EXPLOSIVE POWER AND ANAEROBIC ENDURANCE FOR WRESTLERS

Andy Li-An Ho

Department of Physical Education and Graduate Institute of Sports Coaching Science, Chinese Culture University, Taiwan

The purpose of the article is to highlight several training programs used to condition wrestlers, especially for the anaerobic endurance and explosive power. Conventional interval training programs as well as timed Olympic lifting programs are used for different training goals. Conventional interval training programs with different work to rest ratio are used to elicit adaptations in different energy systems, while timed Olympic lifts with different repetitions and sets as well as rest periods between repetitions and between sets are used to improve explosive power and the capability to carry out explosive movements under fatigue.

KEY WORDS: Olympic lift, sprint, energy systems

Wrestling is a sport requires explosive power, dynamic and isometric strength, aerobic and anaerobic conditioning, quickness and flexibility. One of the biggest challenge that all wrestlers face is to perform under fatigue (Kraemer, Vescovi & Dixon, 2004). During a wrestling match, the blood lactate raise dramatically, which would directly influence the capability of the muscles to contract. Thus, the ability to tolerate discomfort and perform under the accumulation of lactate is crucial for the success in this sport. Although lactate accumulation is the characteristic of wrestling, all three energy systems including anaerobic alactic system, anaerobic glycolysis system, and oxidative system are important (Bompa &Carrera, 2004). The anaerobic alactic system supports activities that are very high in intensity but last for less than 10 second, such as to shoot a takedown or a sudden pull in techniques like arm drag. Anaerobic glycolysis system supports activities last longer than the anaerobic alactic system can sustain and can last up to around 2 minutes. Grappling and holding, sometimes in an isometric form, can last for longer than 30 seconds. In addition, efforts of repeated pushing and pulling would accumulate and result in a working period longer than what the anaerobic alactic system can support. The increase in working time comes with a decrease in working intensity. Thus, the anaerobic glycolysis can only support activities with moderate to high intensity. When activities last beyond 2 minutes, the oxidative system starts to play a more important role. The oxidative system can support for very long period of time, but the intensity is much less than the other two systems. Although working with low intensity is not the primary physical demand of wrestling, the matches usually last for a period of time that is long enough to use combined energy system, in which both anaerobic and aerobic energy system would have to contribute to the energy production. Besides, aerobic system is the primary energy system contributing to the period of recovery. Whether it's the recovery between short bursts of efforts, between different rounds of a match, or between several different matches in a tournament, the wrestlers need to recovery within limited time and try to perform the best of their capability.

In this applied article, I will present several interval training programs I used with the wrestlers I coached based on theories and experience. It is worth mentioning that in this article, there is no intention to provide training program designed to improve "every" aspect of wrestling. Factors not mentioned in this article, such as techniques, strategies, injury prevention, and periodization of strength and conditioning are equally important in our training program, but they are just not the focus of the current article. The purpose of the article is to introduce different interval training we used to improve anaerobic endurance and explosive power.

Interval training using both conventional interval training and weight training can elicit adaptations in lactate tolerance as well as improvement in anaerobic alactic system and aerobic capacity. Conventional interval training uses running on the track or on a treadmill, or cycling on the stationary bike, which can create a steady state of work in the preplanned intensity for a desired period of time. This type of training usually involve short bursts of work with a certain period of rests. The work to rest ratio is the key to the success of the training. The length of work depends on the energy system to be trained (anaerobic alactic system, anaerobic glycolysis system and oxidative system), and the length of the rests is determined by the energy system, the goal of training as well as the current training status of the athletes (Karp, 2004). Furthermore, the type of the rest, whether it's static rest or dynamic rest, is also determined by the energy system to be trained as well as the training goal.

Because of the energy demand, the interval training should be designed to fulfill the needs of wrestling matches. In conventional interval training, three energy systems can be stimulated by using different combinations of work to rest ratio. Training for the anaerobic alactic system consists of short period of working, typically from 6 to 12 seconds, with 30 to 60 seconds of static rest. The rationale behind this type of design is that the short working period ensures that the primary energy system used during the activity is anaerobic alactic system. With maximal or near maximal effort during the working period, the wrestlers can reach a near-exhaustion state. Although total recovery of the anaerobic alactic system requires 3 to 5 minutes of static resting, 70% of the recovery actually occur in the first 30 to 60 seconds (Bompa & Carrera, 2004). The reason to choose static resting is because dynamic rest may still be using some of the ATP resynthesized during recovery, which would lead to less ATP available in the next working period. When ATP is not readily available, anaerobic alactic system will not be able to support activities in high intensity, and anaerobic glycolysis system will take part to help fulfill the energy demand, which results in a lower working intensity supported by mixed energy systems. In this way, training effect in the anaerobic alactic system will be less. As the wrestlers progress, further increase in working intensity and gradual decrease in rest periods can be used to increase difficulty. Sprinting, shuttle running, biking and wrestling-specific drills are commonly used in this type of training.

Training for anaerobic glycolysis requires a working period around 30 seconds to 2 minutes. High intensity activities longer than 30 seconds will result in raise in blood lactate because it is the primary by-product of anaerobic glycolysis. Although blood lactate will return to normal in one hour after training, 45 seconds to several minutes of active recovery would be appropriate for interval training designed to challenge anaerobic glycolysis system. Different length of recovery periods actually serve different purposes of training. When training to improve energy production from anaerobic glycolysis, sufficient rest should be given. The commonly used rest period is twice as long as working period. Thus, the work to rest ratio is about 1:2. However, if the purpose of training is to train for lactate tolerance, one should choose relative shorter rest period. Work to rest ratio may be slightly less than 1:2, a work to rest ratio of 1:1.5 is a common example of this type of training. Depending on the training status of the athletes, sometimes the rest period can be shorter than working period during interval training for anaerobic glycolysis. Highly conditioned athletes may use a work to rest ratio of 1:0.5~0.7. Active recovery is usually used in interval training for anaerobic glycolysis system because active recovery helps remove lactate. Accumulation of lactate would result in reduced capability to produce energy from anaerobic glycolysis, which will result in a further decrease in working intensity and the increase in energy production from oxidative energy system . One thing need to be pointed out is that if the wrestlers do not have a good base of anaerobic capacity, training for lactate tolerance with incomplete recovery between working periods may result in decreased intensity in the next working set. Thus, the progression of anaerobic glycolysis training should be carried out by training for energy production first, and then

gradually reduce the resting period to improve lactate tolerance.

Anaerobic endurance of the wrestlers is build on the base of sound aerobic capacity. Training for aerobic capacity requires lower intensity of work for longer period of time. However, long and slow distance running may not be appropriate for wrestlers for many reasons. One of the reason is prolonged distance running may have some negative effect on power production from the muscle groups in the lower body (Baechle & Earle, 2008). Another reason is the steady state of distance running is different from the characteristics of wrestling, which include repeated explosive power production and dynamic/isometric muscular endurance (Bompa & Carrera, 2004). A typical interval training program can be used to train aerobic capacity without the previously mentioned disadvantages of long and slow distance running. Interval training designed to improve aerobic capacity generally include 2 to 6 minutes of working paired with 1 to 2 minutes of active recovery.

As previously mentioned, Interval training can also be carried out by using weights (Murlasits, 2004). Although some practitioners used weight machines in interval training, timed Olympic style lifts (Lansky, 1999) and free weight training are the preferred ways of training for several reasons. First, Olympic lifts provides the chance for wrestlers to lift with the strength and power of the whole body (Newton, 2006), which is similar to the movement patterns in wrestling matches. The weight machine usually provide several fixed directions to move the weight, so that it is not necessary for the wrestlers to stabilize or balance themselves This results in decreased reflective feedback in posture muscles (Cook, 2010). The weight machine usually designed to reduce the participation of the non-targeted muscle groups in other areas of the body, which is different from the mechanism of wrestling in which the body work as a whole to produce movements. Another advantage to use Olympic style of lifting is the explosive nature of snatch, clean and jerk. Although conventional free weight training using bench press, squat, dead lift and other pushing and pulling exercises provide chances to train dynamic or isometric strength, the rate of force development in these exercises is much less than Olympic lifts. Using Olympic lifts in interval training is very different from conventional interval training that use running or cycling. The effort of each lift is much greater than each step or pedal in conventional interval training, and the intensity of the rest between several consecutive lifts is much less than the steady state of running or cycling. With proper design, timed –Olympic lifts can provide fluctuating intensity during one set of interval training, which fits the need of wrestlers.

As mentioned before, timed Olympic lifting is to use snatch, clean, jerk, push press, high pull, etc, to design an interval training program. The first concern of timed Olympic lifting is safety (Lansky, 1999). Athletes should develop solid technique bases before using this type of training. Even for advanced athletes, the intensity should be low enough to maintain proper form throughout the training session. If the form or posture breaks down, the athletes should cease training or switch to an even lower intensity. Factors related to the training effect of timed Olympic lifting include weight/intensity, duration of rest, duration of one set and the number of sets.

General recommendation of intensity in timed Olympic lifting is 30 to 90% of one repetition maximum (1 RM). Within the range of intensity, the lower end of weight is used for anaerobic power training while the higher end is used to develop maximum or near maximum power. Two sorts of rests are used in timed Olympic lifting: rest between repetitions and rest between rounds. The rest between repetitions means the short break between each explosive lift. Duration of rest between repetitions is determined by the intensity and training purposes. A gradual decrease of rest period while using the same intensity is used to increase difficulty. Typically, 30 to 60 seconds of rest is used in training with 70 to 90% of 1 RM, while 5 to 10 seconds of rest is used in training with 30 to 50% of 1 RM. Apparently, the above two

combinations (high intensity with longer rest and low intensity with shorter rest) elicit different adaptation in the capability of the working muscles. High intensity with longer rest can be used to improve explosive power, while low intensity with shorter break can be used to train anaerobic endurance and maintain power production under fatigue. The duration of each round depends on repetitions and the length of the rest period.

The benefit of using timed Olympic lifts for interval training is that this type of training not only help the wrestlers develop or maintain explosive power, but the repeated efforts of the lifts also accumulate and result in a challenge to the energy systems. For example, one can use an intensity of 60% of 1 RM, with 8 seconds of rest between repetitions for a total of 25 repetitions as one set, and perform 6 sets with 90 seconds between sets. Each of the repetition requires explosive power to perform, which is supported by anaerobic alactic system. However, the accumulation of 25 repetitions without sufficient recovery within one set results in a challenge of anaerobic endurance. The 90 seconds of rest between sets provides incomplete recovery, which also challenges the anaerobic endurance of the wrestlers, especially in the 3rd through 6th sets. This type of interval training mode is more similar to the physiological demand in a wrestling match, which the wrestlers have to move explosively every several seconds. With proper design, periodized interval training programs can be used throughout the year to develop explosive power as well as anaerobic endurance of wrestlers.

REFERENCE:

Baechle, T.R. & Earle R.W. (2008). Essentials of Strength and Conditioning, 3rd Ed. Champaign, IL: Human Kinetics.

Bompa, T.O. & Carrera, M. C. (2004). Periodization: Theory and Methodology of Training. Champaign, IL: Human Kinetics.

Cook, C. (2010). Movement. OTP.

Karp, J. R. (2004). Interval Training for the Fitness Professional. Strength & Conditioning Journal, 22 (4): 64-69.

Kraemer, W.J., Vescovi, J. D.; Dixon, P. (2004). The Physiological Basis of Wrestling: Implications for Conditioning Programs. Strength & Conditioning Journal, 26(2): 10-15.

Lansky, R. C. (1999). Wrestling and Olympic-style lifts: In-season maintenance of power and anaerobic endurance. Strength & conditioning journal, 21(3): 21-27.

Murlasits, Z. (2004). Special considerations for designing wrestling-specific resistance-training programs. Strength & Conditioning Journal, 26(3): 46-50.

Newton, H. (2006). Explosive Lifting for Sports. Champaign, IL: Human Kinetic.