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Review

The training process: Planning for strength–power training in track and field. Part 2: Practical and applied aspects

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Abstract

Planning training programs for strength–power track and field athletes require an understanding of both training principles and training theory. The training principles are overload, variation, and specificity. Each of these principles must be incorporated into an appropriate system of training. Conceptually, periodization embraces training principles and offers advantages in planning, allowing for logical integration and manipulation of training variables such as exercise selection, intensification, and volume factors. The adaptation and progress of the athlete is to a large extent directly related to the ability of the coach/athlete to create and carry an efficient and efficacious training process. This ability includes: an understanding of how exercises affect physiological and performance adaptation (i.e., maximum force, rate of force development, power, *etc*.), how to optimize transfer of training effect ensuring that training exercises have maximum potential for carryover to performance, and how to implement programs with variations at appropriate levels (macro, meso, and micro) such that fatigue management is enhanced and performance progress is optimized.

Keywords: Periodization; Programming; Strength training; Track and field; Training process

1. The training process: putting it together

As described by DeWeese et al.,[1] the training process describes the blending of many factors that provide for athlete enhancement. In addition, these training aspects are embodied within the annual plan. This comprehensive list of aspects can include the training plan (length of periods, exercises, workloads), forms of recovery (nutrition, sleep, physiotherapy), sport-science (evidence-based approach to training), and the athlete-monitoring program (tests that ensure proper development through objective assessment).

Periodization provides the basic framework in terms of fitness phases and timelines, while programming involves making decisions related to the number of repetitions, sets, intensity of exercise and training, volume, and rate of progression. As introduced in Part 1,[1] the "block" method of meeting the tenants of periodization has been demonstrated to be a superior method attacking the complications associated with training and competition for the majority of track and field events in a modern competition setting. For instance, Block Programming may promote more efficient training priorities while maximizing the maintenance of strength–power characteristics, which can ultimately bolster the tapering/peaking phase leading into a major competition.

2. Periodization

Recall that periodization is an integral part of annual planning and represents the theoretical framework for developing a training program. Based on the definition presented in Part 1, a basic tenet of periodization is training nonlinearity. The primary goals of periodization include (a) an appropriate balance of training loads and competitive readiness during the season, (b) fatigue management and the reduction of overtraining potential, and (c) adequately staging and timing of the peak. These goals are primarily met by appropriate variation (non-linearity), which can be achieved through the manipulation of volume, intensity factors, and exercise selection. Coaches should recognize that variation should occur at the larger level (e.g., quadrennial plan) down to the daily training sessions.

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2.1. Traditional periodization

Traditional-periodized training can be divided into three stages or levels: the macrocycle (long-length cycle), the mesocycle (middle-length cycle), and the microcycle (short-length cycle, or day-to-day variation). Each macro- and mesocycle generally begins with high-volume, low-intensity training and ends with high-intensity, low-volume training. The macro- and mesocycle can consist of four fitness phases: (a) preparation (general and special), (b) competition, (c) peaking, and (d) transition or active rest. These phases typically have different goals and can require different degrees of variation within the training elements. It should be noted that a mesocycle can also consist of largely one phase (preparation, *etc*.) depending upon the level of athlete and their needs. Beginners often progress quite well using some variation of traditional programming in which alterations in volume and intensity typically occur more gradually.[2] However, advanced athletes require greater variation in exercise selection, volume and intensity of training compared to beginning athletes to promote continued adaptations to the training stimulus.

2.2. Block periodization

Evidence indicates that most advanced and elite athletes use some form of periodization. Greater variation is necessary as a result of several factors, including: (a) advanced athletes train with greater volumes and intensities than beginners and novices, and may be closer to a non-functional overreaching or overtraining threshold, thus require greater fatigue management resulting from greater variation and (b) as genetic limitations are approached, greater variation and novel approaches to training may be necessary to adequately disturb homeostasis and "provoke" additional adaptation. Thus, several creative resistance-training approaches can further stimulate strength–power adaptations.

Block periodization uses the idea of linking together a sequence of concentrated loads. A concentrated load is unidirectional, meaning that one characteristic of physiological development (e.g., endurance, strength, power) is being emphasized. This does not mean that training is exclusive, but rather that a particular fitness characteristic is being emphasized and other aspects of training de-emphasized through the implementation of retaining loads (minimal doses to maintain specific fitness characteristics). Concentrated loads produce after-effects or residual effects that persist into the next phase. In other words, these after-effects potentiate the next concentrated load.

Sequenced training (which refers to phase potentiation or block periodization) offers advantages not inherent in other forms of training. For example, prior exposure to strength training and resultant increased maximum strength levels can potentiate speed/power gains during a concentrated load of power training. Data from both longitudinal and cross-sectional studies[3–5] indicate that sequenced training, heavy weight training over a few weeks followed by speed–strength training, or combination training (heavy training plus high-power or high-speed training) produces superior results in rate of force development (RFD), speed, and power gains compared to heavy weight training or speed–strength (high power high velocity) training alone. More importantly, evidence indicates that this type phase potentiation (sequenced training) can alter a wide variety of athletic performance variables to a substantially greater extent than either heavy weight training or speed–strength training.[3,6]

2.2.1. Summated microcycles

Evidence suggests that sequenced training can produce superior results in terms of improving speed and power. This model depends upon the idea that after-effects from the preceding phase potentiate gains in the following phase.[7] This phase potentiation (block periodization) model is built upon microcycles and summated microcycles.

A microcycle is the shortest repeatable cycle and is typically specified as 1 week. Microcycles (weeks) can be grouped together to create a summated microcycle (SM). Each SM presents a specific pattern of volume and intensity loading. Therefore, an SM represents a form of concentrated load. The SM can be repeated throughout a mesocycle such that specific stimuli are "re-presented" in a cyclical fashion. Generally, an SM consists of 4 ± 2 weeks, as this period of time appears to be optimal for summating cumulative after-effects (residual effects) while being short enough to ensure that involution does not occur.[8,9] A typical SM would be one in which volume and intensity is increased for 3 weeks followed by an "unload" week, creating a 3/1 SM.[6] The unload week, which creates a marked variation in workload, can be used to reduce overtraining potential and allow for adaptation or "supercompensation".

2.2.2. Furthering phase potentiation through functional overreaching

Conceptually, "supercompensation" is essentially an overshoot in the level of a specific variable past the initial baseline. In advanced athletes, if "supercompensation" of maximum strength, power, and speed are training goals, then additional strategies may be effective. One such strategy entails planned overreaching or functional overreaching. Planned overreaching is an intentional, substantial, sudden increase in volume or intensity that places the athlete in a state of functional overreaching. Functional overreaching occurs provided the overreaching (increased volume/intensity) phase is not too extensive or long lasting. Thus, for resistance training, overreaching can occur as a result of a large increase in volume-load (VL) (or other conditioning activities depending upon the event/sport). Caution should be taken as overreaching can result in chronic fatigue and other symptoms similar to the initial stages of overtraining.[10] Provided that the overreaching phase is not too extensive, a return to normal training volumes can result in a super compensatory effect, promoting an increased performance. Performance improvements can be associated with alterations in the anabolic state which may be coupled with changes in the testosterone:cortisol (T/C) ratio.[11,12] By carefully planning the overreaching phase with a subsequent return to normal training, performance may be substantially enhanced, especially prior to an exponential taper.