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## APPLICATION OF PERIODIZATION IN VARIOUS SPORTS

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### ABSTRACT

Since various sports differ in number of competitions athletes participate in, difference would come in the periodization patterns as well. For instance, **endurance sports** such as marathon and long distance running, limit participation of the athletes to few competitions within a year/season. This results in planning long macrocycles of training often equaling a year in duration. This happens when major competitions of the year are grouped together (i.e. October-November) and athlete can successfully participate in them within one peaking attempt. In case major competitions are scattered over the year or the gap between them is too long (i.e. April-May and October-November), we need to follow double periodization. **Power sports**, like sprints, jumps, weightlifting etc., can have their representatives participating in larger number of competitions a year and their planning pattern could be pretty different. It can well fit into double periodization pattern, but when three to five major competitions are there to participate within the year (i.e. March, July and November), triple or multiple periodization patterns might be of use. **Team games** like football, basketball, hockey and others, with traditionally long competitive periods when they play league matches for four to five months or even longer, plan their macrocycle in completely different manner. They still follow single periodization pattern but they change the ratio of periods within the macrocycle. **Individual/group games** like tennis and badminton follow more or less the multi-peaking patterns with very brief and precisely planned training periods (rather blocks). The reason being, besides participation in the four Grand Slam tournaments and year finale in the form of ATP/WTA world championships (top eight only), players need to play at least four warming up tournaments at various surfaces. Atop of it they need to play good number of ranking tournaments to ensure high ranking and good chances for better seeding in the major tournaments.

## Introduction

Periodisation is increasingly often used these days as a powerful tool to increase sports performance. Importance of periodisation can hardly be overestimated. It's general objective and definite advantage is in the possibility to split training process into manageable smaller blocks. This split is not just about time management. Each of those blocks is actually targeting specific training objectives, so they can be addressed in a better, more precise manner.

The possibility to tackle emerging training goals sequentially is itself a huge advantage, since training has so many components and related objectives.

Periodisation in fact has two distinct applications. Those are:

- (a) Periodisation of training
- (b) Periodisation of motor qualities

Historically, the routes of periodised training belong to Greece. It is said that by a Greek philosopher Flavius Philostratus (AD 170-245), a simple form of periodisation has been used since the ancient Olympic Games ("Primer on periodisation" (<http://coaching.usolympicteam.com/coaching/kpub.nsf/>)).

First attempts to make periodisation scientific belonged to Russia, although collected information was more of empiric, rather than scientific in nature. Russians have enjoyed one huge advantage over other countries: they have practically tested various periodisation models at huge numbers of their international athletes and accumulated an extensive amount of practical information on periodised training (<http://www.pponline.co.uk/encyc/0147.htm>).

The earliest periodisation training schemes utilised by the Soviets were logical but very basic: exercise scientists theorised that training should be divided into general, preparatory, and specific phases. The general stage of training, often lasting for about two months or so, was supposed to develop the heart and lungs, the preparatory training, also two months in duration, sought to boost muscle strength and endurance, and the specific period of about eight months prepared an athlete for an individual sporting event by emphasising extensive practice of the precise movements involved in the sport (Siff & Verkhoshanky, 2000, Graham, 2002).

Russian physical educationist Lev Matveyev and then Romanian sport scientist Tudor Bompa expanded and further organised the periodisation model. Matveyev and Bompa have been regarded as the fathers of modern periodisation. Since the 1960s, other coaches and exercise physiologists have added to the original models, creating "modified" periodisation models. However, despite the differing terminology amongst scientist and practitioners, the scientific basis for periodisation remains a common ground.

Matveyev summarised the modern concept of periodisation on the basis of these earlier ideas as well as his own preliminary work. He divided the training year into distinct phases, each with different characteristics and special application to training strength and power athletes. Despite some modifications made by sports scientist on the basis of the physiological characteristics of different sports, the length of the sports season, and the individual characteristics of various athletes, the fundamental concepts presented by Matveyev remain valid and widely used today (Graham, 2002).

Periodisation of biomotor qualities appeared on the later stages of Periodisation development. Getting into more details, the basic periodisation principles got into the periodised planning of major motor qualities.

Bompa (1994) suggested that every biomotor quality in order to be developed upto the maximum of athletes' potential should go through periodised development.

### **Periodisation of training**

The fundamental objectives of training periodisation are to maximise the training effects, adjust the effects of fatigue, and prevent possible overtraining.

This cycle, we keep emphasising on as: ***load*** ⇒ ***fatigue*** ⇒ ***recovery*** in fact involves the cyclical manipulation of volume and intensity of training.

Volume has been traditionally defined as the total amount of work performed in a training session or in larger training unit. Intensity measures vary in different sports, and where time and distance are factors, intensity measures in % of either maximal speed or absolute achievement (a discuss throw or a long jump for instance). In resistance training however, intensity is expressed in percentage of individual's maximum effort. Plisk & Stone (2003), state that nature of training moves from extensive (high volume /low intensity) to intensive (high intensity/low volume) workloads and from general to specific tasks over a given period of time. The emphasis fluctuates between intensity and volume to achieve specific goal related adaptations Plisk (2004).

According to Siff (2000), classical periodisation involves the division of training into basic structural units such as the training session, training day, microcycle (one week), mesocycle (one month) and macrocycle (e.g., one year).

In practice, those divisions are much more flexible and in fact depend a lot on sport, objectives of training and type of annual planning. These features along with detailed descriptions of micro- meso- and macro-structure we are going to discuss further in the topic.

Another angle of periodisation is further division into phases namely ***preparation, competition, transition***. Basic periodisation commonly operates with macrocycle

as the longest periodisation unit. It can vary in duration from as short as 12 weeks in professional sports up to one year and is usually divided into three distinctive periods such as:

- (a) Preparatory
- (b) Competitive and
- (c) Transitional

Preparatory period is usually the longest and is meant for the development of performance contributing factors and improvement of fitness and performance. It is in turn sub-divided into General Preparatory Period (GPP) and Specific Preparatory Period (SPP).

Notably, GPP emphasises general motor qualities development and addresses the needs of fitness enhancement, whereas SPP is dedicated to specific sport needs and emphasises specific fitness along with sports specific skills.

Main goal of Competitive period is the realisation of athlete's potential built in Preparatory period. This realisation has to occur during participation in major competitions but for this to happen athlete needs to participate in the competitions of less importance. For this reason Competitive Period is traditionally divided into the 'early competitions' (or pre-competitive) and 'main competitions' sub-phases.

By some definitions this period is meant for maintenance of performance. Practically though, the performance has to improve during this period and coincide with the main competition of a macrocycle, usually towards its end.

Transitional period provides an athlete with active rest, recovery and is meant for rehabilitation and treatment, if required. In other words transitional period is meant for controlled detraining which you know as one of the major training principles.

Macrocycle as such (Figure 1) is planned with an ultimate aim of successfully performing in the major competition or number of competitions which are grouped together, within reasonably short period of time, which is good to maintain top performance within it.



**Figure 1:** Macrocycle divided into periods and sub-periods of training ([http://www.medic.usm.my/~ssu/ARTICLES/article\\_42.htm](http://www.medic.usm.my/~ssu/ARTICLES/article_42.htm))

In case major competitions of the season are scheduled with considerable gap in-between, coaches might need to plan two or even more macrocycles in a year, so that each macrocycle is dedicated to successful preparation to one major competition (Roy et.al., 2008).

Terminology, related to the division of training into traditionally known periods of preparatory, competition and transition is not the only one frequently used by exercise and sport training professionals.

In fact, Eastern Block trained coaches traditionally use the preparatory-competition-transition scheme, whereas coaches, involved in amateur and professional sports in America have their annual schedules consisting of off-season, preseason, in-season, and postseason mesocycles. Although these seasons typically relate to the periods of periodisation, let us check how it works so you have no problem discussing periodisation with representatives of any of the hemispheres.

The off-season is defined by Baechle & Earle (2000) as the period between the last contest and about 6 weeks prior to the first contest of the next year's season. This season typically includes most of the preparatory period. The preseason period follows and leads up an athlete to the first contest, and commonly contains the late stages of the preparatory period and the first transition period (the passage from preparatory to competition period).

In-season is basically American equivalent of the competition period and it contains all the contests (competitions) scheduled for that year. After the final competition of the cycle, the postseason or second transition period follows to provide active rest or rehabilitation if needed for the athlete before starting the next year's off-season or preparatory period.

Some alternative approaches were suggested by exercise and sports scientists. Verkoshansky (1977) arguing that Matveyev's model is bit simplistic proposed the 'conjugate' or 'coupled successive system' as a better option for elite athletes in power sports (i.e. jumps, throws), in which a concentrate block of unidirectional training was suggested as an alternative. Issurin (2007, 2008) further developed this idea and suggested the term of 'block periodisation', where concentrated workloads are applied to a minimal number of specifically targeted physical abilities in a particular block.

Despite the theoretical popularity of the classical Matveyev model, number of variations was developed in order to suit multiplicity of sports and possible planning patterns available with them.

## Application of Periodisation in various sports

Since various sports differ in number of competitions athletes participate in, difference would come in the periodization patterns as well (Roy, Krasilshchikov & Nor Azhar, 2008).

For instance, **endurance sports** such as marathon and long distance running, limit participation of the athletes to few competitions within a year/season. This results in planning long macrocycles of training often equaling a year in duration. This happens when major competitions of the year are grouped together (i.e. October-November) and athlete can successfully participate in them within one peaking attempt. In such case we need to follow single periodization pattern of an annual cycle. Example is shown in Fig. 2.

Macrocycles	One macrocycle (1 year)											
Months	1	2	3	4	5	6	7	8	9	10	11	12
Periods	Preparatory Period (PP)								Competitive Period (CP)			Tr. Per (TP)
Duration	7.5 months (30-32 weeks)								3.5 months (16 weeks)			4 weeks

**Figure 2.** Single periodization planning pattern

In case major competitions are scattered over the year or the gap between them is too long (i.e. April-May and October-November), we need to follow double periodization pattern. That is when one year comprises of two about 6-months macrocycles each, with one macrocycle dedicated to participation in one major competition (or group of competitions) and the other macrocycle – for another major competition as in Fig. 3.

Macrocycles	1 <sup>st</sup> Macrocycle (6 months)						2 <sup>nd</sup> Macrocycle (6 months)					
Months	1	2	3	4	5	6	7	8	9	10	11	12
Periods	Preparatory I (PP I)			Competitive I (CP I)		TP I	Preparatory II (PP II)			Competitive II (CP II)		TP II
Duration	3.5 months (15 w)			2 months (9 w)		2w	3 months (13 w)			2 months (9 w)		4 w

**Figure 3.** Double periodization planning pattern

As you can see, Preparatory period (PP) can last for months together, allowing to address and improve all motor qualities and functions, competitive period (CP) can be of couple of month duration with a lot of skills and tactics perfection involved and transitional period (TP) can be of 3 to 4 weeks duration.

**Power sports**, like sprints, jumps, weightlifting etc., can have their representatives participating in larger number of competitions a year and their planning pattern could be pretty different. Although it can still fit into double periodization pattern, but when three to five major competitions are there to participate within the year (i.e. March, July and November), triple or multiple periodization patterns might be of use. It literally means that calendar year can be divided into three to five macrocycles of only 12 to 15 weeks duration each. Example of triple periodization pattern is given in Figure 4.

Macrocycles	1 <sup>st</sup> Macrocycle (17 weeks)				2 <sup>nd</sup> Macrocycle (17 weeks)				3 <sup>rd</sup> Macrocycle (18 weeks)			
Months	1	2	3	4	5	6	7	8	9	10	11	12
Periods	PP - 1		CP 1	TP1	PP - 2		CP 2	TP2	PP - 3		CP 3	TP 3
Duration	11weeks		4w	2w	12weeks		3w	2w	12weeks		3w	3w

**Figure 4** Triple periodization planning pattern

Such periodization patterns unlike in the endurance sports would have short but very intensive preparatory periods (PP) (at times as short as 8 to 10 weeks), competitive periods (CP) of 2 to 3 weeks and rather brief transitional periods (TP) usually not exceeding 2 weeks each.

**Team games** like football, basketball, hockey and others, with traditionally long competitive periods when they play league matches for four to five months or even longer, plan their macrocycle in completely different manner. They still follow single periodization pattern but they change the ratio of periods within a macrocycle.

Preparatory period (PP) would be quite short – three to four months. This is where they predominantly care of general and specific physical fitness and improve their skills.

It is followed by six to eight months of competitive period (CP) with plenty of individual, group and team tactics and skills involved and with all the commitments to the National leagues and Continental Cups.

Finally, it is up to two - three months of transition period (TP), meant for the rehabilitation, treatment of injuries etc. as shown at Figure 5.

Macrocycles	One macrocycle (1 year)											
Months	1	2	3	4	5	6	7	8	9	10	11	12
Periods	Preparatory Period (PP)				Competitive Period (CP)						Tr. Per (TP)	
Duration	4 months (16 -18 weeks)				6 months (24-26 weeks)						2 months (8-9 weeks)	

**Figure 5.** Single periodization planning pattern for team sports with a long league season

**Individual/group games** like tennis and badminton follow more or less the multi-peaking patterns with very brief and precisely planned training periods (rather blocks). The reason being, besides participation in the four Grand Slam tournaments and year finale in the form of ATP/WTA world championships (top eight only), players need to play at least four warming up tournaments at various surfaces. Atop of it they need to play good number of ranking tournaments to ensure high ranking and good chances for better seeding in the major tournaments. This can only be achieved through multiple peaking patterns fragment of which is presented in Fig. 6.

Macrocycle	One macrocycle (3 months)													
Months	April				May				June					
Periods	Preparatory Period (6 weeks)						Competition Period (7 weeks)						TP	
Weeks	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Tournaments							Ranking Trnm			Warm-up Tournament			Major Tournament	Rest

**Figure 6** Fragment of multiple periodization planning pattern applicable to individual games

Traditional periodization with preparatory, competition and transition periods still works here. But the possibility of separating fitness from skills or general workouts from specific would be rather distant. Apparently no such thing as general preparatory or specific preparatory division in preparatory period is feasible.

In such situations professional training requires merger of general and specific fitness with skills in specifically designed drills. Weeks 1 to 4 in our example will be the correct time to use those.

The fusion of skills and tactics will be required bit later, like during weeks 5 and 6 (before the ranking tournament).

The rest is accomplished through the game practice which is plenty during weeks 7 to 13 in our imaginary plan with early competitions at weeks 7 to 10 and a major tournament at weeks 12 and 13.

Recovery is surely there during weeks 4, 11 and 14. The load during week 8 has to be of a stabilizing nature.

## Conclusions

To be effective and fruitful, the choice of periodization pattern should be based on two major factors: the specificity of the sport (especially the number of competitions athletes usually compete per year) and competitions schedule approved for a particular training year.

Described options of annual planning were utilised as part of the Scientific Support provided by author to Indian National teams and were successfully used by Indian National Teams' coaches during preparation for Asian and Commonwealth Games 1998 and 2002, Olympic Games 1996 and 2000 in boxing, wrestling, judo, hockey, kabaddi, rowing, canoeing & kayaking, track and field athletics, volleyball, swimming and weightlifting.

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