

Science of Wrestling



**Annual Research Review
2006**

David Curby EdD

Preface

This annual publication is dedicated to the pursuit and use of the knowledge surrounding the noble and timeless sport of wrestling. Each year, an annotated bibliography of the scientific research, published in English during the year in review, will be compiled and shared with those who work in the wrestling community. It is my hope that this work will spark further research, along with helping to educate those who are in a position to apply this knowledge. I am proud to be affiliated with this great sport. Thanks to our national governing body - USA Wrestling. Thanks to the National Coaching Staff for the support that they have given to me. I am grateful for the chance to work with Ivan Ivanov and Jim Gruenwald and their outstanding wrestlers at the USOEC in Marquette, Michigan. Larry Slater has provided the pictures found throughout this document. The cover shows Bill Zadick winning his 2006 Freestyle World Championship in China.

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Bibliography of Wrestling Research from 2006

Akopyan, A. O., Pankov, V. A., & Kim, A. Y. (2006). Formation of technique of Grecian-Roman wrestlers training in new conditions of competitive activity (translated from original Russian). *Teoria i Praktika Fiziceskoj Kul'tury* 2006: Issue 2, 21-23.

Keywords: competition/rules/technique/training/research/culture/Sports

Abstract: The Radical changes of the rules of competitions in the Grecian-Roman wrestling have made completely new demands to the technique of elite wrestlers training, which have touched basically the conditions of the effective realization of the technical actions. The technology of the organization of the training process developed by the authors allows coaches to solve the problem of anaerobic productivity of the wrestler's organism according to the new conditions of realization of competitive duels and the increased demands to the speed-power abilities.

Notes: 1 The All-Russian Scientific Research Institute of Physical Culture and Sports, Moscow, Russia; 2 The All-Russian Scientific Research Institute of Physical Culture and Sports, Moscow, Russia; 3 The All-Russian Scientific Research Institute of Physical Culture and Sports, Moscow, Russia



New rules in Greco-Roman emphasize par terre techniques

Editor's Note: This paper is included as a good example of the applied sport science conducted in many countries. The reduction in the length of matches, coupled with the opportunity to score from the reverse lift position, have reduced the need for power endurance, placing a premium on the speed-strength capabilities of the Greco-roman wrestler.

Anderson, B. J. (2006). Prophylactic valacyclovir to prevent outbreaks of primary herpes gladiatorum at a 28-day wrestling camp. *Jpn J Infect Dis*, 59, 6-9.

Keywords: herpes/dermatology/Skin infections

Abstract: Herpes gladiatorum (HG) plagues the sport of wrestling, especially in high school wrestlers and summer camps they attend. This study evaluated the usage of valacyclovir to prevent acquisition of primary HG, due to herpes simplex virus type 1 (HSV-1), in high school wrestlers at a 28-day wrestling camp. At the beginning and end of camp, IgM and IgG anti-HSV-1 antibodies were collected. Out of 332 male wrestlers, aged 13-20, who entered camp, 94 elected to participate in blood sampling. Sixty-four were on antiviral medication. Among the 94 wrestlers, 28 (29.8%) had positive IgG anti-HSV-1 titers. Of this group, 66 of 94, were HSV-1 IgG seronegative. At the end of camp, 55 of these original seronegative individuals elected to participate in blood sampling and none had detectable IgM anti-HSV-1 and -2 antibodies. Compared to previous years without antiviral usage, introducing prophylactic valacyclovir reduced clinical HG outbreaks by 87% at this 28-day wrestling camp. Due to the high prevalence of this virus in high school wrestlers, serological testing should be done at the beginning of each season. HSV-1 seropositive individuals should consider being on antiviral medication throughout the season to minimize the risk of transmitting the virus to other wrestlers.

Notes: Boynton Health Service, University of Minnesota, Minneapolis, Minnesota 55455, USA.
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Editor's Note: Dr. Anderson is a proponent of the prophylactic use of anti-virals in certain wrestlers. He provided answers to several questions I posed to him:

You recommend the serological testing of wrestlers-what would the costs be?

The cost varies, but is usually around \$20.

I have read that there is a herpes vaccine available in England-what is the possibility of approval for use in the USA?

A vaccine has been looked at for several years, but they are focusing on HSV-2. This type only accounts for 3-6% of herpes that causes HG. The vast majority is due to HSV-1.

Are there any interactions/contraindications for acyclovir, valacyclovir, etc?

The PDR states to be aware of using zantac with valtrex, otherwise there are no real problems. If the patient has other medical problems, such as a reduced kidney function, then reducing the dosage may be warranted. Acyclovir and valacyclovir can cause mild diarrhea and headaches. These are short lived and don't cause any long term problems. These drugs have minimal problems. And as far as resistance issues, over 20 years of usage of acyclovir has shown less than 0.3% resistance in immunocompetant individuals.

The control of herpes gladiatorum must be a primary focus of those involved in the sport of wrestling. I include an Associated Press article describing a situation in Minnesota from the 2006-07 season:

Herpes outbreak suspends high school wrestling in Minnesota

Updated 1/30/2007

MINNEAPOLIS (AP) — High school wrestling was suspended Tuesday across Minnesota due to a widespread outbreak of a skin infection. The Minnesota State High School League said 24 cases of herpes gladiatorum have been reported by 10 teams. The virus is spread by skin-to-skin contact. Symptoms have included lesions on the face, head and neck of wrestlers. The league banned competitions and direct contact between wrestlers in practice until Feb. 6. The suspension is meant to control the current outbreak, allow time to diagnose new cases and prevent disqualifications at the state tournament, scheduled for Feb. 28-March 3.

The Minnesota Department of Health has been tracking the virus, caused by herpes simplex type 1, the same strain that causes cold sores. Officials first became aware of the outbreak at a tournament held in Rochester in late December. Scot Davis, who coaches wrestling at Owatonna High School, has been

involved in wrestling in Minnesota for more than 40 years and says he can't remember the league completely shutting down. Davis' team, which gets doctor checkups several times a week, competed at the Rochester tournament where the outbreak was first detected, yet none of his wrestlers have been infected. He applauds the suspension. "I think it's a bold step," he said. "How else are you going to get this thing cleared up? How do I explain to a mom that her kid has herpes forever?"

Steve Larsen, wrestling coach at Century High School in Rochester, said his team will miss three competitions because of the eight-day suspension. "It's going to make scheduling interesting," he said. "I hope some of it will get rescheduled." The Century team has had no skin problems this year, Larsen said. But in the past, when a few of his wrestlers came down with ringworm, his team was suspended from practice and competition as a precaution. Infected wrestlers have to sit out matches and get cleared by doctors before they can resume wrestling, he said.

Dr. B.J. Anderson, a former wrestler who acts as a health adviser to the high school league, blames the outbreak on doctors who have been misdiagnosing and inappropriately treating the viral infections as bacterial ones. "(Doctors) are not doing the right tests," he said. Anderson said the greatest concern is an infection of the eye, which can, in rare cases, lead to scarring or blindness. The virus can remain in a body indefinitely, he said. A similar outbreak occurred in 1999, affecting 63 wrestlers and disqualifying several of them from the state tournament, Anderson said.

Dr. Henry Balfour, a national expert on herpes who works in the department of virology at the University of Minnesota, said wrestlers are at a higher risk for this sort of infection than other people because of the nature of the sport. "Usually you have to have damage to the skin," he said. "If there is a break in the skin, ...then the virus could take and cause a skin infection." Balfour said the virus is not fatal but is a detrimental nuisance that can recur. Such outbreaks are common in the wrestling world, frequently occurring at summer camps, he said.

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Barr, B., Felkner, M., & Diamong, P. M. (2006). High school athletic departments as sentinel surveillance sites for community-associated methicillin-resistant staphylococcal infections. *Tex Med*, 102, 56-61.

Keywords: dermatology/hygiene/Infection/Skininfections/StaphylococcalInfections/Staphylococcus aureus

Abstract: Methicillin-resistant *Staphylococcus aureus* (MRSA) is an emerging infection in athletes. Our study assessed MRSA burden in Texas 4A and 5A high school athletic departments by contacting 447 licensed athletic trainers (LATs) regarding skin infections in athletes; 186 (41.6%) responded. Sixty LATs reported MRSA in their athletic departments. The largest MRSA outbreak (23 infected persons) occurred in football players. The trainers also reported MRSA in wrestlers, volleyball players, cross-country runners, nonathlete students, and adults. Students and adults involved in high school athletics require MRSA intervention because of their large numbers and extensive contacts. Physicians should be aware of the potential for MRSA and should culture rather than treat empirically, communicate with school health staff to maximize surveillance for affected students when MRSA occurs in their student community, and contact their health department when the number of students with MRSA meets the unusual group expression, outbreak, or unusual severity criteria.

Notes: Texas Department of State Health Services, 1100 W 49th, Austin, TX 78756, USA.

Editor's Note: Doctors, trainers, coaches, athletes and parents must all have an increased awareness regarding MRSA. Athletic administrators must monitor the sanitation of athletic and locker facilities.

Baum, A. (2006). Eating disorders in the male athlete. *Sports Med.*, 36, 1-6.

Keywords: Anabolic Steroids/body fat/Body Image/Eating Disorders/females/Weight Loss

Abstract: Eating disorders do occur in male athletes. They are less prominent than in female athletes, and therefore in danger of being missed. The high-risk sports fall into the same categories as with females: aesthetic sports, sports in which low body fat is advantageous, such as cross-country and marathon running, and sports in which there is a need to 'make weight', including wrestling and horse racing. Athletic involvement may foster the development of an eating disorder. Some male athletes, in their preoccupation with body image, will abuse anabolic steroids. While sports participation may contribute to the aetiology of an eating disorder, the converse is also true. Exercise may be used as therapy for some cases of eating disorder. In order to adequately treat eating disorders in the male athlete, it is first essential to identify cases. Psychoeducation of athletes, their families, coaches and trainers is an important first step. Counseling an athlete to pursue a sport appropriate to his body type, or to leave his sport behind altogether (an unpopular recommendation from a coach's perspective) can be important to treatment. Treatment of co-morbid psychiatric conditions is essential. Treatment can be structured using a biopsychosocial approach, and all appropriate modalities of therapy, including individual, family and group, as well as psychopharmacotherapy, where appropriate, should be applied.

Editor's Note: *While my initial feeling is that these pathological behaviors do not persist past the end of the season in male wrestlers, it is always best to depend on empirical data. "Psychoeducation" is quite a new, and interesting assignment to add to the already numerous responsibilities of a coach. In this case, one is considering the problems that the athlete brings to the sport, not necessarily the problems the sport causes itself. This type of situation is probably present in the situation where the athlete abuses anabolic steroids, not as a means for improved performance, but as a means to meet a psychological need.*

Buford, T. W., Rossi, S. J., Smith, D. B., O'Brien, M. S., & Pickering, C. (2006). The Effect of a Competitive Wrestling Season on Body Weight, Hydration, and Muscular Performance in Collegiate Wrestlers. *J Strength Cond Res*, 20, 689-692.

USOEC Coach Ivan Ivanov uses extensive sport-specific strength training throughout the season for his Greco-roman wrestlers



Keywords: Body Weight/hydration/
hydration status/strength
training/urine/urine specific
gravity/Weight Loss

Abstract: The purpose of the present investigation was to examine the effects of a collegiate wrestling season on body weight, hydration, and muscular performance. Twelve Division I collegiate wrestlers (mean \pm SE; 20.75 \pm 0.41 year) volunteered to participate in testing sessions during midseason and 3 weeks following the season. Testing consisted of weigh-in, providing a urine sample for hydration analysis, and a measure of isometric leg extension peak torque. Weight significantly increased (p

< 0.05) following the completion of the competitive season. No significant change in urine specific gravity (p

0.05) was observed. Muscular performance was affected by the season as peak torque (PT) and PT-to-body weight ratio increased significantly ($p < 0.05$). Following the collegiate wrestling season, augmentation in body weight and muscular performance of the wrestlers occurs without alterations in hydration status. Further research is warranted on what type of strength training program would most effectively reduce the decrements in strength associated with weight loss and the strain of a competitive season.

Notes: A.B. Harrison Human Performance Lab, Department of Athletics, Oklahoma State University, Stillwater, Oklahoma 74078.

Editor's Note: I conducted two years ago of the top 10 Division 1 programs. The majority employed in-season lifting programs consisting of a combination of high intensity circuit training with weight machines, along with free-weight exercises using explosive movements.

Cheuvront, S. N., Carter, R. 3., Haymes, E. M., & Sawka, M. N. (2006). No effect of moderate hypohydration or hyperthermia on anaerobic exercise performance. *Med Sci Sports Exerc*, 38, 1093-1097.

Keywords: Dehydration/Environment/Fatigue/Heat/hypohydration/power/Temperature/Weight Loss

PURPOSE: This study examined the effects of hypohydration and moderate hyperthermia (core temperature elevation) on anaerobic exercise performance in a temperate environment. **METHODS:** Eight active males completed two passive heat exposure trials (180 min, 45 degrees C, 50% rh) with (EUH) and without (HYP) fluid replacement. A single 15-s Wingate anaerobic test (WAnT) was used to assess anaerobic performance (peak power, mean power, and fatigue index) before (-180 min) and again at three time points after passive heat exposure to include immediately (0 min), 30 min, and 60 min after in a temperate environment (22 degrees C). Rectal temperature (T_c) was measured throughout the experiment. **RESULTS:** HYP reduced body mass (2.7+/-0.7%) ($P < 0.05$) but had no effect on any WAnT performance measure. Passive heat exposure elicited moderate hyperthermia in both trials (EUH: 0.6 degrees C; HYP: 1.0 degrees C) and returned to baseline within 30-60 min following similar decay curves. HYP T_c remained higher (0.4 degrees C) than EUH throughout testing ($P < 0.05$), but moderate hyperthermia itself produced no independent effect on anaerobic exercise performance in either trial. **CONCLUSIONS:** This study demonstrates that neither moderate HYP nor the moderate hyperthermia accompanying HYP by passive heat exposure affect anaerobic exercise performance in a temperate environment.

Editor's Note: These results indicate that moderate weight loss achieved via passive heat exposure did not affect anaerobic performance. Wrestlers employ saunas at temperatures higher than those used in this study and with weight losses exceeding the 2.7% average in this study. At what point is performance compromised?

Degoutte, F., Jouanel, P., Begue, R. J., Colombier, M., Lac, G., Pequignot, J. M., & Filaire, E. (2006). Food restriction, performance, biochemical, psychological, and endocrine changes in judo athletes. *Int J Sports Med*, 27, 9-18.

Keywords: Ammonia/Body Composition/BodyWeight/Diet/Fatigue/Insulin/ Testosterone/urea/Weight Loss

Abstract: In order to test the hypothesis that dietary restriction may have a negative influence on physiological and psychological adaptation to a judo competition, we examined the effects of weight loss induced by restricting energy and fluid intake on the physiology, psychology, and physical performance of judo athletes. Twenty male judoka were randomly assigned to one of two groups (Group A: called diet, n = 10; height 174.8 +/- 1.9 cm, body weight 75.9 +/- 3.1 kg; they were asked to lose approximately 5 % of their body weight through self-determined means during the week before the competition; Group B: called control, n = 10; height 176.4 +/-

1.1 cm, body weight 73.3 +/- 6.3 kg maintained their body weight during the week before the competition). A battery of tests was performed during a baseline period (T1), on the morning of a simulated competition (T2) and 10 min after the end of the competition (T3). The test battery included assessment for body composition, performance tests, evaluation of mood, determination of metabolic and hormonal responses. Dietary data were collected using a 7-day diet record. The nutrient analysis indicated that all the athletes followed a low carbohydrate diet whatever the period of the investigation. For the Group A, the food restriction (- 4 MJ per day) resulted in significant decreases of the body weight and altered the mood by increasing Fatigue, Tension and decreasing Vigour. Dietary restriction had also a significant influence on metabolic and endocrine parameters and was associated with poor performance. After the competition, significant decreases of the levels in testosterone, T/C ratio, alkali reserve, and free fatty acid were observed in both groups, whereas the plasma concentrations in insulin, ammonia, urea, and uric acid were increased. In conclusion, our results suggest that the combination of energy restriction and intense exercise training, which causes weight reduction before a competition, adversely affects the physiology and psychology of judo athletes and impairs physical performance before the competition. Our data are the first to demonstrate that a competition including five 5-min bouts induced the same changes of physiological and psychological variables and performance whatever the dietary intake (dietary restriction or not) during the seven days before the competition.

Notes: Laboratoire BAPS, UFR Recherche, Universite Blaise Pascal, Batiment Biologie, Les Cezeaux, Aubiere, France

Editor's Note: This study is similar to one conducted by W. J. Kraemer, et al, using a simulated wrestling tournament. (Physiological and performance responses to tournament wrestling. Med.Sci.Sports Exerc. 33 (8):1367-1378, 2001.) The adverse stresses of both competition and "weight-making" are documented. International wrestling rules now call for the completion of a weight class to be done in one day. Coaches should strive to reduce those effects associated with dietary restriction. Both judo and wrestling share the need to answer these questions.

Devgan, L. L., Gill, H. S., Faustin, C., Park, H. B., & McFarland, E. G. (2006). Posterior dislocation in a voluntary subluxator: a case report. *Med Sci Sports Exerc*, 38, 613-617.

Keywords: injur/itation/Shoul/r/surge/s/rehab

Abstract: PURPOSE: Posterior instability of the shoulder is an uncommon occurrence. Its etiology has been classified as traumatic or atraumatic and its type as voluntary (individual can subluxate the shoulder posteriorly) or involuntary. Typically, patients with posterior voluntary instability do not have a history of trauma, can be treated successfully with physical therapy; and undergo surgery if the instability becomes symptomatic or develops an involuntary component. We present a patient with voluntary posterior subluxation who developed a symptomatic posterior instability after a traumatic event. PATIENT PRESENTATION: This patient was unable to return to his preinjury function despite nonoperative interventions, including rehabilitation, and required operative treatment of his posterior labrum lesion. This patient had a rare combination of voluntary, atraumatic instability that coexisted with traumatic posterior shoulder instability. CONCLUSION: This case emphasizes the importance of recognizing this constellation of instability patterns and documents that traumatic posterior instability, even in the presence of preexisting voluntary posterior subluxations, may require operative intervention in young, active individuals.

Dillard, D. M. (2006). *Predictive factors of brachial plexus neuropathy in wrestling athletes: A prospective longitudinal study*. MS West Virginia University.

Keywords: Brachial Plexus/injuries/Neck/neuropathy/strength

Abstract: Brachial plexus neuropathies are prevalent within wrestling. Objective:The purpose was to examine

possible predisposing factors to brachial plexus neuropathy. Design. This study was a prospective longitudinal study. An athletic training room at an Eastern Wrestling League University (EWL). Patients and other participants. Twenty-three collegiate wrestlers ranging in age from 19.83 +/- 1.62 years volunteered to participate. Interventions. Neck strength, Head-neck segment, Head-neck length, and neck girth were measured. Previous history and number of years of wrestling were measured using a questionnaire. Main outcome measures. Neck strength and previous history may predispose wrestlers to brachial plexus neuropathy. Results. There was a main effect for neck strength in the directions of right and left lateral flexion for Time. All other analyses were not significant. Conclusion. Trends indicate that a larger sample size may allow effects to be noted. Further research is necessary to examine these possible effects.

Editor's Note: *Published The measurement of neck strength is an under utilized tool in wrestling. Rezasoltani, et al (2005. Cervical muscle strength measurement in two groups of elite Greco-Roman and free style wrestlers and a group of non-athletic subjects. Br J Sports Med, 39, 440-443.) provide some initial data for wrestlers. The further use of the Nicholas Manual Muscle Tester with wrestlers seems warranted, and could become a standard part of the wrestler's profile. It could assist in return to action decisions when neck injuries do occur.*

Dixon, C. B., Deitrick, R. W., Cutrufello, P. T., Drapeau, L. L., & Lovallo, S. J. (2006). Effect of mode selection when using leg-to-leg BIA to estimate body fat in collegiate wrestlers. *J Sports Med Phys Fitness*, 46, 265-270.

Keywords: Body Composition/Electric Impedance/body fat/Body Mass Index/hydrostatic weighing/weight control plans

Abstract: AIM: When using leg-to-leg bioelectrical impedance analysis (LBIA) to examine body composition, a computer-programmed mode (i.e., standard STD or athletic ATH) must be selected prior to assessment. This study examined the effect of LBIA mode selection on the estimated %BF of collegiate wrestlers. METHODS: Forty hydrated (Usg <1.02) wrestlers had %BF estimated using the ATH mode, which was then compared to the STD mode and hydrostatic weighing (HW), used as the reference method. Mean difference from HW (MD), standard error of estimate (SEE), and pure error (PE) values were calculated for the entire sample and three data subsets according to body mass index (BMI, kg/m²): <25 (n=16), 25-29.9 (n=18), and >30 (n=6). RESULTS: The %BF (mean+/-SD) was underestimated by the ATH (12.1+/-4.7) and overestimated by the STD (17.1+/-5.2) mode when compared to HW (14.1+/-6.3) for the entire sample (P<0.05). When examined relative to BMI, the ATH mode accurately estimated %BF in the BMI <25 group (MD=-1.2%, SEE=2.7%, PE=2.8%) and the STD mode accurately estimated %BF in the BMI >30 group (MD=1.5%, SEE=2.4%, PE=2.8%). Both modes inaccurately assessed %BF in the BMI 25-29.9 group with predictive errors >3.5%BF. CONCLUSIONS: The ATH mode is not appropriate for all individuals meeting the definition of athletic. However, the predictive accuracy of LBIA may be improved by selecting the ATH mode when BMI <25 and the STD mode when BMI >30, even when testing athletes.

Editor's note: *We must continue to look for methods to predict minimal wrestling weights that are easy to use, practical, cost effective, and accurate. Unfortunately, there are limitations with BIA methodology at this time. I conducted a survey of all state associations prior to the 2006-07 season and was surprised to find that 22 states allow the use of BIA. The procedures listed by some of these states do not specify the mode setting, while others specify the "standard" mode for all subjects.*

Ergin, S., Ergin, C., Erdogan, B. S., Kaleli, I., & Evliyaoglu, D. (2006). An experience from an outbreak of tinea capitis gladiatorum due to Trichophyton tonsurans. *Clin Exp Dermatol*, 31, 212-214.

Keywords: dermatology/experience/Infection/Itraconazole/Skin/Tinea/Trichophyton

Abstract: Tinea corporis gladiatorum' describes a dermatophytosis transmitted mainly from close skin contact among wrestlers. Although tinea corporis is well recognized, no data are available for tinea capitis infections in wrestlers. After finding tinea capitis infection in a student wrestler, we aimed to search for possible ringworm infections among wrestlers in a wrestling boarding-school. Of the 32 wrestlers, 29, aged 12-18 years, were affected, of whom 22 had scalp involvement. Trichophyton tonsurans was isolated from 20 of the patients, and T. mentagrophytes from the remaining two. Isolated strains of dermatophytes were susceptible to terbinafine and itraconazole. The patients with tinea capitis received oral terbinafine for 4 weeks, and patients with more than two lesions but without scalp involvement received oral terbinafine for 2 weeks. Overall clinical and mycological cure rate was 72.4% and 70%, respectively, at assessment at week 6. The asymptomatic dermatophyte carrier rate was negative 1 year after control of the epidemic. Terbinafine seems to be an alternative drug for the treatment of tinea capitis caused by T. tonsurans; however, control of an outbreak may be very difficult and effective preventive measures should be considered.

Notes: Departments of Dermatology and Microbiology, Faculty of Medicine, Pamukkale University, Denizli, Turkey

Finaud, J., Degoutte, F., Scislowski, V., Rouveix, M., & Filaire, E. (2006). Competition and Food Restriction Effects on Oxidative Stress in Judo. *Int J Sports Med*, Feb 1.

Keywords: Body Composition/Body Weight/competition/Diet/Weight Loss

Abstract: We examined the effects of weight loss induced by restricting energy and fluid intake on antioxidant status and oxidative stress of judo athletes. Twenty male judoka were randomly assigned to one of two groups (Group A: called diet, n = 10; height 174.8 +/- 1.9 cm, body weight 75.9 +/- 3.1 kg; they were asked to lose approximately 5 % of their body weight through self-determined means during the week before the competition; Group B: called control, n = 10; height 176.4 +/- 1.1 cm, body weight 73.3 +/- 6.3 kg maintained their body weight during the week before the competition). A battery of tests was performed during a baseline period (T (1)) on the morning of a simulated competition (T (2)) and 10 minutes after the end of the competition (T (3)). These tests included assessment for body composition, determination of lag phase (Lp) before free radical induced oxidation, maximum rate of oxidation (R (max)) during the propagating chain reaction and maximum amount of conjugated dienes (CD (max)) accumulated after the propagation phase, and lipidic profile. Uric acid concentrations were also evaluated in plasma. Dietary data were collected using a 7-day diet record. We noted that the athletes followed a low carbohydrate diet whatever the period of the investigation. Concerning antioxidant nutrients, we can notice that mean nutritional intakes are in the normal range values for vitamin A, C and E at T (1) and T (2). Rapid weight loss induced a significant increase in Lp values (p < 0.05) and uric acid concentrations without alterations in oxidative stress. Our data also showed that the competition induced the same changes of oxidative-antioxidant status whatever the dietary intake during the seven days before the competition. Moreover, the effect of the competition on the antioxidant and oxidant parameters was more pronounced than the diet. These results could be linked to the food containing a large proportion of PUFA and a relatively low proportion of carbohydrates.

Notes: Laboratoire de Biologie Interuniversitaire des Activites Physiques et Sportives, Bat Biologie B, Campus des Cezeaux, Aubiere Cedex, France

Editor's Note: Judo athletes share the same weight loss concerns as wrestlers.

Grindstaff, T. L. & Potash, D. H. (2006). Prevention of Common Wrestling Injuries. *Strength and Conditioning Journal*, 28, 20-28.

Keywords: conditioning/injuries/injury prevention/Risk/strength/strength training/training

Abstract: Wrestling, both a contact and collision sport, places extreme demands on the entire body. These demands all too often result in injury. With injury rates second only to football (41), strength and conditioning professionals must understand not only injuries common to wrestling but also how a properly designed, well-planned strength training and conditioning program may help to decrease this high injury rate. The sections that follow provide a brief overview of wrestling, including its muscular and physiological demands, and suggestions for exercises intended to reduce the risk of common injuries while improving performance.



Editor's Note: The authors list some valuable exercises to be included in a complete wrestling training regimen.

National Coach Steve Fraser attends to Jim Gruenwald after sustaining a shoulder dislocation at the World Championships

Hedayati, M. T., Afshar, P., Shokohi, T., & Aghili, R. (2006). A study on tinea gladiatorum in young wrestlers and dermatophytes contamination of wrestling mats from Sari-Iran. ***Br J Sports Med.*** Nov 30

Keywords: hygiene/mats/Tinea/Trichophyton

Abstract: OBJECTIVE: For the first time we studied the prevalence of tinea gladiatorum among young wrestlers and dermatophytes contamination of wrestling mats from Sari city the capital of Mazandaran, a northern Province of Iran. DESIGN: We examined 324 wrestlers (age range 9-20 years) from 7 active clubs in Sari city and obtained skin scrapings from 135 of suspected wrestlers to tinea gladiatorum. The scraped skin samples were evaluated with potassium hydroxide examination. Pleated carpet sterile fragments (5x5 cm) were used for survey of wrestling mats contamination. Sabouraud's dextrose agar with and without chloramphenicol and cyclohexamide (SC and SCC) was used to culture scrapings and wrestling mats samples. The dermatophytes were identified by routine laboratory techniques. RESULTS: Our study showed that of the 324 wrestlers, 65 (20.1%), presented tinea gladiatorum. The most lesions have been on the trunk and head. All of wrestling mats samples was positive for dermatophyte. Trichophyton tonsurans (T. tonsurans) was isolated from all of scrapings and wrestling mats samples. CONCLUSION: Considering that the isolation of many number colonies of T. tonsurans from all of wrestling mats and from involved wrestlers to tinea gladiatorum as the only dermatophytes species, we think the contamination of wrestling mat to T. tonsurans has a crucial role to catch tinea gladiatorum among wrestlers.

Notes: School of Medicine, Mazandaran University of Medical Sciences, Islamic Republic of Iran

Editor's Note: There are equivocal reports concerning the culturing of dermatophytes from wrestling mats. The prevailing opinion is that the main mode of transmission of tinea gladiatorum is from skin to skin contact.

Hetzler, R. K., Kimura, I. F., Haines, K., Labotz, M., & Smith, J. (2006). A comparison of bioelectrical impedance and skinfold measurements in determining minimum wrestling weights in high school wrestlers. *J Athl Train*, 41, 46-51.

Keywords: body fat/Electric Impedance/females/MWW

Abstract: Context: Whether bioelectrical impedance and skinfold analysis can be used interchangeably to establish minimal wrestling weights (MWWs) is unknown. Using both methods in a particular program may result in the misclassification of some athletes. Objective: To compare the MWW calculated from skinfold measurements with those derived from 5 bioelectrical impedance equations and determine if the 2 methods could be used interchangeably for high school wrestlers. Design: Repeated measurements were obtained using bioelectrical impedance and skinfold analysis to determine MWWs. Data were collected during the preseason. Setting: High school. Patients or Other Participants: Two hundred eight wrestlers (151 males, 57 females), aged 13 to 18 years. Main Outcome Measure(s): The bioelectrical impedance analysis was conducted with the MWW protocol administered annually by certified athletic trainers. The resistance and reactance were used in 5 equations to investigate the level of agreement between bioelectrical impedance and skinfold analysis for determining MWW. The MWWs were based on a minimum body fat of 7.0% for males and 14.0% for females. Results: When comparing bioelectrical impedance and skinfold analysis, we found prediction error ranged from 1.51 to 2.34 kg for males and 0.27 to 9.16 kg for females. Conclusions: To protect the health of the athletes and maintain competitive equity, a single method should be used to determine MWWs. Bioelectrical impedance and skinfold analysis cannot be used interchangeably to determine MWWs.

Burns, D. & Waniger, K. (2006). Letter to the Editor. *J Athl Train*, 41, 355-356.

Keywords: Electric Impedance/skinfolds/MWW/weight control plans/Weight Loss

Dear Editor, We read with interest and appreciation the article by Hetzler et al, "A comparison of bioelectrical impedance and skinfold measurements in determining minimum wrestling weights in high school wrestlers" (*J Athl Train*. 2006;46-51). Although we applaud the authors on a well-done and important research endeavor, we would like to emphasize some concerns relative to applying their results to certifying minimum safe competition weights in wrestlers.

The question being asked was whether skinfold (SF) and bioelectrical impedance (BIA) methods can be used interchangeably for the prediction of minimum wrestling weight (MWW) in high school wrestlers. Skinfold measurements (3-site Lohman equation for males, 4-site Jackson equation for females) and BIA reactance/resistance measurements (RJA Quantum II instrument, hand-foot technique) were obtained for all participants in the same session. Euhydration was assured by eliminating data from any subject with a urine specific gravity >1.020. Percentage of fat was estimated by (1) converting SF sum to body density using the appropriate equation and converting density to percentage of body fat using the Brozek equation and (2) using 4 equations to convert reactance/resistance values to percentage of body fat. Each equation had been normalized previously to specific populations. From percentage of body fat, predicted MWW was calculated under the standard assumption that lean body mass does not change during the period of modification. The authors used an analytical technique not commonly applied for comparison of body composition data: plotting the data according to the Bland-Altman technique (see their Figures 1 through 8) rather than the more common relational scatter plot. In the authors' technique, the relationship between the difference of the 2 methods and the predicted MWW is shown. They then calculated a "total error" for the procedure. In general, if one looks only at the averages of the MWW values, little difference is evident between SF and BIA values in both male and female wrestlers. However, when predicting a safe amount of weight for the individual wrestler to lose over the season, fairness in wrestling weight classification and, more importantly, the wrestler's eventual health depend on individual values, not average values. It is therefore important to look at the scatter of the data, not the average values. For males, the mean prediction error ranged from 3.66 kg (8.1 lb) to 1.51 kg (3.3 lb). For females, this range was 9.16 kg (20.2 lb) to 0.27 kg (0.6 lb). The implications of these findings are that (1) SF and BIA data cannot be used interchangeably in predicting MWW in high school wrestlers; (2) choice of the prediction equation is critical in

using BIA data, and no single equation properly serves all wrestlers; and (3) use of BIA data rather than SF data leads to large MWW discrepancies for many wrestlers and can, at best, result in unfair weight classifications and, at worst, lead to dangerously overestimating the amount of weight the wrestler can safely lose.

A total of 208 high school wrestlers (151 males, 57 females, aged 13 to 18 years) from Oahu, HI, public schools participated in this study. The wrestler subject pool presumably consisted of Hawaiian adolescents. The ethnic breakdown of the participants was not included in the methods. We know that the distribution of total fat as adipose fat is different in adults of Polynesian descent than in other racially diverse adults and white adults. Can we also expect this difference in total fat distribution among racial groups to be present in adolescents? What fraction of the subject pool was of Polynesian descent? This factor does not seem to have been addressed in the handling of the data.

The data (from these authors and from previous researchers) clearly indicate that BIA, if used carefully, can be a helpful assessment tool for relative body composition assessment. But it should not be accepted as a method for attempting the absolute assessment of body composition. This is particularly true for foot-foot technology, as used by Tanita, Taylor, and other "bathroom"-type scales. Yet hand-foot instruments are also affected by similar error sources. The manufacturers of BIA equipment, and Tanita in particular, argue strongly against this conclusion, but their contentions are all argued from pooled data and do not address the errors generated when trying to apply single measurements to individuals.

Although the mean prediction error was in the range of 5 to 10 lb between the SF and BIA methods, significant numbers of wrestlers are outside this range. In the lower weight classes, the difference from one weight class to another is approximately 2 to 3 kg. If the BIA MWW for an individual wrestler is outside the ± 2 SD range, it becomes possible to classify the athlete in any of 5 weight classes, depending on the direction of the error. This is a huge and unacceptable disparity. The Bland-Altman plots in this study indicate that the magnitude of the difference in predicted MWW among methods is not a function of the size of the athlete; if it were, the differences would taper outward toward the right side of the graphs. Thus, the expected error (in absolute lb or kg) is as large for lighter wrestlers as it is for heavier ones. A 5-lb error in assessing how much weight a 112-lb wrestler can safely lose has a much greater effect than the same 5-lb error applied to a 225-lb wrestler, so this reality is a significant implication of the authors' results. In addition, the distinction between absolute and relative measurements of body composition was not made clear in the article. The question of fairness may be addressed on a relative basis by ensuring that only one method (SF or BIA) is used for determining MWW. The issue of safety for an individual wrestler's weight loss calculation depends on the accuracy of an absolute measurement of lean body mass.

The SF values in this study were replicated by having 3 certified athletic trainers measure each athlete. The intertester validity (test objectivity) for SF measurements is notoriously poor, and it requires experience to learn how to take SF measurements with high reliability. The degree to which one can ascribe absolute accuracy to single-assessor measurements by incidental assessors has not yet been well documented. Many state organizations are strongly opposed to "central" assessment, forcing the assessment into the hands of certified athletic trainers, school nurses, or school administrators who do not perform these procedures routinely and (perhaps) do not maintain the necessary skills to perform them accurately.

One last comment should be made regarding the prediction of a safe amount of weight loss for any individual wrestler. If we allow the use of both SF and BIA in the same state association (at present, the National Wrestling Coaches Association protocols allow both SF and BIA), which value do we use? Wrestlers as a group tend to want to lose as much weight as possible; if this is the case and if we allow use of the highest percentage of body fat, we multiply the chances for error and unsafe weight loss.

We thank you for allowing us to share our thoughts, and we once again congratulate the authors on their research endeavor regarding a very important area of health maintenance with our wrestlers. We encourage further research in this area, and we look forward to the comments of the authors regarding our thoughts.

Editor's Note: see comments following Hetzler response

Hetzler, R. K., Kimura, I. F., Haines, K., Labotz, M., & Smith, J. (2006). Author's Response. *J Athl Train*, 42, 356.

Keywords: Body Composition/Electric Impedance/MWW/Weight Loss/values/

Dear Editor,

We thank Fr Doug Burns and Dr Kevin Waninger for sharing their thoughts concerning our recent paper in their letter. We appreciate their statement on the importance of this type of research to protect the health of high school wrestlers. Below we address the points and questions raised in the same sequence as in their letter.

In their second paragraph, Burns and Waninger accurately summarize our study. They also state, "The authors used an analytical technique not commonly applied for comparison of body composition data: plotting the data according to the Bland-Altman technique (Figures 1-8) rather than the more common relational scatter plot."

Burns and Waninger also state:

In general, if one looks only at the averages of the MWW [minimum wrestling weight] values, little difference is evident between SF [skinfold] and BIA [bioelectrical impedance] values in both male and female wrestlers. However, when predicting a safe amount of weight for the individual wrestler to lose over the season, fairness in wrestling weight classification and, more importantly, the wrestler's eventual health depend on individual values, not average values. It is therefore important to look at the scatter of the data, not the average values.

We actually included scatter plots in the original submission of the paper but removed them in response to a reviewer's request. Although the scatter plots were removed, we feel that the residuals shown on the Bland-Altman plots accurately show the absolute differences between the BIA measurements and estimates of body composition.

Their third paragraph deals with the ethnic diversity of our subject population, and they make an important observation. The lack of ethnic-specific equations for the subjects was a limitation of our study and points to the need for further research in this area. The state of Hawaii has great ethnic diversity, and the children of the state reflect this diversity. Multiethnic families are commonplace in Hawaii, and, thus, many of the children are of mixed ethnic backgrounds. Therefore, classifying subjects by ethnicity becomes problematic (as does the selection of prediction equations to determine body composition). On the island of Oahu at the time of data collection, the ethnic breakdown, based on census data, was approximately 27% white, 2% black, <1% American Indian, 42% Asian, 9% native Hawaiian/Pacific Islander, and 20% mixed (2 or more ethnicities). Although we did not determine the ethnic backgrounds of the subjects in our study, we speculate that our subject population was fairly representative of the population as described above.

We tend to agree with the comments that Burns and Waninger made in the fourth paragraph concerning the use of BIA to establish MWWs. However, we do recognize that improvements in prediction equations and BIA instrumentation may alleviate some of these concerns in the future. We feel that their contention that BIA results in "relative" measures rather than "absolute" measures of body composition is beyond the scope of our paper and is perhaps debatable. However, if their contention is accepted, it would certainly obviate the use of BIA to determine MWWs.

In the next paragraph, they raise another important point when they state, "A 5-lb error in assessing how much weight a 112-lb wrestler can safely lose has a much greater effect than the same 5-lb error applied to a 225-lb wrestler, so this reality is a significant implication of the authors' results" and "The issue of safety for an individual wrestler's weight loss calculation depends on the accuracy of an absolute measurement of lean body mass." We acknowledge this to be true and, in retrospect, we would probably change our discussion to reflect this point.

The next paragraph deals with the "intertester validity (test objectivity) for SF measurements," which they contend is "notoriously poor, and experience is required to learn how to take SF measurements with high reliability." This is an insightful comment and poses a real concern for those charged with fairly determining MWWs. We have unpublished data from our laboratory showing that certified athletic trainers can achieve a high degree of intertester reliability after a training session in body composition assessment using SF.

Additionally, their measurements were in good agreement with those of the 2 professors who offered the training and who have a great deal of experience in this area. In any case, the methods used to actually determine MWWs in our study by SF were not under our control. Rather, the Hawaii Athletic Trainers' Association developed and implemented the program, and we used their actual minimal weight calculations in our data set.

We agree with the last comment of Burns and Waninger that methods to determine minimal weights should be standardized and that for competitive equity and the safety of the athletes, only one method should be used.

Editor's Note: Many people are not willing to accept an error of plus or minus 20 lbs (several weight classes) in prediction of minimal weight. Therefore, they do not accept BIA/Tanita results. Some studies that support the use of BIA have not used a criterion method in their study. They simply compare BIA results to skin folds. Both are predictions. That is not a validation study. Many in the wrestling community feel that doing something is better than nothing. BIA is quick, easy and requires little tester training. However, several studies suggest the validity, precision and systematic bias of BIA is unacceptable for correctly classifying minimum weight in wrestlers. Work remains to be done!

Horswill CA, Curby, D. G., Bartoli, W. P., Stofan, J. R., & Murray, R. (2006). Effect of Carbohydrate Intake During Wrestling Practice on Upper-Body Work in Adolescents. *Ped Ex Science*, 18, 470-482.

Keywords: Arm/arm cranking/arm ergometry/Dehydration/energy expenditure/Exercise/hydration/training

Abstract: We examined whether the type of fluid ingested during wrestling training would affect arm ergometry in adolescent athletes. Wrestlers ($n = 11$) trained for 2-hr sessions and consumed fluid containing 6% carbohydrate or a placebo of equal volume administered double blind and in randomized fashion. To account for training demands across beverage comparisons, energy expenditure (EE) was estimated by using the rate of appearance of CO₂ (RaCO₂) after ¹³C-bicarbonate ingestion. The performance test was completed after training and consisted of 6 min of intermittent, high-intensity arm cranking. The results showed the difference in total



arm work ($\text{kg} \cdot \text{m}^{-2} \cdot \text{min}$) between carbohydrate ($2,130 \pm 263$) and placebo ($1,961 \pm 401$) conditions approached statistical significance ($p = .07$). Fluid intake matched 50% of sweat loss, resulting in modest dehydration for both treatments. Carbohydrate ingestion during training may enhance high-intensity intermittent arm work in adolescent wrestlers; however, the additive effects of carbohydrate dose and fluid volume for hydration need to be teased apart in subsequent research on adolescents performing such exercise.

Editor's Note: Horswill's arm crank protocol has been used by elite wrestlers. The loading has been increased to 0.07kg/kg body weight.

The novel method for estimating energy expenditure yielded values of approximately 1,050 kcal per 2 hour practice. It would be desirable to replicate these measures during a higher intensity practice of elite wrestlers.

Hubner-Wosniak, E.; Kosmol, A.; Kusior, A. (2006) The Evaluation of Upper Limb Muscles Anaerobic Performance of Elite Wrestlers and Boxers *Research Yearbook* 12 (2), 218-221.

Keywords: anaerobic tests performance; wrestling; boxing

Background: The purposes of the present study were to examine if there are any differences in anaerobic performance of upper limb muscles between elite wrestlers and boxers and to investigate how the repetition test reflects the potential of muscles to derive the energy via the glycolytic pathway. The subjects were 11 greco-roman style wrestlers and 13 boxers, representing the Polish National Team. The athletes performed two

tests on arm crank ergometer. First of them consisted of 30 s maximum effort with resistance of 0.055 kg/kg body mass, and the second one, 15 s test was repeated 8 times with 20 s break and resistance 0.04 kg/kg body mass. Peak and mean power were recorded in each test, and blood lactate concentration was determined during 30 minutes of recovery. Additional lactate determinations were made after wrestling (Pytlasiski '04 Tournament) and boxing (Stamm '05 Tournament) matches. The results of this study showed, that relative peak power in both exercise tests was higher in wrestlers than in boxers. Post-exercise peak blood lactate concentration after 30 s arm cranking was lower than after the cessation of interval exercise test and after tournament match both in wrestlers and in boxers. It seems that the interval test protocol utilized in this study is a reliable means of determining upper body work output in athletes trained via upper body exercise and appears to simulate the intensity of efforts expended in a wrestling and boxing match.

Notes: email: elzbieta.wozniak@awf.edu.pl

Hubner-Wozniak, E.; Lutoslawska, G.; Kosmol, A.; Zuziak, S. THE EFFECT OF TRAINING EXPERIENCE ON ARM MUSCLE ANAEROBIC PERFORMANCE IN WRESTLERS. *Human Movement* 2006, Vol. 7 Issue 2, p147 6p

Keywords: wrestlers; training experience; anaerobic performance

Purpose. The purpose of the present study was to evaluate the effect of training experience on arm muscle anaerobic performance in wrestlers. **Basic procedures.** The subjects of the study were 13 senior wrestlers, members of the Polish national team, and 19 junior wrestlers. All the participants performed a modified upper-body Wingate test, which consisted of five 30s stages of maximal arm cranking against a resistance equal to 3.5% of the athlete's total body mass. The peak and mean power of each effort was recorded during the test. For lactate measurements, blood was taken from the earlobe 3, 5, 7, 9, 11, 13 and 30 min after cessation of the exercise. **Main findings.** It was shown that during each 30s stage senior wrestlers displayed a significantly higher



relative (W/kg) peak and mean power output than junior wrestlers. The peak power declined from the first to the fourth stage in seniors and to the third stage in juniors. At the same time the decline in mean power output was similar (from the first to the fourth stage) in both groups of wrestlers. The peak lactate concentration (La_{max}) was significantly higher in senior wrestlers than in junior wrestlers (17.4 and 14.1 mmol/l, respectively). However, the study results indicated that lactate clearance was faster in seniors ($0.37 \text{ mmol min}^{-1}$) than in juniors ($0.28 \text{ mmol min}^{-1}$). **Conclusions.** It can be concluded that the wrestler's training enhances arm muscle anaerobic performance, and there are indications that it also contributes to an increase in aerobic capacity. Notes: email: elzbieta.wozniak@awf.edu.pl

Editor's Note: Arm cranking can be a valuable training technique for wrestlers, as well as a testing modality for researchers and coaches. Efforts must be made to establish optimal loading for various classes of wrestlers, as well as work rest ratios which are in line with the demands of the new rules.

Kilic, H., Baltaci, A. K., Gunay, M., Gokbel, H., Okudan, N., & Ciciouglu, I. (2006). The effect of exhaustion exercise on thyroid hormones and testosterone levels of elite athletes receiving oral zinc. *Neuro Endocrinol Lett*, 27, 247-252.

Keywords: Age/Diet/Hormones/Minerals/Nutrition/supplements/Testosterone/thyroid/values/zinc

Abstract: OBJECTIVES: The present study aims to investigate how exhaustion exercise affects thyroid hormones and testosterone levels in elite athletes who are supplemented with oral zinc sulfate for 4 weeks. METHODS: The study included 10 male wrestlers, who had been licensed wrestlers for at least 6 years. Mean age of the wrestlers who volunteered in the study was 18.70 +/- 2.4 years. All subjects were supplemented with oral zinc sulfate (3 mg/kg/day) for 4 weeks in addition to their normal diet. Thyroid hormone and testosterone levels of all subjects were determined as resting and exhaustion before and after zinc supplementation. RESULTS: Resting TT3, TT4, FT3, FT4 and TSH levels of subjects were higher than the parameters measured after exhaustion exercise before zinc supplementation ($p < 0.05$). Both resting and exhaustion TT3, TT4 and FT3 values after 4-week zinc supplementation were found significantly higher than both of the parameters (resting and exhaustion) measured before zinc supplementation ($p < 0.05$). Resting total testosterone and free testosterone levels before zinc supplementation were significantly higher than exhaustion levels before zinc supplementation ($p < 0.05$). Both resting and exhaustion total and free testosterone levels following 4-week zinc supplementation were found significantly higher than the levels (both resting and exhaustion) measured before zinc supplementation ($p < 0.05$). CONCLUSION: Findings of our study demonstrate that exhaustion exercise led to a significant inhibition of both thyroid hormones and testosterone concentrations, but that 4-week zinc supplementation prevented this inhibition in wrestlers. In conclusion, physiological doses of zinc administration may benefit performance.

Editor's Note: The dose used was 3mg/kgbody wt/day of zinc sulfate. The average weight of the wrestlers was 73.5 kg, so the average absolute dose was 220 mg/day, of which 89 would be zinc. 15mg/day is the RDA. There are toxicities reported for impaired copper uptake with intakes of 25mg/day, declines in high density lipoproteins with intakes of 80mg/day, and recently there have been suggestions of urinary problems in seniors taking excess zinc. I would be careful in going beyond with the "one-a-day" vitamin/mineral supplement.

Kukidome, T.; Aizawa, K.; Nakajima, K.; Masujima, A. *Japanese Journal of Clinical Sports Medicine* 2006, Vol. 14 Issue 3, 325-333.

Keywords: weight loss; elite wrestler; survey questionnaire

The purpose of the study was to elucidate the actual state of weight loss among the contestants for the All Japan Wrestling Championships. [Method] All the 286 contestants (196 males, 90 females) for the All Japan Wrestling Championships in 2002 were selected as the respondents for the survey, and the intent of the survey questionnaire was explained to them. A self-administered questionnaire was used for the survey. [Findings] The number of wrestlers who subjected themselves to a weight loss program for the championships amounted to 163 among males (83%), 62 among females (77%); among these wrestlers, 147 males (90%) and 56 females (90%) tried to reduce their weight by more than 5 kg. Those who had a weight loss program of less than 8 days numbered 118 among males (72%), and 51 among females (82%). These findings reveal that the contestants for the competition, the majority of whom were elite wrestlers, lose an excessive amount of weight in a short time.

Editor's Note: While high school and collegiate competition in the US have moved to one hour before dual meets and two hours for tournaments, in most international and domestic competition governed by FILA, allows for day before competition weigh-ins.

Maskhulia, L., Chabashvili, N., Akhalkatsi, V., & Chutkerashvili, T. (2006). Left ventricular morphological changes due to vigorous physical activity in highly trained football players and wrestlers: relationship with aerobic capacity. *Georgian Med News*, 133, 68-71.

Keywords: adaptation/aerobic capacity/Oxygen Consumption/oxygen uptake/training

Abstract: The heart undergoes profound changes in response to systematic athletic training. Several adaptations of cardiac shape and function occur with athletic training to improve the heart's function as a pump and thereby increase aerobic capacity. Maximal oxygen consumption or VO₂ max is regularly used as an index of physical fitness but the issue of which of the left ventricular structural parameter correlates with VO₂ max remained unresolved. The aim of the study was to examine the effects of the long-term intensive physical training on cardiac responses in highly trained athletes-football players and wrestlers- and reveal the structural parameter of the heart which better correlates with aerobic capacity. We studied a group of highly trained male athletes, 221 football players and 51 wrestlers, and 48 healthy male sedentary controls. The research has included M and 2D-echocardiography, resting ECG and stress-testing. The data indicate that highly trained male athletes had higher value of maximal oxygen uptake PWC(170) and PWC(170)/kg than untrained male controls; they exhibit greater left ventricular internal dimension, left ventricular wall thickness, relative wall thickness, left ventricular mass and mass index compared to the untrained controls. The amount of physiologic hypertrophy that occurs in the athletes is related to the intensity and duration of the exercise and is directly related to the fitness level or VO₂ max. It was concluded that VO₂max is the variable that better correlates with the LVMI.

McGuigan, M. R., Winchester, J. B., & Erickson, T. (2006). The importance of isometric maximum strength in college wrestlers. *J Sports Science and Medicine* 108-113.

Keywords: Exercise/Health/sport science/research/strength/Thigh/power/Exercises/team/testing/Sports

Abstract: Previous research has demonstrated the importance of isometric maximal strength (PF) and rate of force development (RFD) in a variety of athletic populations including track cyclists and track and field athletes. Among coaches and sports scientists there is a lack of agreement regarding how much strength is required for optimal performance in most sports. The purpose of this study was to examine relationships between measures of PF, RFD and one repetition maximum (1RM) strength with other variables that might contribute to successful performance in collegiate wrestlers. Eight men (M = 20.0, SD = 0.4 years; Height M = 1.68, SD = 0.13 m; Mass M = 78.0, SD = 4.2 kg) who were Division III college wrestlers participated in this study. They were tested for PF using the isometric mid thigh pull exercise. Explosive strength was measured as RFD from the isometric force-time curve. The 1RM for the squat, bench press and power clean exercises were determined as a measure of dynamic strength. Vertical jump height was measured to determine explosive muscular power. The wrestlers also ranked themselves and the coaches of the team also provided a ranking of the athletes. Correlations between the variables were calculated using the Pearson product moment method. Results indicated strong correlations between measures of PF and 1RM ($r = 0.73 - 0.97$). The correlations were very strong between the power clean 1RM and PF ($r = 0.97$) and squat 1RM and PF ($r = 0.96$). There were no other significant correlations with other variables apart from a strong correlation between RFD and coaches ranking ($r = 0.62$). Findings suggest that isometric mid thigh pull test does correlate well with 1RM testing in college wrestlers. RFD does not appear to be as important in college wrestlers. The isometric mid thigh pull provides a quick and efficient method for assessing isometric strength in athletes. This measure also provides a strong indication of dynamic performance in this population. The lack of strong correlations with other performance variables may be a result of the unique metabolic demands of wrestling.

Notes: 1 School of Exercise, Biomedical and Health Sciences, Edith Cowan University, Joondalup, WA, Australia

2 Department of Kinesiology, Louisiana State University, Baton Rouge, LA, USA

3 Department of Exercise and Sport Science, University of Wisconsin-La Crosse, La Crosse, WI, USA

Nielsen, F. & Lukaski, H. (2006). Update on the relationship between magnesium and exercise. *Magnesium Res*, 19 180-189.

Keywords: Magnesium/Nutrition/oxygen uptake/Stress/weight control

Abstract: Magnesium is involved in numerous processes that affect muscle function including oxygen uptake, energy production and electrolyte balance. Thus, the relationship between magnesium status and exercise has received significant research attention. This research has shown that exercise induces a redistribution of magnesium in the body to accommodate metabolic needs. There is evidence that marginal magnesium deficiency impairs exercise performance and amplifies the negative consequences of strenuous exercise (e.g., oxidative stress). Strenuous exercise apparently increases urinary and sweat losses that may increase magnesium requirements by 10-20%. Based on dietary surveys and recent human experiments, a magnesium intake less than 260 mg/day for male and 220 mg/day for female athletes may result in a magnesium-deficient status. Recent surveys also indicate that a significant number of individuals routinely have magnesium intakes that may result in a deficient status. Athletes participating in sports requiring weight control (e.g., wrestling, gymnastics) are apparently especially vulnerable to an inadequate magnesium status. Magnesium supplementation or increased dietary intake of magnesium will have beneficial effects on exercise performance in magnesium-deficient individuals. Magnesium supplementation of physically active individuals with adequate magnesium status has not been shown to enhance physical performance. An activity-linked RNI or RDA based on long-term balance data from well-controlled human experiments should be determined so that physically active individuals can ascertain whether they have a magnesium intake that may affect their performance or enhance their risk to adverse health consequences (e.g., immunosuppression, oxidative damage, arrhythmias).

Notes: U.S. Department of Agriculture, Agricultural Research Service, Grand Forks Human Nutrition Research Center, Grand Forks, ND 58202-9034, USA. fnielsen@gfhnrc.ars.usda.gov

Editor's Note: *I posed two questions to Dr. Nielsen: Should coaches encourage their athletes (wrestlers) to take a magnesium supplement to the level of your recommended needs, given their exercise/sweating to make weight? and What are possible toxicity problems associated with the ingestion of excess magnesium in the diet?*

As I indicated in my article, magnesium intakes less than 260 mg/day may impair performance and enhance the negative effects of strenuous exercise. Thus, athletes should be encouraged to have intakes higher than this. Eating a diet high in whole grains, pulses, legumes, leafy green vegetables, and milk is the preferred method for obtaining adequate intakes of magnesium. However, to assure adequate intakes of magnesium for athletes such as wrestlers who have a tendency to practice dietary habits not conducive to adequate intakes, a supplement providing magnesium may be appropriate. However, magnesium intakes higher than requirements will not have much effect on performance, and to answer your second question first, too much magnesium will result in gastrointestinal upset and diarrhea. This diarrhea effect will vary among individuals so I would recommend that dietary intakes be not much more than the current RDA (recommended dietary allowance) of 400-410 mg/day for males. Because most people consume over 200 mg/day, and 300 mg per day probably will allow for maximum performance, supplemental magnesium in amounts close to 100 mg/day probably would be adequate. This amount is often found multi-vitamin-mineral supplements. Taking such a supplement would assure that other nutrients that may be low in the diet are also adequate for athletes practicing weight control. Taking a supplement providing magnesium only to meet the magnesium requirement is less desirable than doing it through diet or a multi-vitamin-mineral supplement.

Oppliger R.A., Utter A., Scott J.R., Dick, R. W., & Klossner, D. (2006). NCAA Rule Change Improves Weight Loss among National Championship Wrestlers. *Med Sci Sports Exerc.*, 38, 963-970.

Keywords: Body Composition/MWW/NCAA/weight/Weight Loss

Abstract: **PURPOSE::** The present investigation was initiated to examine the weight management practices among wrestlers participating in the NCAA Division I, II, and III wrestling tournaments. Part 1 examined the efficacy of body composition assessment between preseason (PRE) and postseason (POST). Part 2 examined rapid weight loss (RWL) during the 20 h preceding the weigh-in and the rapid weight gained (RWG) during the first day's competition. **METHODS::** Subjects include 811 competitors from Divisions I, II, and III participating in the NCAA national championship tournaments between 1999 and 2004. Measurements included relative body fatness (% BF) and weight (WT) on the day preceding the tournament and the evening of the first day. Minimal weight (MW) was computed with 5% BF. Retrospectively, MW, % BF, and WT from the previous fall were obtained for comparisons from NCAA records. **RESULTS::** Part 1: WT and % BF decreased significantly PRE (WT 74.0 +/- 11.1 kg; % BF 12.3 +/- 3.4%) to POST (WT 71.5 +/- 10.4 kg; % BF 9.5 +/- 1.8%), but MW (PRE MW 68.0 +/- 9.2 kg, POST MW 67.9 +/- 9.1 kg) remained unchanged. Heavier wrestlers and Division I and II



*Ben Askren-University of Missouri, 174 lb class
Named Outstanding Wrestler at 2007 NCAA Championships*

wrestlers showed the greatest changes in WT and % BF. Part 2: RWL averaged (+/- SD) 1.2 +/- 0.9 kg and relative to weight 1.7 +/- 1.2%. Division I and lighter wrestlers showed the greatest change. RWG averaged 0.9 +/- 0.8 kg, or 1.3 +/- 1.2%. RWG was greater among lighter and Division I and II wrestlers. **CONCLUSIONS::** Minimal weight estimates PRE appear valid compared with POST. RWL and RWG are reduced significantly over previous investigations with only mat-side weigh-ins. The NCAA weight management program appears effective in reducing unhealthy weight cutting behaviors and promoting competitive equity. Efforts to institute similar programs among younger wrestlers seem warranted.

Editor's Note: This is good news for the sport!



Robozzo, B., Bertollo, M., & Bertoli, L. (2006). Frequency and direction of competitive anger in contact sports. *J Sports Med Phys Fitness*, 46, 501-508.

Keywords: psychological
training/psychology/team/skill/combat sports/behavior

Abstract: **AIM:** The purpose of the present study was to investigate whether athletes involved in physical contact sports may interpret their feelings of anger as facilitative of performance, and to examine differences in the interpretation of anger as a function of the type of sport (team vs individual) or the competitive skill level (high vs

low). **METHODS:** A modified version of the State-Trait Anger Expression Inventory was administered to 100 Italian adult male athletes practicing rugby or individual combat sports (judo, freestyle wrestling, or Greco-Roman wrestling). The questionnaire was intended to measure the frequency and the direction (i.e., the facilitative-debilitative interpretation) of competitive anger. **RESULTS:** Many athletes engaged in contact sports tended to interpret their competitive anger as facilitative of performance rather than debilitative. The type of sport and the athlete's standard level can mediate the individual's interpretation of the effects of anger symptoms upon performance. **CONCLUSIONS:** Competitors can interpret their anger as helpful to energize behavior and channel physical and mental resources for skill execution. Practitioners should assist athletes in gaining control over anger rather than attempting to suppress it. **Notes:** Institute of Motor Sciences, Faculty of Medicine and Surgery, University of Padua, Padua, Italy.
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Editor's Note: *Coaching still as much an art, as it is a science. One must be ready to use the anger that may be found in competition, but it must be channeled in a positive direction. When Zidane retaliated to the trash talking of his opponent in the FIFA World Cup Final, it was a mistake. Coaches, like Momir Petkovic, preach to their athletes to focus on your game plan and not to allow an opponent or the situation distract you from that plan.*

Saarni, S. E., Rissanen, A., Sarna, S., Koskenvuo, M., & Kaprio, J. (2006). Weight cycling of athletes and subsequent weight gain in middleage. *Int J Obesity*, March 28.

Keywords: Age/Body Mass Index/long term health/weight control/weight cycling/Weight Gain/Weight Loss

Abstract: Objective: To study the effects of repeated cycles of weight loss and regain as young adults on long-term weight development. Design: A follow-up study with questionnaires in 1985, 1995 and 2001. Setting: Finland. Subjects: A national cohort of 1838 male elite athletes who had represented Finland in major international sport competitions in 1920-1965, including 370 men engaged in sports in which weight-related performance classes are associated with weight cycling (boxers, weight lifters and wrestlers; further called as weight cyclers), and 834 matched control men with no athletic background. Outcome measure: Weight change since the age of 20 years, body mass index (BMI) and prevalence of obesity and overweight. Results: The weight cyclers gained 5.2 BMI units from age 20 years to their maximum mean weight, which was at age 58.7 years. Corresponding figures for the controls were 4.2 BMI units at 58.5 years and for other athletes 3.3 BMI units at age 62.5 years. The proportion of obese (BMI ≥ 30 kg/m²) subjects was greatest among the weight cyclers both in 1985 and 1995. In 2001, the weight cyclers were more often obese than other athletes, but did not differ from the controls. The odds ratio for the weight cyclers to be obese compared to other athletes in 1985 was 3.18 (95% confidence intervals 2.09-4.83), and compared to the controls 2.0 (1.35-2.96). The enhanced weight gain of the weight cyclers was not accounted for by present health habits (smoking, alcohol use, use of high-fat milk or physical activity) or weight at age 20 years. Conclusions: Repeated cycles of weight loss and regain appear to enhance subsequent weight gain and may predispose to obesity. Chronic dieting with weight cycling may be harmful for permanent weight control.

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Editor's Note: Dr. Saarni has been using the excellently organized cohorts of former Finnish Olympians for some beautiful studies on the long-term health of athletes. I asked Dr. Saarni about the possibility that body type specific to the weight classification sports (usually high mesomorphy, with low ectomorphy) might be the factor explaining future body weight (body fat) gain. Here is his response: I agree with your opinion that there could be a selection bias to different sports because of a person's physical qualities (i.e. somatotype). Different types probably are more likely to choose body building than others and the same persons might be more predisposed to weight gain. It might be, that the inclination to choose e.g. body building (or weight cycling) is caused by same background factors as predisposition to weight gain. The other option is, that weight cycling causes predisposition to weight gain.

To further study this, family studies would be of great value. For example studies of families where other family members are weight cyclers and others are not. Or studies with longer follow-up time, beginning before weight cycling starts.

Schmidt, A., Akbar, M., Kunz, M., & Johann, K. (2006). [Olympia participation 6 months after surgical replacement of a cruciate ligament -- optimal rehabilitation of a top athlete]
[Article in German]. *Sportverletz Sportschaden*, 20, 43-45.

Keywords: Anterior Cruciate Ligament/injuries/Knee/rehabilitation

Abstract: We present the medical history of an Olympic wrestler who suffered a rupture of the anterior cruciate ligament. Operative reconstruction of the anterior cruciate ligament was performed using an autogenous semitendinosus-gracilis-tendon-transplant. The operation was followed by an aggressive rehabilitation program set up to meet the individual requirements. Six months later the athlete was able to compete at the 2004 Olympic Games in Athens.

Editor's Note: . An interesting case study that once again demonstrates the will that athletes employ in rehabbing their injuries.

Secher, N. & Volianitis, S. (2006). Are the arms and legs in competition for cardiac output? *Med Sci Sports Exerc*, 38, 1797-1803.

Keywords: Arm/arm cranking/blood flow/Blood Pressure/Cardiac Output/oxygen uptake /blood/flow

Abstract: Oxygen transport to working skeletal muscles is challenged during whole-body exercise. In general, arm-cranking exercise elicits a maximal oxygen uptake (VO₂max) corresponding to approximately 70% of the value reached during leg exercise. However, in arm-trained subjects such as rowers, cross-country skiers, and swimmers, the arm VO₂max approaches or surpasses the leg value. Despite this similarity between arm and leg VO₂max, when arm exercise is added to leg exercise, VO₂max is not markedly elevated, which suggests a central or cardiac limitation. In fact, when intense arm exercise is added to leg exercise, leg blood flow at a given work rate is approximately 10% less than during leg exercise alone. Similarly, when intense leg exercise is added to arm exercise, arm blood flow and muscle oxygenation are reduced by approximately 10%. Such reductions in regional blood flow are mainly attributed to peripheral vasoconstriction induced by the arterial baroreflex to support the prevailing blood pressure. This putative mechanism is also demonstrated when the ability to increase cardiac output is compromised; during exercise, the prevailing blood pressure is established primarily by an increase in cardiac output, but if the contribution of the cardiac output is not sufficient to maintain the preset blood pressure, the arterial baroreflex increases peripheral resistance by augmenting sympathetic activity and restricting blood flow to working skeletal muscles.

Editor's Note: Although wrestlers were not included, I believe that they would yield results similar to the rowers, swimmers, and cross-country skiers studied. The results point for the need for sport-specific testing.

Smith, Abbie E.; Roberts, B. Scott; Koch, Alex; Mayhew, Jerry (2006) Within-Day and Between-Day Variations in Urine Specific Gravity and Osmolality Measurements. *Missouri Journal of Health, Physical Education, Recreation & Dance* 2006, Vol. 16, p38

Keywords: Measurement precision; reliability; hydration; athletes

NCAA regulations prohibit wrestlers from competing when urine specific gravity is >1.020 . The assessment of U_{sg} is usually performed on a single occasion typically during the afternoon hours. Despite the finality of the measurement for determining wrestling eligibility, no evaluation of the within-and between-day variability of measurement has been done. The purpose of this study was to assess the variations in measurement of U_{sg} and osmolality (U_{osm}) within and between days. Six moderately trained individuals (5 M, 1 F) collected 138 samples over a 5-day period. Fluids and diet were allowed ad libitum. U_{sg} was measured in duplicate using a refractometer (ICAL model 2020), and U_{osm} was determined using freezing-point depression (Advanced Micro-Osmometer, model 3300). The interclass correlation coefficients were $ICC = 0.99$ for both U_{sg} and U_{osm} . U_{sg} was highly correlated with U_{osm} ($r = 0.98$) indicating that a $U_{osm} = 755$ mOsm was equivalent to a $U_{sg} = 1.020$. Individual within-day variations ranged from 0.0069 to 0.0084 for U_{sg} and 279 to 323 for U_{osm} . Individual between-day variation ranged from 0.0016 to 0.0084 for U_{sg} and 133 to 354 for U_{osm} . Repeated-measures ANOVA across days indicated no significant pattern to either U_{sg} or U_{osm} . Fifty-eight samples (44%) were above the 1.020 cut-off and ranged from 2% to 92% within individuals. Daily water intake was significantly inversely correlated with U_{sg} ($r = -0.43$) or U_{osm} ($r = -0.38$). Use of protein supplements was significantly directly correlated with U_{sg} ($r = 0.68$) or U_{osm} ($r = 0.70$). Time of day does not appear to be an essential criteria for assessing U_{sg} and U_{osm} . However, water intake and/or protein supplementation may increase both the within-day and between-day variations of measurement.

Editor's Note: Hydration assessment, using urine specific gravity, is now a standard part of wrestling weight control plans. It has been attacked by some athletes and coaches as being arbitrary and not accounting for natural individual variation. This information seems to support the current procedures for hydration assessment used in most weight control plans. This can be helpful to the sports medicine personnel who are in a position to evaluate the plans.

Sophromadze, Z., Chabashvili, N., & Kakhabrishvili, Z. (2006). Lower extremity vein digital photoplethysmography in highly qualified football players and wrestlers. *Georgian Med News*, 133, 72-74.

Keywords: blood flow/preparation/recovery/restoration/training

Abstract: Modern sport, along with the high technical, tactic and psychological readiness, requires good physical preparation achieved by a big physical load during trainings and competitions. Aim of the investigations was to study lower extremity venous system functional condition during physical load in highly qualified football players and wrestlers. Highly qualified 25 football players and 30 wrestlers, of age 18-25 years, were studied. Olympic, World and Europe champions were included among wrestlers. Lower extremity venous system digital photoplethysmography (D-PPG) was conducted by apparatus: Rheo Dopplex II of Huntleigh Diagnostics. The equipment digitally analyses photoplethysmographic plots. Significant functional parameters: vein restoration time (VRT) and venous pump function (VP) in deep venous system were reported by the apparatus appropriate software. It included parameter interpretation diagram, defining degree of venous system condition as normal, equivocal or pathological. Target sportsmen were examined in the sitting position with physical loading pedis. Sportsmen lower extremity vein light transducing change registration associated with the degree of vessel filling was studied by digital photoplethysmography. The study results showed that vein restoration time (VRT) in

football players is two times minor to compare to the one of wrestlers, while venous pump (VP) function is about 1.5 times higher in footballers than in wrestlers. Degree of lower extremity venous system condition according to parameter interpretation diagram program showed normal values only in few cases. Slight deviations were observed only in individuals with recent trauma. Further examination after the appropriate treatment revealed normal values in traumatic subjects. The search also showed that digital photoplethysmography appears to be effective, simple and financially available diagnostic method, which should be more frequently applied in lower extremity vein function examinations among sportsmen of different kinds as well as in estimation of recovery therapy effectiveness in post-trauma period.

Notes: Department of Medical Rehabilitation and Sports Medicine, Tbilisi State Medical University.

Sophromadze, Z. (2006). Color Doppler ultrasonography study of highly qualified wrestler and football players upper and lower extremity arteries. *Georgian Med News*, 131, 47-49.

Keywords: artery/blood flow/ultrasonography

Abstract: Reaching high results in sports is main problem in the field of modern sport. It is based on sportsman's appropriate health condition to meet high intensity and amount of training and competition load. Highly qualified sportsmen wrestlers (30 individuals) and football players (25 individuals) were studied. Age range was 18-25 years. The aim was to study upper and lower extremity artery functional condition during rest and physical exercise among highly qualified wrestlers and footballers. Colour duplex sonography was performed by apparatus Acuson 128 x P/10, transducers -7.5 MHz lineal. Upper and lower extremity arteries simultaneous visual examination was performed in B-regime with blood stream colour cartogram and blood stream spectral analysis. Upper and lower extremity artery colour duplex sonography study revealed that wrestlers' upper extremity artery lumen diameter and blood stream flow was 1 fold increased. Study also demonstrates lower extremity middle calibre artery lumen diameter 1.5 fold increase after exercise in football players than in wrestlers. Thus, upper and lower extremity arteries differently react on physical exercise among sportsmen of different kinds, e.g. footballer lower extremity artery diameter and blood flow reach high levels more than in wrestlers, while, the same parameters in upper extremities arteries do so in wrestles, rather than in footballers.

Editor's Note: Blood flow characteristics of different athletic groups at this point seems to be basic research. At what point will this yield information for the coach has yet to be uncovered.

Tomikowa, R. (2006). Mongolian Wrestling (Bukh) and Ethnicity. *Int J Sport Health Science*, 4, 103-109.

Keywords: folk wrestling/history/Mongolia/sociology

Abstract: Bukh is a Mongolian traditional sport, in which the wrestler's body represents a beast and a bird of prey, namely supernatural strength. This is recognized as a numinous embodiment or spiritual possession. In the meantime, the incarnation rite of Bukh also functions as that of the community of Nutag. The symbolism of Bukh, in this meaning, is realized in two ritual spaces, the Ovoo festival whose cultural background lies in Nutag and Naadam festivals and Bukh serves a function as a mechanism to sustain collective memories and identity, perpetuating the identity of the Mongolians.

Editor's Note: Wrestling holds a very important position in Mongolian life and culture. There are many examples of folk wrestling that should be studied and documented before they are lost. In the photo to the left, a Mongolian wrestler wears a traditional wrestling hat.



Turbeville, S. D., Cowan, L. D., & Greenfiels, R. A. (2006). Infectious Disease Outbreaks in Competitive Sports: A Review of the Literature. *Am J Sports Med*, March 27.

Keywords: Disease Outbreaks/Environment/epidemiology/herpes/HerpesSimplex/Infection/injuries /practice /Skin infections/Staphylococcus aureus

Abstract: Recent outbreaks of infectious diseases in athletes in competitive sports have stimulated considerable interest. The environments in which these athletes compete, practice, receive therapy for injuries, and travel, both domestically and internationally, provide varied opportunities for the transmission of infectious organisms. The purpose of this medical literature review is to identify the agents most commonly reported in the medical literature as responsible for infectious disease outbreaks in specific sports and their modes of transmission and to guide targeted prevention efforts. A literature review of English-language articles in medical publications that reported outbreaks of infectious diseases in competitive athletes was conducted in PubMed MEDLINE from 1966 through May 2005. Outbreaks that were solely food borne were excluded. Fifty-nine reports of infectious disease outbreaks in competitive sports were identified in the published medical literature. Herpes simplex virus infections appear to be common among wrestlers and rugby players, with no single strain responsible for the outbreaks. Methicillin-resistant *Staphylococcus aureus* was responsible for several recent outbreaks of soft tissue and skin infections among collegiate and professional athletes. The most common mode of transmission in outbreaks was direct, person-to-person (primarily skin-to-skin) contact. Blood-borne exposure was implicated in 2 confirmed outbreaks of hepatitis. Airborne and vector transmissions were rarely reported. This review provides an overview of infectious disease outbreaks thought to be either serious enough or unusual enough to report. Appropriate surveillance of the frequency of infections will allow sports medicine staff to identify outbreaks quickly and take necessary measures to contain further transmission and prevent future outbreaks.

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Editor's Note: *An outstanding compilation. It points out the weaknesses used in some studies of disease outbreaks that do not perform "sufficient analyses to identify likely sources of exposure." Wrestling (32%) followed football (34%) with frequency of reports of outbreaks for specific sports. An interesting fact is that the earliest reference to an disease outbreak in competitive sport deals with professional wrestlers-Patton, JM. Wrestler's Trachoma. Am J Ophthalmol. 1922; 5:545.*