weightlifters and wrestlers had significantly lower percentages of body fat than the untrained men (12.70%). With respect to cross-sectional area (CSA), the weightlifters had significantly greater values than the wrestlers in the bones of the upper arm and thigh as well as the muscles of the lower leg and thigh. There were no significant differences between the two athlete groups in the bones of the lower arm and lower leg or the muscles of the upper arm and lower arm. Interestingly, the weightlifters and wrestlers

had greater bone and muscle CSA than the untrained men in every area except for the bone of the lower leg.

The researchers also looked at the ratio of lean (bone + muscle) CSA for different sites. They found that the weightlifters had more lean tissue in their lower bodies and the wrestlers had more lean tissue in their upper bodies. Understand that this doesn't mean that their development was due to their training methods. Rather, their body types may have predisposed them to be successful in their particular sport.

## **STRENGTH AND AGE DIFFERENCES**

A study that was published in the European Journal of Physiology examined the strength of two groups of wrestlers. One group consisted of 108 club wrestlers who were 8.1 - 13.9 years old (average age 11.3). The other group consisted of 150 high-school wrestlers who were 14.3 - 18.6 years old (average age 16.6).

Testing was done 1 - 2 weeks prior to their competitive seasons. The wrestlers were tested for isokinetic peak torque (force) at three different speeds in leg extension and leg flexion with their preferred leg.

For the younger wrestlers, the ability to produce peak force in leg extension and leg flexion was associated with increases in age. For the older wrestlers, the ability to produce peak force in leg extension was associated with increases in age but the ability to produce peak force in leg flexion was associated with increases in fat-free (or lean-body) mass.

So, the study showed that age is a greater determinant of force production in younger wrestlers than in older ones. The researchers concluded that for fair competition, young wrestlers should be matched for age as well as body size.

## **NECK STRENGTH AND SIZE**

A study that appeared in the European Journal of Applied Physiology compared the strength and thickness of the neck extensors (the muscles that are located on the back of the neck) of 18 wrestlers to that of 37 judo athletes. All of the 55 subjects were from the Nippon Sport Science University in Japan. There were no significant differences between the wrestlers and judo athletes in terms of age, height or body weight. On average, however, the judo athletes had more years of experience than the wrestlers (8.5 compared to 4.8).

Neck strength was measured at eight different angles. The neck strength of the wrestlers exceeded that of the judo athletes at every angle measured. Depending upon the angle being measured, the neck strength of the wrestlers was 17 - 92% greater than that of the judo athletes.

Neck thickness was measured at seven different sites. The neck thickness of the wrestlers exceeded that of the judo athletes at every site measured. Depending upon the site being measured, the neck thickness of the wrestlers was 7.6 - 17.0% greater than that of the judo athletes.

## **NECK INJURIES**

In a study that was published in Seminars in Neurosurgery, three medical doctors presented information about athletic-related injuries to the cervical spine (the neck area). It is estimated that 2 - 3% of all athletic injuries are to the spine. In looking at all of the spinal injuries that occurred in the United States from 1973-81, 15% of the injuries to the cervical spine happened during athletic activities. By far, the sport in which most of those injuries occurred was recreational aquatics (mostly from unsupervised diving, often with alcohol a contributing factor and in bodies of water other than a swimming pool). Other athletic activities with a high incidence (in order) were football, gymnastics, "snow sports" and wrestling. The overwhelming majority of athletic injuries resulted in either temporary or permanent quadriplegia and the average age at injury was 21.

Statistics aside, what can be done to reduce the risk of cervical injury? The answer is preparation. This is done in two locations: the wrestling room and the weight room. In the wrestling room, coaches must teach and reinforce proper technique; in the weight room, coaches must require their wrestlers to strengthen the muscles that influence the neck.

A few words to coaches about training the neck: If your weight room has a neck machine, that's great. But make sure that your athletes use it (and in a meaningful manner). Neck machines are not very expensive, especially plate-loaded ones. If your weight room does not have a neck machine, ask your booster club to purchase one or do a fundraiser. Let those who are higher up the food chain know that a neck machine will benefit other sports as well. What if you simply cannot get a neck machine? Pardon the triple negative but not having a neck machine is not an excuse for not having wrestlers train their necks. In this case, wrestlers can - and should - perform neck exercises with manual (partner) resistance.

---

*Editor's Note: Matt Brzycki has authored, co-authored or edited 13 books on strength and fitness including: Wrestling Strength: The Competitive Edge, Wrestling Strength: Prepare to Win and Wrestling Strength: Dare to Excel. The three wrestling books are available at all major bookstores or through Cardinal Publishers Group (800-296-0481).*