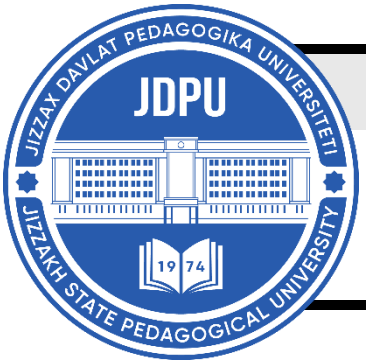
DOI: https://doi.org/10.37547/mesmj-V5-I1-28 Pages: 200-207

MENTAL ENLIGHTENMENT SCIENTIFIC – METHODOLOGICAL JOURNAL



MENTAL ENLIGHTENMENT SCIENTIFIC – METHODOLOGICAL JOURNAL

http://mentaljournal-jspu.uz/index.php/mesmj/index

THE IMPORTANCE OF DEVELOPING THE QUALITY OF STRENGTH IN WRESTLING

Ulugbek R. Karimov
Associate Professor
National University of Uzbekistan
Tashkent, Uzbekistan
E-mail: U_Karimov@mail.ru

ABOUT ARTICLE

Key words: wrestling, complex skills, strength, training program, adaptive ability, physiological profile, tournament, physical performance, volumes.

Received: 04.01.24
Accepted: 06.01.24
Published: 08.01.24

Abstract: Wrestling is a dynamic, high-intensity combative sport that requires complex skills and tactical excellence for success (Zi-Hong et al., 2013). To be successful on the world stage, wrestlers need very high levels of physical fitness. Wrestling demands all qualities of fitness: Maximal strength, aerobic endurance, anaerobic power and anaerobic capacity. To be effective, wrestling techniques must also be executed with high velocity (Zi- Hong, 2013). Enhancing the functional ability of each of these physiological qualities is the primary aim of the Wrestling S&C Coach. Athletes who wrestle at an elite level (international caliber) are often required to perform strength, power, and endurance training concurrently with aims to achieve improvements in all performance measures. Concurrent training is defined in the literature as strength and endurance training in either immediate succession or with up to 24 hours of recovery separating the 2 exercise modalities (Reed at all, 2013). Much of the research indicates a possible attenuation of strength and power as a result of concurrent training while aerobic capacity and endurance performance appear to be minimally affected (O.Sullivan, 2013). Concurrent training also applies in the technical and tactical development of the wrestler. Often the rigorous demands of practice can create a high level of fatigue, which must be considered when we advise a training program.

INTRODUCTION

The efficiency, safety, and effectiveness of strength training programs are paramount for sport conditioning. Therefore, identifying optimal doses of the training variables allows for maximal gains in muscular strength to be elicited per unit of time and also for the reduction in risk of over-training and/or overuse injuries. A quantified dose-response relationship for the continuum of training intensities, frequencies and volumes has been identified for recreationally trained populations but has yet to be identified for competitive athletes. The purpose of this analysis was to identify this relationship in collegiate, professional, and elite athletes[1]. A meta-analysis of 37studies with a total of 370 effect sizes was performed to identify the dose-response relationship among competitive athletes. Criteria for study inclusion were (a) participants must have been competitive athletes at the collegiate or professional level, (b)the study must have employed a strength training intervention, and (c) the study must have included necessary data to calculate effect sizes. Effect size data demonstrate that maximal strength gains are elicited among athletes who train at a mean training intensity of 85% of 1 repetition maximum (1RM), 2 days per week, and with a mean training volume of 8 sets per muscle group. The current data exhibit different dose-response trends than previous meta-analytical investigations with trained and untrained nonathletes. These results demonstrate explicit dose-response trends for maximal strength gains in athletes and maybe directly used in strength and conditioning venues to optimize training efficiency and effectiveness [2].

MATERIALS AND METHODS

Although concurrent training does allow for the training of multiple physical qualities, it does place great adaptive demands on the athlete. The acute responses and long-term adaptations of the Neuromuscular and Neuroendocrine systems seem to be the most relevant areas to investigate with this population [3]. Many factors appear to determine the adaptive ability of elite wrestlers to concurrent training, including the athlete’s level of physical conditioning, overall life stressors, nutrition1, overall training volume, and the training program design.

Gaining insight into the most optimal ways to minimize interference by understanding models of fatigue are the cornerstones of this article. Also, understanding and analyzing elite level wrestlers’ physiological data gives practitioners insight into the benchmarks their athletes must reach to perform at the highest level [4].

The objectives of this article are as follows:

To highlight the physiological profile of elite, word-class male and female wrestlers.

To review concurrent training literature and observe the adaptations that result from different methodology.

To offer some programming strategies to minimize the interference effect and optimize the adaptation process.

To provide some future study design directions for researchers in this area so that the training programs being evaluated are an accurate representation of elite freestyle wrestling performance.

Wrestling can be traced back to ancient times. “During the Ancient Olympic Games, from 708 B.C., wrestling was the decisive discipline of the Pentathlon. In fact, it was the last discipline to be held – after the discus, the javelin, the long jump and the foot race – and it designated the winner of the Pentathlon, the only crowned athlete of the Games” (United World of Wrestling Website).

Freestyle wrestling first made its appearance in 1904. In Greco-Roman wrestling only upper body moves are allowed, whereas freestyle includes upper body and leg wrestling. Both styles are currently offered in the Olympic Games and other international competition (Horswill, 1992) [5]. In September 2001, the International Olympic Committee announced the inclusion of Women’s Freestyle wrestling at the 2004 Olympic Games in Athens (Wrestling Canada website: Spectator Resources, 2016) [6].

Wrestling can be categorized as an intermittent, combative sport that requires maximal strength and power demands of the entire body, with a high anaerobic energy metabolic demand (Passelerague & Lac, 2012). It is also a weight class sport. Competitors are matched against others of their own size. This reduces the exclusion of smaller athletes in sports where physical size gives a significant advantage.

Wrestling activity is extremely chaotic in nature, encompassing repeated explosive movements at a high intensity that alternates with submaximal work. Thus, the primary energy systems utilized are the anaerobic adenosine triphosphate-creatine phosphate (ATP-CP) and lactic acid systems, within the scope of the aerobic system. It has been demonstrated that there are no major physiological differences between wrestlers of both freestyle and Greco-Roman styles (Mirzaei, 2009) [7].

In 1904, freestyle wrestling was first introduced during the St. Louis Games. At the Stockholm Olympic Games in 1912, freestyle wrestling was absent from the program, and “Icelandic wrestling” was instead organized. Wrestling matches took place on three mats in the open air. They lasted one hour, but finalists wrestled without a time limit (United World Wrestling Website). Over the past century, the match structure of international Freestyle wrestling has taken on several forms evolving past a continuous 5-minute period in the late 1990’s to the current: Two, 3-minute periods with a 30-second rest between periods. A match may be won by “fall”, by technical superiority or by points (Wrestling Canada website: Spectator Resources, 2016) [8]. During tournaments, multiple matches per day may occur over the course of a few days. There are no rule differences for female competitors. There is no overtime period; a tie is broken by point classification in the second round.

RESULT AND DISCUSSION

Very few studies examined pulmonary function amongst this population. Sharratt et al. (1984) found the pulmonary function, resting blood pressure and hematology measurements to “be typical

of healthy adult males" and there were no sport-specific differences on these parameters. Sharatt et al. (1984) also reported in elite senior level wrestlers, maximum minute ventilation was low relative to the peak oxygen uptake values and high levels of blood lactate. He hypothesized that elite wrestlers may "hypo ventilate during maximum exercise as a result of becoming conditioned to years of restricted breathing" (Sharratt et al., 1984). No data was found on elite females. There is, perhaps, a need for more research in this area [9].

Data collected on collegiate wrestlers have cardiac stroke volumes and left ventricular volumes similar to non-athletes but smaller than those of endurance-trained athletes. The wall and septum of the left ventricle were greater in the wrestler than in the non-athlete and endurance athlete. Because wrestling does not demand the high cardiac output or stroke volume of endurance sports, an expansion of the left ventricle chamber with training does not occur. In general, there is limited data on Pulmonary and Cardiac function on this population.

Strength is defined as the ability to exert force under finite conditions, independent of time and space. Strength is very much related to both velocity and biomechanics, so interpreting results of strength data when one cannot observe and monitor technique is limiting. In the wrestling literature, strength is often measured by a percentage of 1RM on a multi-joint/primary lift, by hand grip dynamometry and often expressed relative to the mass of the athlete (relative strength).

Rules changes in the 1970's changed the tactics of the sport of Freestyle wrestling placing importance on an aggressive style of wrestling versus holding or 'stalling.' As a result, improving the dynamic strength of wrestlers, in all muscle actions (concentric, isometric and eccentric) became a training focus. Horswill's review in 1992 compared successful male elite[2] wrestlers to less successful wrestlers and found that greater strength to be an advantage. However, although his work is very comprehensive, Horswill did not use typical primary exercises for strength assessment. Thus, his data is not particularly useful for the strength and conditioning coach [10]. Yoon (2002) also noted in his works that successful male wrestlers showed higher dynamic and isokinetic strength than unsuccessful wrestlers.

[2]*Elite = International level competitor*

A unique approach in how to address strength needs for this population was seen in East Germany. They tested for maximal strength through a 1-repetition max; speed strength by timing the lifting of a weight (75% of your weight class weight) for 8 reps; and tested strength endurance with maximum reps at the weight class standard. They also had performance standards for each weight class (2010 Annual Review of Wrestling Research).

WEIGHTLIFTING STANDARDS FOR EAST GERMAN WRESTLERS
MINIMUM STANDARDS FOR EACH WEIGHT CLASS

STRENGTH-1 REPETITION MAX

	WEIGHTCLASS (KG)									
LIFT	**48**	**52**	**57**	**62**	**68**	**74**	**82**	**90**	**100**	**130**
BENCH	85	90	95	100	105	110	115	120	125	130
PULLUPS	45	50	55	60	65	70	72.5	72.5	72.5	72.5
SQUAT	150	160	170	180	185	190	195	200	205	205
PRONE ROW	85	90	95	100	105	110	115	120	125	130
CLEAN	90	95	100	105	110	115	120	125	130	135

TIME FOR 5 REPS WITH WEIGHT CLASS STANDARD

	WEIGHTCLASS (KG)									
LIFT	**48**	**52**	**57**	**62**	**68**	**74**	**82**	**90**	**100**	**130**
BENCH	6.0	6.0	6.5	6.5	7.0	7.0	7.5	8.0	9.0	10.0
PULLUPS	6.0	6.0	6.0	6.5	6.5	6.5	7.0	7.0	7.5	8.5
SQUAT	5.0	5.0	5.0	5.5	5.5	5.5	6.0	6.0	6.5	7.5
CLEAN	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	9.0	9.5
ROPE CLIMB	5.3	5.2	5.1	5.0	5.0	5.0	5.1	5.2	5.4	5.4

MAX REPS WITH WEIGHT CLASS STANDARD

	WEIGHTCLASS (KG)									
LIFT	**48**	**52**	**57**	**62**	**68**	**74**	**82**	**90**	**100**	**130**
BENCH	40	38	36	34	32	30	28	26	24	22
PULLUPS	35	34	33	32	31	30	28	26	22	18
HALF SQUAT	66	64	62	60	58	56	54	52	48	44
PRONE ROW	40	38	36	34	32	30	28	26	24	22

Table 1. Annual Review of Wrestling Research

Dr. Boris Podlivaev also shared an updated version of his performance standards at the FILA Scientific Congress held at the Moscow World Championships.

A brief synopsis is included in the chart below, based on weight class. A more comprehensive list with wrestling-specific tests can be found in the literature (Podlivaev, 2010). No information was found on the protocols for these tests or why partial scores were given. The numbers for bench press and cleans appear to be very low as compared to the East Germans standards.

Table 2. Wrestling-Specific Tests by Weight Class

TESTS	55-60 kg	66-84 kg	96-120 kg
30 m sprint (s)	4.53	4.59	4.63
60 m sprint (s)	7.9	7.79	7.8
100 m sprint (s)	12.98	12.87	13.27
Pull-ups (n)	34.4	32.4	22.6
Push-ups (n)	70	68.1	57.6
Cleans (kg)	74	82	113.5
Bench Press (kg)	83	92.50	125.5
Hanging Leg Raises (n)	18.2	15.3	14.4
800 meter sprint (min)	2.47	2.51	3.20

8 km Cross (min)	28.34	29.18	36.31

Mizraei's case study on a World Champion Greco-Roman male wrestler (2010) collected pull-up data of 50 repetitions, (versus the National Iranian norm of 37 reps). This is considerably higher than the Russian data, but 'how' the tests were conducted (strict reps versus momentum) was not observed, so the data is difficult to compare [11].

The research on elite females by Zi-Hong et al. (2013) used several isokinetic tests at two different velocities as well as 5 isotonic exercises for evaluation. These included: Deep squats, Prone rowing, Olympic style deadlifts and Power cleans from the floor and a unique lift called the hold and squat to measure strength in elite female wrestlers [12]. These lifts were chosen because they are part of the Chinese female wrestlers training program. Four weight categories were tested (48kg, 55kg, 63kg, and 72kg). Average values for each lift, across four weight categories, are as follows:

Table 3. Chinese Female Wrestlers Training Program

Wt. Category	Deadlift	Deep Squat	Prone Rowing	Power Clean	Hold & Squat
48 kg	109 kg	90 kg	64 kg	74 kg	104 kg
55 kg	126 kg	100 kg	74 kg	75 kg	104 kg
63 kg	123 kg	99 kg	76 kg	77 kg	110 kg
72 kg	150 kg	106 kg	78 kg	82 kg	125 kg

To summarize Zi-Hong's research, it was found that an Olympic or World Championship medalist generally demonstrated the highest 1RM value for any weight category. Other research also indicated that more experienced and successful wrestlers, as defined by the number of international tournaments, were also stronger (Zi-Hong, 2013) [13].

It is important to mention very few papers used what would be typical strength and power exercises prescribed by a strength and conditioning coach to train and measure strength [14]. It would be ideal to see 1RM strength data on the top male and female Freestyle wrestlers using: Deep squats, bench press, prone rowing and cleans as exercises.

CONCLUSION

Experienced coaches who work with highly trained strength-power athletes would question most of the practical application of the research on concurrent training to date as it has often been conducted on untrained subjects for too short of an intervention period. Thus, research findings will be more helpful when the subjects tested are trained and include technical and tactical training as part of their overall training plan [15]. With experienced wrestlers, the use of RPE during both practice and matches combined with duration can give investigators good insight into total volume loads at

wrestling practice. Different technical skills practiced by the wrestler elicit very different levels of muscular effort, so this must be considered in the overall training program. Practice conditions can be classified as high intensity or low intensity: Live go's and match specific work to rest ratios are all high intensity. Technical, slower pace partner work might be considered low intensity. Heart rate data might not be helpful as a means to categorize intensity due to the nature of the work [16]. If we consider sport-specific drills and practice settings as specific modalities of endurance training, we might be able to evaluate their impact on strength, speed and power outcomes.

Understanding the demands of the sport of wrestling is of huge value to the strength & conditioning coach and sport scientist. The application of this knowledge must incorporate all dimensions of physiology, biomechanics and sport medicine with the combined intuition and coaching ability of the elite coach. A comprehensive review of fatigue models and Hans Selye's works is a terrific place to begin general investigation of the process of adaptation. The study and dissection of training practice of sprinters, throwers, jumpers, gymnasts, weightlifters, GS lifters, rowers, swimmers and endurance athletes also helps one understand the training process. It is from studying these less chaotic or purist sports that one can begin to understand how the athlete may or may not adapt to a training program that involves the development of several physical qualities at once (Tsatsouline, Personal Communication, 2016) [17].

REFERENCES:

[1]. ABERNETHY, P.J. Influence of acute endurance activity on isokinetic strength. *Journal of Strength & Conditioning Research* 7:141–146. 1993.

[2]. ABERNETHY, P.J., AND B.M. QUIGLEY. Concurrent strength and endurance training of the elbow flexors. *Journal of Strength & Conditioning Research* 7:234–240. 1993.

[3]. BAKER, D.G., AND NEWTON, R.U. Adaptations in upper-body maximal strength and power output resulting from long-term resistance training in experienced strength-power athletes. *Journal of Strength & Conditioning Research* 20 (3): 541-546, 2006.

[4]. BARBAS, I ET AL. Physiological and performance adaptations of elite Greco-Roman wrestlers during a one-day tournament. *European Journal of Applied Physiology* 111: 1421-1436. 2011.

[5]. BELL, G.J., S.R. PETERSEN, H. QUINNEY, AND H.A. WENGER. Sequencing of endurance and high-velocity strength training. *International Journal of Sports Medicine* 13:214–219. 1988.

[6]. BELL, G.J., SYROTUIK, D. et al. Effect of concurrent strength and endurance training on skeletal muscle properties and hormones concentrations in humans. *European Journal of Applied Physiology*. 81: 418-427. 2000.

[7]. CALLAN SD, et al. Physiological profiles of elite freestyle wrestlers. *Journal of Strength & Conditioning Research* 14(2): 162–169, 2000.

[8]. CHILIBECK, P.D., SYROTUIK, D and BELL, G.J. The effect of concurrent strength and endurance training on quantitative estimates of subsarcolemmal and intermyofibrillar mitochondria. *International Journal of Sports Medicine* 23: 33-39. 2002.

[9]. DOCHERTY, D., AND B. SPORER. A proposed model for examining the interference phenomenon between concurrent aerobic and strength training. *Sports Medicine* 30:385–394. 2000.

[10]. DUDLEY, G.A., W.M. ABRAHAM, AND R.L. TERJUNG. Influence of exercise intensity and duration on biochemical adaptations in skeletal muscle. *Journal of Applied Physiology* 53:844–850. 1982.

[11]. DUDLEY, G.A., AND R. DJAMIL. Incompatibility of endurance and strength training modes of exercise. *Journal of Applied Physiology* 53: 1446–1451. 1985.

[12]. GARCIA-PALLERAS J et al. Physical fitness factors to predict male Olympic wrestling performance. *European Journal of Applied Physiology* 111: 1747–1758, 2011.

[13]. GOLLNICK, P.D. Metabolism of substrates: energy substrate metabolism during exercise and as modified by training. *Symposium: Metabolic and Nutritional Aspects of Physical Exercise.* April 11, 1983.

[14]. HAKKINEN, K., ALEN, M., KOMI, P.V. Neuromuscular, anaerobic and aerobic performance characteristics of elite power athletes. *European Journal of Applied Physiology* 53: 97-105. 1984.

[15]. HAKKINEN K, ALEN M, KRAEMER W et al. Neuromuscular adaptations during concurrent strength and endurance training versus strength training. *European Journal of Applied Physiology* 89: 42-52. 2003.

[16]. HENNESSEY, L.C., AND A.W.S. WATSON. The interference effects of training for strength and endurance simultaneously. *Journal of Strength & Conditioning Research* 8:12–19. 1994.

[17]. HORSWILL C.A. Applied physiology of amateur wrestling. *Sports Medicine* 14(2). 114-143. 1992.