

Applying Complex Training Principles to Boxing: A Practical Approach

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SUMMARY

THIS ARTICLE DISCUSSES THE APPLICATION OF COMPLEX TRAINING PRINCIPLES IN THE DEVELOPMENT OF SPEED AND POWER IN BOXING. IN IT, WE ILLUSTRATE HOW THE ADDITION OF EXTERNAL RESISTANCE, APPLIED IN BIOMECHANICALLY SIMILAR WAYS TO TRADITIONAL BOXING SKILLS AND INCORPORATED BEFORE EACH TRADITIONAL BOXING TRAINING SET, CAN HAVE A POTENTIATION EFFECT, RESULTING IN SUBJECTIVELY OBSERVED INCREASES IN PERFORMANCE. IT IS ALSO HOPED THAT THIS ARTICLE MAY STIMULATE ADDITIONAL RESEARCH IN THIS AREA.

INTRODUCTION

Complex training, or the use of contrasting loads to elicit an acute enhancement in power output (12), has gained much interest in recent years, both as a training method for developing power and as a warm-up (7,14,15). In practice, complex training involves exercise sets whereby a traditional strength movement is followed by a biomechanically similar power exercise (1,2). An example of this is a set of heavy back squats

(5 repetitions at 5RM) followed by a set of 5 counter-movement jumps. This approach can lead to an enhanced performance of the subsequent lighter set over and above that which would occur without the previous heavy resistance set (3).

The short-term augmentation of subsequent power exercise is likely a result of enhanced twitch potentiation (11,12,16) after the heavy resistance exercise. This is usually termed post-activation potentiation in situations in which the muscle actions are voluntary. Several studies have shown positive effects of complex training for the acute enhancement of upper-body power. Gullich and Schmidtbleicher (10) observed a significant reduction in the movement time of a rapid bench press movement after isometric maximum voluntary contractions; Evans et al. (7) observed a significant increase in medicine ball put distance after the performance of a 5RM bench press; Baker (3) reported a 4.5% increase in power output, assessed by Smith machine bench press throws with a resistance of 50 kg, following the performance of 6 repetitions of bench press at 65% of 1RM.

Other than the type of exercise chosen for the initial potentiating exercise, 2 major variables must be considered: the optimal load for the initial potentiating exercise and the rest interval

before the performance of the subsequent power set.

OPTIMAL LOAD

There is some evidence supporting the use of heavy loads for the strength movement. Successful protocols have used loads in the region of 5RM; these protocols require participants to lift at intensities approaching 85% of their 1RM for 5 repetitions, before performance of the subsequent power exercise. Significant increases in the performance of the subsequent power activity (in both upper and lower body) have been observed after these heavy load protocols (5,7,8,13–15,17).

REST INTERVAL

When seeking to enhance performance with complex or contrast methods, there is a trade off between the degree and time course of the potentiation achieved and the fatigue induced by the preload stimulus (6,10). It is important, therefore, to identify the time when the muscle has recovered from the fatiguing preload, but still demonstrates an enhanced or potentiated performance. Significant increases in the performance of the subsequent power activity have been observed after rest intervals of between 3 and 4 minutes (3–5,7–10,13–15,17).

KEY WORDS:

boxing; post-activation potentiation; complex training

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Table 1
Steps taken when applying complex training principles to boxers

Step	Action
1	Identify areas for improvement. Usually information is achieved from a combination of fitness testing and through discussion with the coach. If the needs analysis reveals the boxer needs to improve speed, power, or strike rate, then progress to step 2.
2	Identify key punches used by the individual: jab, hook, uppercut, etc. Achieved through video analysis of the boxer during training and competition and in consultation with both the boxer and coach.
3	Experiment with cables, dumbbells, and bungee cords to identify the appropriate technique and body positions required to match the style of the boxer. It is important that the techniques used have a high mechanical specificity to the actual moves used by each individual boxer in the ring.
4	Implement contrast training principles to improve speed, power, and punch rate.

Table 2
Exercises used

Exercise	Coaching points	Contrasted with
Cable uppercut	5–6 reps. Med/Heavy load (6–8 RM). Use a low pulley so the direction of resistance is close to vertical. With hand held close to body the emphasis is on a powerful drive upwards with the legs and on the efficient transfer of forces through the trunk. Focus on the recoil out of the bottom position. We place this exercise first because it involves the heaviest load and gets the boxer into the mindset of using the legs and trunk to develop the force (Figure 1).	Explosive uppercuts into bag (5–6 reps*).
Cable hook	5–6 reps. Use the heaviest load that the athlete can maintain good form with for 6–8 reps, but no heavier! The pulley (or bungee cord) is at mid trunk height with the direction of resistance almost horizontal. Emphasize trunk rotation and back foot swivel to ensure optimal ground reaction force. Hand held close to body (Figure 2).	Explosive hooks into bag (5–6 reps*).
Cable jab	5–6 reps. Select a weight that allows a fast, high quality movement, but still only allows 6 reps (6RM). Emphasize foot positioning and transferring forces efficiently from the feet to the hands.	Explosive jabs into bag (5–6 reps*).
Heavy dumbbell shadow boxing	6–10 seconds. We use dumbbell loads ranging from 15 to 25% of the athlete's body mass (approximately 10- to 17.5-kg dumbbells for a middleweight fighter). Emphasis is on legs and trunk to transfer forces to the hands. The athlete keeps dumbbell close to body and must be able to maintain this without hands dropping. Punches are not thrown. May be performed tethered (Figure 4).	Either unweighted shadow boxing (10–15 seconds) with the emphasis on speed or explosive punch bag combination (10–15 seconds) (Figure 5).
Light dumbbell shadow boxing	6–10 seconds. We use dumbbell loads in the range 5 to 10% of body mass. (Normally 5- to 7.5-kg dumbbells for a middleweight). Emphasize speed and good technique from legs and trunk. Arms extend as punches are partially thrown, but never fully extend. (Figure 3). May be performed tethered (Figure 4)	Unweighted shadow boxing with the emphasis on speed (10–15 seconds).
Shadow boxing	No contrast set. 10–20 seconds. Emphasis on fast and relaxed. Always finish the session fast.	

*We typically use 5–6 repetitions. This tends to be self selected by the boxers as the range that allows maximal intensity for each repetition without a decrease in the velocity of movement.



Figure 1. Cable uppercut.



Figure 3. Dumbbell shadow boxing.



Figure 5. Explosive punch bag combinations.



Figure 2. Cable hook.



Figure 4. Dumbbell shadow boxing-tethered.

APPLICATION OF COMPLEX TRAINING TO BOXING

The training methods used with boxers have evolved from the findings and principles highlighted previously but with specific application to the movements used in boxing. Typically, we adopt the following steps when

applying complex training principles to boxers (Table 1).

EXERCISES

Most of these exercises are performed with the boxer's hands wrapped and wearing mitts, which allows the boxer to grip the cables/dumbbells and also

protects his hands when punching a bag in the subsequent power set. Some experimentation with foot and body position is required with individual athletes to make these exercises feel as natural as possible.

The authors recommend a variety of rest intervals, from 30 to 240 seconds. Although previous research would suggest that 240 seconds provides an appropriate balance between fatigue and potentiation (3,4,7,9,10,14,15,17), the authors have observed enhanced performance with as little as a 30 seconds rest interval. We believe that this short interval is likely a result of the emphasis we place on correct technique during the heavy preload activity, with the boxer performing just enough repetitions to induce potentiation, yet not enough to induce fatigue (see Table 2 for examples; Figures 1-5).

The exercises are performed in the order shown, which allows us to always finish the session with high-velocity movements (Table 3). We do, however, usually only perform 3 or 4 separate exercises in each session. For example, typically, we will include only 1 complex training session per week and

Table 3
A typical session

1	3× cable uppercut (5–6 reps; 6–8 RM*)/punch bag uppercuts (5–6 reps)
2	3× cable hook (5–6 reps; 6–8 RM*)/punch bag hooks (5–6 reps)
3	2× heavy dumbbell shadow boxing (6–10 seconds; 15–25% body mass)/punch bag combinations (6–10 seconds)1× heavy dumbbell shadow boxing (6–10 seconds; 15–25% body mass)/unloaded shadow boxing 10–15 seconds)
4	2× shadow boxing (10–20 seconds).

*These loadings refer to the loads at which 6–8 perfect repetitions can be performed without compromising technique.

continue to build over a 6- to 8-week period from 8 to 10 weeks out from a fight. This schedule allows this type of power training to compliment the fight-specific work undertaken without compromising the athlete's other training.

It is important when training athletes to enhance speed and power that the training emphasis stays firmly on high-velocity, high-quality movements and that the sessions do not induce metabolic fatigue. Ideally, these sessions should be performed when the athlete is not fatigued. They can be incorporated before other boxing sessions. Close liaison with the coach will be required to ensure there is no conflict with the other training the boxers will be undertaking. Attributes such as local muscular endurance, fatigue resistance, or boxing-specific cardiovascular fitness should not be trained within these sessions. These attributes can and should be trained elsewhere.



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