

Training Wiser Instead of Training Harder: A Complex Training Program (CPX)

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Gönderilme Tarihi: 18.12.2020 – Kabul Tarihi: 25.02.2021

Abstract

A Badminton competition at the elite level requires a high combination of neuromuscular function and the involvement of these systems depends on the nature of the sport. This mini-review study aimed to discuss the impact and vital role of complex training programs (CPX) on physiological performance variables. CPX training program is one of the most advanced forms of the sports training program which follows as the combination of traditional weight training exercises immediately with lighter load explosive plyometric exercises, set for set. Previous researchers have shown that the CPX training program has a positive impact on the anthropometric variables, sprint, vertical jump (VJ), and change of direction (COD). The results of the authors recommend the use of CPX to maximize the upper and lower body power. Therefore, many practitioners and coaches are looking to find the best training for optimizing training programs and at the same time reduce the risk of injury. To become an elite badminton athlete, the physiological characteristics requirement is quite specific. Therefore, the authors mentioned that “right training, at the right time, makes you perfect”. In conclusion, this mini-review has revealed that a combination of weight strength training followed by plyometric training is needed during periodization for improving neuromuscular functions

Keywords: Athlete Performance, Strength Training, Conditioning, Plyometric Training

Daha Şiddetli Antrenman Yerine Daha Akıllı Antrenman: Kompleks Antrenman Programı (CPX)

Öz

Elit düzeyde bir Badminton müsabakası, nöromusküler fonksiyonun yüksek bir kombinasyonunu gerektirir ve bu sistemlerin katılımı, sporun doğasına bağlıdır. Bu mini inceleme çalışması, karmaşık antrenman programlarının (CPX) fizyolojik performans değişkenleri üzerindeki etkisini ve hayati rolünü tartışmayı amaçladı. CPX antrenman programı, geleneksel ağırlık antrenmanı egzersizlerinin, set için ayarlanmış daha hafif yük patlayıcı pliometrik egzersizlerle hemen bir araya getirilmesiyle takip edilen spor antrenman programının en gelişmiş formlarından biridir. Önceki araştırmacılar, CPX antrenman programının antropometrik değişkenler, sprint, dikey sıçrama (VJ) ve yön değişikliği (COD) üzerinde olumlu bir etkisi olduğunu göstermişti. Yazarların sonuçları, üst ve alt vücut gücünü en üst düzeye çıkarmak için CPX kullanımını önermektedir. Bu nedenle, birçok uygulayıcı ve koç, antrenman programlarını optimize etmek ve aynı zamanda yaralanma riskini azaltmak için en iyi antrenmanı bulmaya çalışıyor. Seçkin bir badminton sporcusu olmak için fizyolojik özellikler gereksinimi oldukça spesifik. dolayısıyla yazarlar “doğru zamanda doğru antrenman sizi mükemmelleştirir” demişlerdir. Sonuç olarak, bu mini inceleme, nöromusküler fonksiyonların iyileştirilmesi için periyodizasyon sırasında ağırlık kuvvet antrenmanının ardından pliometrik antrenmanın bir kombinasyonunun gerekli olduğunu ortaya koymuştur.

Anahtar kelimeler: Sporcu Performansı, Kuvvet Antrenmanı, Kondisyon, Pliometrik Antrenman

1. Introduction

One of the most interesting sports all around the world is Badminton which originally is from China (Liu et al., 2021). Badminton is a racquet sport discriminated by periods of high intensity interspersed with short rests between rallies and is a highly explosive sport that involves a unique movement technique and strength over a relatively small court area (Fu et al., 2021). Badminton requires a combination of aerobic and anaerobic fitness, strength, power, speed, quick change of direction (COD), jumps and lunges, flexibility, technical skill, and psychological (personality & motivation) characteristics (Henn, 2021). Regarding elite athletes' performance, it is well established that physiological factors are essential in players' improving performance and success in the competition. That, the capacity to generate high force, strength, and high power output plays a major role in overall athletic performance and based on a recent review and meta-analysis by Harries et al. (2012) has been proposed as the foundational basis for athletic development (Harries et al., 2012). However, besides improving athlete performance, also coaches are looking to prevent and decrease the level of injuries. As researchers have shown that the level of injuries in badminton athletes are too high as they mentioned participants and engage in the tournament can make the risk of injuries up to %39 (Phomsoupha & Laffaye, 2020). Therefore, with regards to the above mentioned coaches and practitioners trying to find a safe pathway for reaching athletes to peak performance. Hence, one of the most exciting methods used by the practitioner is strength training.

Strength training defines as an efficient method for increasing the strength and hypertrophy of muscle (Carpinelli & Otto, 1998). Of course for reaching this level of proficiency, the strength training order and manner are really important that what kind of strength, with how much intensity and the speed of muscle contraction. Therefore, the coaches and practitioners who are looking for muscle hypertrophy them using as high volume with low muscle contraction speed. However, many athletes from the explosive sport who are looking for maximum muscle contraction in a short time use high intensity and low volume of strength training (Ferreira et al., 2020). Therefore, sports scientists and coaches for reaching a high level of muscle power output trying to use different and mixed-method strength training for instance by manipulating exercise intensity and volume and also, using new equipment such as resistance band, elastic band, eccentric and concentric, and plyometric exercise.

Another type of exercise modality which many coaches are using in the training program schedule is known as plyometric exercise (Grgic et al., 2020). Plyometric exercise or by some scientists named the stretch-shortening cycle (SSC) refers to skeletal muscle movement which is classified as eccentric (lengthening muscle), isometric (static contraction), and finally concentric (shortening) muscular actions. Indeed, SSC is a collaboration of neural and muscular functions (Guo et al., 2021). SSC enhances neuromuscular power by enhancing the stored energy

elastic. Therefore, if coaches use it correctly and with the high-velocity movement then the stored and released energy is more countable. Today, coaches use different modalities of plyometric exercise such as countermovement jump, hurdling, throwing, static jump using the medicine ball and elastic band (Bhosale et al., 2020). Therefore, the main goals of any coach and practitioner are optimizing training programs and at the same time, decrease the risk of injuries. Hence, we are introducing one of the powerful training modalities known as a complex training program.

The complex training program (CPX) is comprised of two major training modalities and incorporates a set of resistance exercises followed by paired plyometric exercises (Figure 1) (Saad). A review by Thapa et al. (2020) describes the CPX training program is defined as a combination training that alternates biomechanically similar high-load resistance-training exercises with lighter-load power exercises, set for a set (Thapa et al., 2021). The CPX training program is applied to increase muscular strength, muscular endurance, speed, explosive power, COD, and overall performance mediated by increasing the rate of force development (RFD) (Cormier et al., 2020). The neuromuscular features underlying these positive adjustments may be associated with changes in physiological mechanisms such as phosphorylation of myosin light chains, storage and utilization of elastic energy (stretch-shortening cycle function), type II muscle fibers, motor unit recruitment, muscle and nerve synchronization, firing frequency rate, and inter and intramuscular coordination (Jensen & Ebben, 2003). To the best of the authors' knowledge, there are no studies were found on the effects resulting from the application of complex training in an elite badminton athlete. Hence, given the lack of literature on the effects of complex training in badminton sports, therefore, in the current brief communication, we introduce the 4-weeks CPX training program example for an elite badminton athlete.

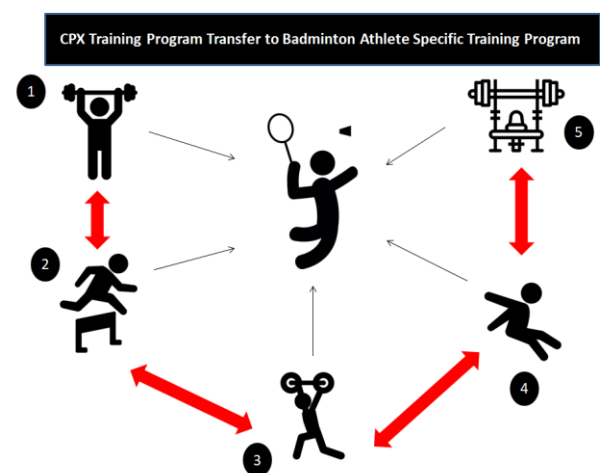


Figure 1. The schematic picture of the CPX training program

2. Complex Training Program

Here, the authors introduce one of the acceptable CPX training programs. In this regard, the athlete at first tries to use the strength training concerning the one-repetition maximum 1RM (%70-%80-%90) and after that perform the explosive plyometric exercise. So, such other training programs the most important variable is to increase the training overload by volume or intensity or both of them. For instance, one simple method to increase the training intensity is to modify the height of the jump box or the number of repetitions or to increase the 1RM percent. Therefore, this example of CPX training program is managed for four weeks with increase the volume and intensity each week for an elite badminton athlete who is looking for increasing maximal muscle output, maximal change of direction without any fatigue to decrease their performance during the match.

Table 1: The example of Strength and Plyometric exercise training method

Strength Exercise									
Variables	Week-1 Intensity	Week-2 Intensity	Week-3 Intensity	Week-4 Intensity	R	S	RBE	RBS	
1 Squat	70 %	80%	90 %	70%	4-6	3	3	3-5	
2 Bench Press Barbell	70 %	80%	90 %	70%	4-6	3	3	3-5	
3 Leg Curl Machine	70 %	80%	90 %	70%	4-6	3	3	3-5	
4 Seated Barbell Shoulder press	70 %	80%	90 %	70%	4-6	3	3	3-5	
5 Leg Extension Machine	70 %	80%	90 %	70%	4-6	3	3	3-5	
Explosive Plyometric Exercise									
1 Front Box Jump	3 x 8 (20 cm)	3 x 8 (30 cm)	3 x 8 (40 cm)	3 x 8 (20 cm)	6-8	3	3	3-5	
2 Two Handed Medicine Ball Chest Throw	3 x 8 (5 kg)	3 x 8 (6 kg)	3 x 8 (8 kg)	3 x 8 (5 kg)	6-8	3	3	3-5	
3 Drop Jump + Rebound	3 x 8 (20 cm)	3 x 8 (30 cm)	3 x 8 (40 cm)	3 x 8 (20 cm)	6-8	3	3	3-5	
4 Medicine Ball Over Head Throw	3 x 8 (5 kg)	3 x 8 (6 kg)	3 x 8 (8 kg)	3 x 8 (5 kg)	6-8	3	3	3-5	
5 Double Leg Band Hamstring Kick	3 x 8	3 x 12	3 x 15	3 x 8	6-8	3	3	3-5	

Note. Each strength exercise follows by each plyometric exercise simultaneously. For example, Athlete at first did one set of squat for 6 repetitions then did the front box jump for 8 repetitions and so on and so forth. R = Repetitions; S = Sets; RBE = Rest Between Exercise; RBS = Rest Between Sets; m = Minutes;

3. Discussion

This brief communication presents novel and valuable, concomitant with monitoring athlete training execution, regular feedback discussion, and negotiation based upon training method. The main goal of this study is that there was a notable increase in the physiological capability observed in 4-week of the CPX training program in an elite badminton player. The CPX training program had a positive impact on decreasing body mass, body fat percentage, 20-m sprint and 5-0-5 agility time with concomitant increases in the vertical jump, as well as peak and average power output as the previous researchers mentioned that (Comyns et al., 2010; Jensen & Ebben, 2003; Thapa et al., 2021). In parallel, previous researchers have proposed the benefits of CPX training in improving athlete physical performance in different sport but not in Badminton (Cormier et al., 2020; Jensen & Ebben, 2003; Saad; Thapa et al., 2021). Numerous factors may have contributed to the changes in the vertical jump, sprint, and COD abilities including better muscle synchronization, increased neuromuscular coordination, enhanced motor unit recruitment and moto-neurons firing rate, increased motor neuron excitability and reflex potentiation, and a greater muscular strength/force which this experience may have contributed to the increases adopted in the present study (Docherty et al., 2004). These factors may be linked to a higher effective skill domain contributing to the improvement in the badminton demand. We utilized a complex training methodology, combining resistance and plyometric training set by set, which allowed coaches to supervise weight and plyometric training in a single workout on the same day. Furthermore, an articulation of both these methodologies is an efficient way to produce gains in a sprint, vertical jump, and COD, which is supported by the results of the present study. Lastly, it is worth reporting the absence of injury during this program. This is also an advantage of the recommended program, proving that CPX in badminton athletes helps to prevent and reduce injury risk when correctly designed and competently supervised.

In conclusion, this brief combination presents a modification in training methodology with a shift toward CPX training being coincident with greater improvements in physiological capability, which further supported a change in athlete sports performance improvement. This study suggests that coaches who work with elite athletes should know and adopt the mixed method of training such as CPX training, instead of traditional strength training. So, hopefully, with the knowledge and information provided by this study, coaches can implement a CPX training program to improve athletes in their respective sport.

4. Strength and Limitations

The tremendous strength of the current study is that this study for the first time was conducted to analyze the effect of the CPX training program in improving badminton athlete performance. The authors have planned to run this CPX training program method with the elite international Badminton athlete to analyze and monitor their performance.

Funding

No external funding.

Conflict of interest

The authors have no conflicts of interest to declare and manuscript is approved by all authors for publication.

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