Periodization and Complex Training in a High School Summer Program

Timothy D. Macaluso, MS, MBA, CSCS
New Egypt High School, New Egypt, New Jersey

Mike Nitka, MS, CSCS*D; FNSCA
Column Editor

SUMMARY

THIS COLUMN DESCRIBES THE USE OF PERIODIZATION AND COMPLEX TRAINING AS AN EFFICIENT AND EFFECTIVE WAY TO INCREASE STRENGTH AND POWER DURING A SUMMER OFF-SEASON HIGH SCHOOL PROGRAM.

INTRODUCTION

Our high school is relatively small with approximately 550 students from grades 9 through 12. We have a high percentage of multisport student-athletes, and for many of them, the summer is their only off-season from scholastic sports. Because of this, we need to be very efficient in designing our summer strength and conditioning programs, which last from the beginning of June through mid-August. Below is a brief discussion of periodization and complex training (CT) and how we use both to achieve gains in strength and power during our summer off-season programs.

PERIODIZATION

The term periodization has been used liberally for several years in the field of strength and conditioning. The generally accepted definition of periodization is a planned variation of training variables with the goal of achieving optimum performance at a given time (4). Recently, there has been some debate regarding the use of the expression "linear periodization." Some have argued that linear periodization is misleading because of the notion that all periodization could be considered nonlinear (4). For the purposes of this column, the expression "traditional periodization" is used to describe a gradual shift from high-volume/low-intensity training to low-volume/high-intensity training (5).

Periodization programs are typically divided into training phases or "mesocycles." These mesocycles consist of different objectives and are manipulated by the program variables such as sets, repetitions, exercise intensity, and the like. It has been suggested that mesocycles can last from 4 weeks to 3 months depending on the situation (4,5). An example model may include 4 mesocycles with the objectives of hypertrophy, strength, strength/power, and peaking (5).

Alternative periodization models have been presented. One such model is often referred to as "nonlinear or undulating" periodization (4,8). This model varies the volume and intensity of each training session. As an example, one session may incorporate 4 sets of 3 repetitions at a high intensity (90–95% 1 repetition maximum [1RM]) using 3–4 minutes of rest. The next session may include 3 sets of 8–10 repetitions at a lower intensity (70–75% 1RM) with a rest period of 1–2 minutes. We use this type of undulating model for some of our in-season programs.

We have found that a condensed version of the traditional model that focuses on the later phases of strength, power, and peaking to be an efficient and effective way to train our athletes during our off-season summer program. Three factors have led us to use this model. The first is that traditional periodization is generally accepted as an effective way to increase strength and power (8). Second, we are limited by a relatively short time frame that we are working within during the summer months. Finally, we have been successfully using this periodization model for our off-season programs for several years.

IMPLEMENTATION

Regardless of the type of periodization training model that is chosen, there are several considerations when implementing the model. Some considerations may include exercise selection and order, training goals, age/experience

level of the athletes, and available equipment and space. Focusing on the goal of increasing muscular power for enhancing athletic performance, along with the other factors mentioned, there are 3 general training methods that have been used. These include using traditional multijoint weight training, such as the squat or deadlift, explosive plyometric exercises, and weightlifting exercises, such as the clean and jerk (3). These methods can be used separately or in combination within a training model. CT is one such combination method that we have chosen to implement within a traditional periodized training model.

COMPLEX TRAINING

CT involves performing a resistance exercise followed by a biomechanically similar plyometric exercise. It has been theorized that CT can be an effective way of increasing muscular power. Although, there exists some disagreement within the scientific research regarding this claim (3), recent research has suggested that CT can significantly improve muscular power (9,10). There have been some theories suggested to explain the physiological adaptations of CT. One is the theory of postactivation potentiation, which suggests that the explosive capability of the muscle is enhanced after being subjected to maximal or near maximal contractions (3). However, that theory has been contradicted by other research (7). Although there appears to be a need for more specific research, we believe CT to be a safe and effective way to train athletes with the goal of increasing muscular power.

There does not appear to be any research that would indicate that CT impairs performance. Some studies have shown that CT can result in several training benefits. These benefits include the potential to significantly improve upper- and lower-body power (1,9,10). CT has also been identified as an efficient and organized way to incorporate resistance and explosive training in one training session (6,7). This is especially relevant for our situation because we have to move a large amount of athletes through a relatively small facility in a short time frame. There are also studies that have concluded that CT can be performed

Table 1
Seven-week periodization training model

Week	Reps	% of 1RM Sets 1–4
1	4 × 5	70-75-75-80
2	4 × 5	75-80-80-85
3	4 × 5	80-85-85-90
4	4 × 3	80-85-85-90
5	4 × 3	85-90-90-95
6	4 × 3	90-95-95-100
7	4-3-2-2	95-100-100-105

Reps = repetitions; 1RM = 1 repetition maximum.

Table 2
Complex pair exercise selection

Strength	Plyometric
Deadlift	Box jump Depth jump Medicine ball jump squat Broad jump
Squat	
Bench press	Medicine ball chest pass Clap push-up Plyometric push-up
Incline bench press	
Standing Row	Medicine ball overhead throw

Table 3
Example training session

Exercise	Sets/reps	Set 1	Set 2	Set 3	Set 4
Warm-up/core					
Dot drill	5 × 5	N/A			
Draw-in	3 × 10	N/A			
Complex training					
Deadlift	4 × 3	80%	85%	85%	90%
Depth jump	4 × 5				
Standing row	4 × 3	80%	85%	85%	90%
Medicine ball overhead Throw	4 × 5				
Strength/power training					
Good morning	3 × 10	N/A			
Power clean	4 × 3	80%	85%	85%	90%
Jerk	4 × 3	80%	85%	85%	90%
Calf raise	4 × 3	80%	85%	85%	90%

Reps = repetitions.

safely by adolescent athletes (10). Additionally, CT has been shown to improve vertical jump heights in as little as 3 weeks (9). All these factors have led us to incorporate CT into our summer off-season training program.

2009 SUMMER PROGRAM

Considering the aspects of periodization and CT discussed above, we created a 9-week program with our varsity and junior varsity football team, which included a week of pretesting, a 7-week training period, and a week of posttesting. Athletes trained 3 days a week. Table 1 displays the periodization model used for most exercises including the strength exercise in the complex pair. As seen in Table 1, we

Table 4
Example speed, agility, and conditioning training session

Component	Stretches/drills		
Warm-up/static/dynamic stretching	800-m jog		
	Neck/arm circles	Marching	
	Trunk twists	Knee hugs	
	Heel/toe raises	Frankenstein	
	Long arm swings	High knees	
	Front/side lunges	A-skips	
	Straight-leg high kicks	Skips for distance	
	Adductor/abductor leg raises	Skaters	
	Prone scorpions	Broad jumps	
	Mountain climbers	Cariocas	
	Butterfly stretch	Bounding	
		Paw throughs	
Speed/agility (1 or 2 exercises per session)	Review arm movement/dorsiflexion		
	Practice starts/no drop steps		
	Practice 10-yard acceleration		
	Ladder drills		
	Minihurdles		
	Zigzag/change of direction		
	T-drill		
	Pro agility		
Conditioning (sprints on track)	**Number**	**Yards**	**Rest (s)**
	5	50	20
	90-s rest		
	5	40	15
	90-s rest		
	10	30	10
	90-s rest		
	10	20	10
	400-m Cool down		

began with a relatively low intensity in week 1 and proceeded quickly through a very high intensity in week 7. Athletes were required to estimate their 1RM on some exercises in which they did not attempt during the pretesting week. Percentage charts were provided to the athletes as part of their training packet. We also performed a 1-hour speed, agility, and conditioning session after each lifting session.

Workouts were broken into 3 parts. They included a warm-up and core exercise, 2 complex pair exercises, and 4 strength/power exercises. It is important to mention that all athletes had some prior experience with weight training. Less experienced athletes had modified training sessions to ensure that proper technique was being followed. An example was having a younger athlete initially perform the power shrug instead of the power clean. Over time, the power clean was introduced when the athlete was ready as determined by the coach and athlete.

Table 2 shows the selection of exercises that we used for CT. The major strength exercises were the deadlift, squat, bench or incline bench press, and the standing row. Each strength exercise had a corresponding explosive plyometric exercise. Athletes performed 1 upper-body and 1 lower-body complex pair per session. The complex pairs were performed in a back-to-back fashion. Athletes were instructed to perform 1 set of the resistance exercise followed by at least a 1-minute rest period. They would then perform the explosive exercise. Research has suggested the ideal rest period between complex pairs to be at least 1 minute (2,6). Athletes took approximately 3–5 minutes between complex pair sets. Table 3 displays an example of a full training session.

SPEED, AGILITY, CONDITIONING

After each lifting session, we performed a 1-hour speed, agility, and conditioning session that included 3 parts. First, athletes performed a warm-up and stretching component that included an 800-meter jog, followed by static and dynamic warm-up exercises. The second part focused on either linear speed technique exercises or change of direction agility exercises. Finally, the last component consisted of conditioning exercises in the form of sprints. Sprints and rest times were manipulated throughout the summer. The number of sprints performed gradually increased, whereas the rest times between each sprint gradually decreased. An example speed, agility, and conditioning training session is shown in Table 4.

We are expanding the use of this training model with other sports in our athletic program. It is our belief that using traditional periodization and CT have been important aspects of our summer training program.

Tim Macaluso *is the strength and conditioning coach and a teacher at New Egypt High School in New Jersey.*

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