2022, *Retos, 45,* 174-183

Criteria for identifying and assessing sports training periodization models
Criterios para identificar y evaluar modelos de periodización de entrenamiento deportivo

*Estélio Henrique Martin Dantas, **Juan Cristóbal Barrón-Luján ***Michael Douglas Celestino Bispo, ****Erik Salum de Godoy, ***Cristiane Kelly Aquino dos Santos, *****Maria de Nazaré Dias Bello, **Gabriel Gastélum-Cuadras

*Federal University of the State of Rio de Janeiro (Brazil), **Autonomous University of Chihuahua (México), ***Tiradentes University (Brazil), ****University of the State of Rio de Janeiro (Brazil), *****Federal University of Rio de Janeiro (Brazil)

Abstract. Periodization is a methodological system that distributes training contents. With the evolution of sports, several periodization models were developed based on Matveev's classic periodization, Verkhoshansky's Blocks periodization model, Vorobiev's Modular, Arosiev and Kalinin's Pendular, Tschiene's High Load, Valdivielso's ATR, Platonov's Multicyclical, and Bompa's Priority, among others. The vast majority of models - and even their variations - have made it difficult to classify and select which periodization to use. To that end, the aim of the present study was to create criteria to identify sports training periodization models and, with the use of analysis and discussion of their characteristics, propose a classification and indicate the applicability of the most widely cited models in the literature. In the methodology of this study, a group technique known as direct discussion was used. The group consisted of 20 Master's students, all researchers of the models proposed and sports training students at the Science of Human Motricity Course of Castelo Branco University, in addition to four discussion mediators. Despite a number of conceptual differences, the results show that most of the contemporary periodization training models derive from Matveev's model, in an attempt to meet the demands currently imposed by sports. We analyzed the models investigated and concluded that despite their diversity, some characteristics are common and help distinguish each of them in terms of structure, load variation, number of peaks, sports level and applicability.
Keywords. Sports Training; Sports training periodization; Sports training planning; Periodization models.

Resumen. La periodización es un sistema metodológico que distribuye los contenidos formativos. Con la evolución de los deportes, se desarrollaron varios modelos de periodización basados en la periodización clásica de Matveev, el modelo de periodización de Bloques de Verkhoshansky, Modular de Vorobiev, Pendular de Arosiev y Kalinin, Carga de alto de Tschiene, ATR de Valdivielso, Multicíclico de Platonov y Prioridad de Bompa, entre otros. La gran mayoría de modelos, e incluso sus variaciones, han dificultado la clasificación y selección de qué periodización utilizar. Para ello, el objetivo del presente estudio fue generar criterios para identificar modelos de periodización del entrenamiento deportivo y, con el uso del análisis y discusión de sus características, proponer una clasificación e indicar la aplicabilidad de los modelos más citados en la literatura. En la metodología de este estudio se utilizó una técnica grupal conocida como discusión directa. El grupo estuvo integrado por 20 estudiantes de maestría, todos investigadores de los modelos propuestos y estudiantes de formación deportiva del Curso de Ciencia de la Motricidad Humana de la Universidad Castelo Branco, además de cuatro mediadores de discusión. Los resultados muestran que la mayoría de los modelos de entrenamiento de periodización contemporáneos derivan del modelo de Matveev, en un intento de satisfacer las demandas impuestas actualmente por los deportes. Analizamos los modelos investigados y concluimos que a pesar de su diversidad, algunas características son comunes y ayudan a distinguir cada uno de ellos en cuanto a estructura, variación de carga, número de picos, nivel deportivo y aplicabilidad
Palabras clave: Entrenamiento deportivo; Periodización del entrenamiento deportivo; Planificación de entrenamiento deportivo; Modelos de periodización.

Introduction

Physical activity has been inherent to mankind since the dawn of time when humans ran to escape danger or threw stones as a means of defense.

For thousands of years, human beings have used games to display their skills. Some of them were commemorative, and others religious rituals. A priori, these games sought to reproduce survival activities, such as hunting and warrior skills. Since then, there has been a need to organize training models (Hernandes et al., 2000).

A model is a theoretical framework of a system or reality, created to facilitate its understanding, study and organization. The origin of work intended to increase the output of physical activity is as old and important as sports itself (Augustsson et al., 2011).

According to Dantas (2021), periodization is the overall and detailed planning of the time available for training, according to the established intermediate objectives, and adhering to the scientific principles of sports exercise.

Gomes (2002), reported that, in the second half of the 20th century, sports training periodization changed

Fecha recepción: 21-12-21. Fecha de aceptación: 23-02-22
Juan Cristóbal-Barrón
jcbarron@uach.mx

frequently as different sports modalities evolved.

Stone et al. (1999), suggested that well planned periodization programs may enable a more rigorous control of training variables, a reduction in the potential of overtraining, superior performance adaptations, and generally better performance in the appropriate time, such as peak phases.

According to De La Rosa and Farto (2017), and Garzón and Fajardo (2017) sports training periodization can be understood as the organized division of the annual or bi-annual training of athletes, with a view to preparing them to achieve certain previously established goals and obtain a good result at a certain culminating point of a competitive season, requiring that the fitness obtained be the result of adjusting training load dynamics at their maximum level for the competitive moment.

Based on a number of references, we suggest that periodization is a methodological system that distributes training contents as a function of the availability of resources, founded on knowledge of the laws and sports training principles, and providing the possibility of achieving certain intermediate goals which culminates in the best athletic fitness possible in previously selected competitive events.

Historically, records of the first training cycles come from Ancient Greece. The Hittites, reporting on horse training, described the use of cycles consisting of 3 days of stimuli and 1 day of rest (Dantas, 2021; Lopez et al., 2018).

This marked the start of training periodization.

Current sports phenomenon has steadily been increasing due to its commercialization, and as a result of media exposure. Sports discussions are no longer restricted to groups of scientists but have spread worldwide and are debated by different classes of society, age ranges, trainers and athletes.

With the evolution of science, specialists have strived to develop a more effective training methodology (Barrero & Matinez-Cabrera, 2019; Romero-Caballero et al., 2022). Kiely (2018) reported that, to develop periodization models, it is particularly important to understand and transfer the framework proposed by Hans Seyle, namely, his theory of stress and the general adaptation syndrome, to the field of sports.

In the 1950s, Matveev developed his classic periodization model, a training methodology aimed at all sports, in order to obtain excellent Olympic Games results which, at the time, was the most important sporting competition in the world, a relatively short event held every four years. This periodization was widely disseminated and became the framework for other models.

With the evolution of sports, as it became highly professionalized, capitalized and commercialized, several megaevents were created, generating the need for equally significant performances. Thus, in order to meet current demands, a number of periodization models were developed. Matveev's Classic Periodization led to the development of other models such as Verkhoshansky's Blocks periodization model, Vorobiev's Modular, Arosiev and Kalinin's Pendular, Tschiene's High Load, Valdivielso's ATR, Platonov's Multi-cyclical, and Bompa's Priority, among others.

Although these models are based strongly on the biological dimension paradigm established by the theories of Hans Seyle, they result from interactions between this paradigm and intuition, beliefs and the experience of trainers, as well as with socioeconomic and technological dimensions (Kiely, 2018; Cunanan et al., 2018).

The large number and variation of these models has made it difficult to classify and select which periodization to use. The trend has been to choose a method based on highly subjective criteria, often obtaining a result by chance, without definitively knowing which model is best suited to achieve the desired objectives.

Objective

The aim of the present study was to establish criteria to identify sports training periodization models, analyze and discuss their characteristics, propose a classification and indicate the applicability of the models most widely cited in the literature.

Methodlogy

The methodology of the present study used a group technique called directed discussion (Brasil, 1997).

The group consisted of 20 Master's students, all researchers of the proposed models, and sports training students at the Science of Human Motricity course of Castelo Branco University, in addition to four discussion mediators.

The directed discussion mediators handed out a document to each group containing the main characteristics of each model, which are described in the literature review of this article. After listening to a lecture on the main points of these models, the 20 Master's students were divided into 5 groups of 4

individuals. Each group was instructed to examine the proposed topic and fill out the working script as a function of its structure, load variation, number of peaks, athlete level and applicability (table 1), all in one hour. Next, under the supervision and moderation of the mediators, the students were encouraged to freely and critically express their ideas and. at the end of the discussion, a summary was prepared with the main ideas and results.

Table 1.
Working script to fill out.

Models	Structure	Load	Peaks	Level	Applicability
MATVEEV (Classic)					
VERKOSHANSKI (Blocks)					
VALDIVIELSO (ATR)					
VOROBIEV (Modular)					
PLATONOV (Multicyclical)					
TSCHIENE (High Loads)					
AROSIEV AND KALININ (Pendular)					
BOMPA (Priority)					

Theoretical Foundation for the Study

Athlete preparation is an object of study of the greatest interest. Several training periodization models have been proposed to solve problems related to training application and control, management of variables and related resources, as well as to obtain the best athletic fitness possible in previously established competitive events. The most significant characteristics of the main periodization models found in the literature are described below.

a. Matveev Classic Periodization.

According to Granell and Cervera (2003), the first methodology proposed and scientifically developed to organize training contents was the Annual Planning Structure of L.P. Matveev or Classic Periodization (1958). Created in a highly politicized environment, this model was developed to rationalize and determine training loads. It aims to achieve and maintain sports fitness in order to obtain sports excellence.

The models currently applied in high-performance sports were created based on the Olympic cycle. The training cycle was divided into preparation periods, and subdivided into basic, specific, competition and transition phases (Fernandes, 2011; Oliveira, et al., 2004).

The preparation period is relatively longer with a predominance of load volume. The relatively shorter and more concentrated competition period involves a change in the loads used as well as a transition period to enable the athlete to rest and recover.13

The dynamics of manipulating training loads is variable, alternating between the volume and intensity of workloads in each phase of the training process (Black et al., 2017; Enoksen et al., 2011).

The cycle-based structure (micro, meso and macrocycles) was conceived with well-defined characteristics regarding the means, methods and manipulation of training loads, which are better understood in the new technologies used to create more specific training plans suited to contemporary sport (Owen, et al., 2017).

The classic model is also applicable, primarily in the initial phases of the sport expectation plan, youth categories and in situations with a relatively long training period, in order to obtain good performance in a short competition. Santos, Castelo and Silva (2011), proposed applying this model to soccer, since they associated the description of planning structures with preparation periods, divided into a basic and specific phase, and a competition and transition period, obtained as a result of their study and characteristics of the Matveev model. Figure 1 shows the annual planning structure of Matveev's model (Lacórdia et al., 2011; Santos et al., 2011)

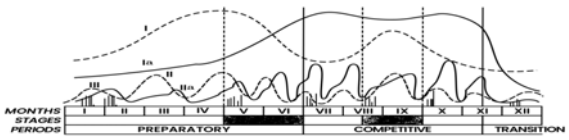

Figure 1. Matveev's Classic Periodization Model. Source: Forteza (1986).

Godoy et al. (2002) concluded that «Classic Periodization was efficient in obtaining significant Olympic results.»

The model is easy to understand because the phases are established according to load distribution and used in several sports (Godoy et al., 2002).

b. Blocks (Verkhoshansky)

Block training, presented by professor (Dr) Iuri V. Verkhoshansky in the early 1980s, proposed significant changes in sports training periodization. According to Forteza, it was designed especially for strength sports (Stone et al. 1999).

Verkhoshansky presented his ideas in a book entitled «Planning and Organization of Sports Training», published in Moscow in 1985. According to Marques Junior (2020), this model began to be disseminated after the success obtained by athletes in sports involving explosive strength at the 1980 Olympic Games and was later adopted by other athletes. This gave rise to the idea of contemporary periodization, as an alternative to the Matveev model (Marques Junior et al., 2019; Verkhoshansky, 2005).

The Blocks model, represented in figure 2, involves

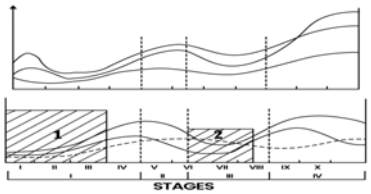

Figure 2. Verkhoshansky's Block Periodization Model. Source: Forteza (2005).

concentrated training loads aimed at improving strength, power and speed, qualities directly related to intensity in two or more training blocks every two and a half months (Matveev, 1986).

Verkhoshansky does not include the transition stage, since it would reduce the athlete's performance curve due to the shorter training time available, which also precludes separating the basic and specific stage. This optimizes the training time available by overlapping the basic stage and its specific counterpart in training blocks specific to the sport, obtaining several significant peaks in different competitions during the season (Granell & Cervera, 2003).

It does not achieve the same performance as that obtained with Matveev's periodization model, which produces a more prominent peak in the cycle, but makes it possible to obtain significant peaks in the different events on the calendar of some sports.

c. ATR (Valdivielso)

This model, created in 1986 by Issurin and Kaverin, got its name because it uses 3 types of mesocycles: Accumulation, Transformation and Realization (ATR). These are short periods where the loads applied are concentrated, making it possible to obtain several peaks during the season (Marques Junior, 2019; Manso et al., 2010).

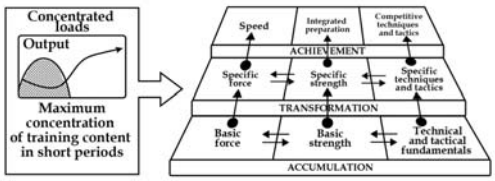

Figure 3. Physical qualities developed in each mesocycle. Source: Manso (2010).

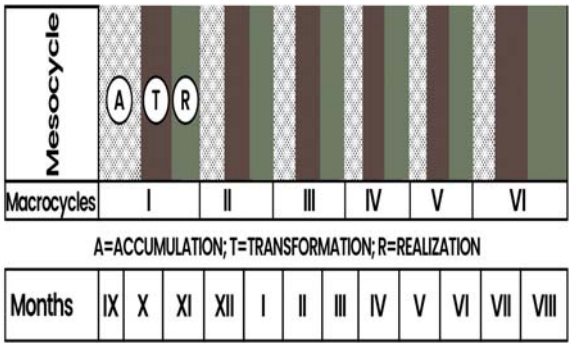

Figure 4. Valdivielso's ATR Periodization Model. Source: Manso (2010).

Figure 4 shows that there is no transition phase and that its application allows for a number of macrocycles during the year.

Currently, the ATR model is widely applied to facilitate the planning, prescription, application and control of training, and does not overlap or replace the basic phase (accumulation). It is ideal for situations in which the competition is short and involves meets, and was very successful in Spanish swimming events, but is also feasible in team sports if the competition is organized as previously described (Manso et al., 2010).

Macrocycles are quite short in this type of organization. Thus, as shown in figure 3 and 4, the principle of concentrated loads is used to obtain optimal performance in different competitive events during the season. Currently, this model is widely applied.

Mallo investigated the effects of ATR periodization model on physical fitness of professional soccer athletes and relates high satisfactory improvements on physical fitness. So, it can be said that ATR model is useful to situations with short conditioning periods and long and / or multiplecompetitons during a sort season (Azevedo & Godoy, 2004).

d. Modular (Vorobiev)

Vorobiev was an Olympic medal winner in weightlifting in the 1960s. After retiring from competition, he became a coach in that sport, and created Vorobiev's modular.

Despite not predominating, the loads oscillate and remain above 80% most of the time. This large variation is used as a resource to obtain increasingly higher adaptations, since the body responds uniformly to a uniform stimulation (Azevedo & Godoy, 2004).

The basic phase is not considered because it is regarded as not promoting rapid athletic development, and specific preparation is therefore prioritized. Thus, according to Azevedo et al., this emphasis on specific training is used to adapt the body to the demands of the sport in question (Azevedo & Godoy, 2004).

It is important to underscore that this model -

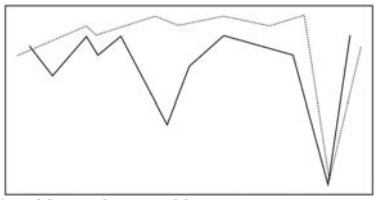
Figure 5. Voobiev's Modular Periodization Model. Source: Manso (2010).

originally created for an individual Olympic sport, with intense performances, no variations in techniques and of short duration - is suitable for sports with similar characteristics. Due to the specific preparation and high loads used, primarily in terms of intensity, this periodization model is aimed at training athletes that have mastered the technique, generally high-performance individuals (Azevedo & Godoy, 2004).

e. Multicyclical (Platonov)

This consists of a prolonged application of the classic model, aimed at enabling athletes to obtain good results throughout their competitive career. It requires better organization and control of the contents and leads to a gradual increase in specificity, allowing athletes to realize their maximum potential.

The gradual increase in specificity results in a decrease in the basic phase and over time in the training periodization of elite athletes. The preparation period is gradually shortened and the competitive phase occupies most of the season, in contrast to the demands on beginner athletes. The concern about beginners demonstrates the scope of the model, characterizing its adaptation to the individual performance expectation plan (Dantas, 2021).

The choice of system is based on factors that determine the duration of preparation periods and stages, including the length of the season, demands of the sport and stage of the plan (Portal, et al., 2004; Platonov & Boslhakova, 2013).

The competitive calendar is the primary factor that governs the organization of training periods, adapting all basic and specific preparation to the events selected.

Another factor is the demand of the sport, which determines the manipulation and adaptation of specific loads. A third factor is the stage of the performance expectation plan, since beginner athletes in the youth categories need greater attention to acquire technical skills and reach basic performance levels to be able to subsequently withstand the specific demands of the sport (Chevrier et al., 2016).

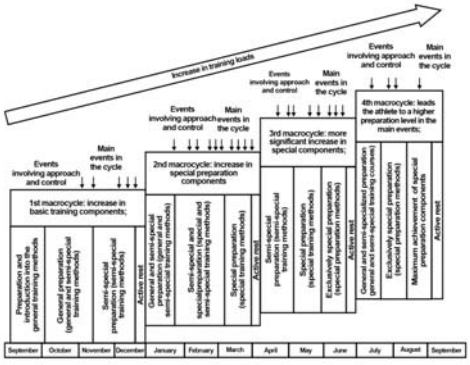

Figure 6. The Platonov Multicycle Model. Souce: Platonov (2004).

This model allows athletes to participate in 2 to 4 Olympic cycles. The increase in athletic career length helps organize the preparation structure into 4 Olympic cycles. In order to promote this longevity, all preparation planning should be long-term, preventing early depletion of the adaptive resources of young athletes, and enhanced assimilation of all the components of athletic preparation; that is, the physical, technical, tactical, psychological, cognitive and social components (Tavares Junior, 2014; Portal, et al., 2004; Konaski et al., 2012). Figure 6 summarizes the Platonov Multicycle Model.

f. High Load Model (Tschiene)

Given the need of athletes to maintain a high output level in several events or in prolonged events for an entire season, the German author Peter Tschiene organized the High-Output Structural Training Scheme De La Rosa and Farto (2017).

The author systematized structure, alternating volume and intensity without lowering the 80% maximum potential levels, as shown in Figure 7.

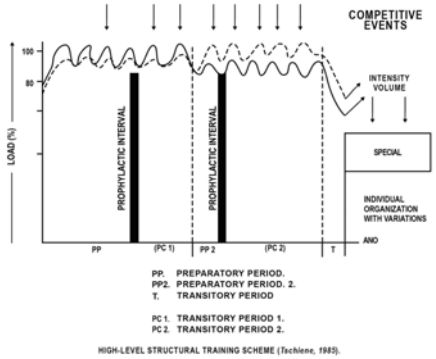

Figure 7. Tschienne's High-Load Periodization Model. Source: Forteza (2004).

Under this organizational method training is considerably taxing, creating the need to alternate high-intensity cycles with active recovery, using a strategy to maintain output performance throughout the season (Portal, et al., 2004).

The demand for good performance in different events, or over a season, requires predominantly specific work, including that of the event. As such, in this model, the competition itself is used as a training element to develop the highest sports fitness level possible at the most crucial time of the season (Manso et al., 2010; Driggers et al., 2017).

All the characteristics, from the loads applied to training specificity, indicate the use of the model in high-performance athletes who participate in several events over a short period of time, or simultaneously over

prolonged periods (more than 2 months), requiring good performances throughout the season.

g. Pendular Model (Arosiev and Kalinin)

This model was created by the Russian Arosiev and Kalinin, in 1971. It is an improvement of the Matveev model, but with shorter macrocycles. As with ATR, it was created to meet the demands of contemporary sports, in which athletes need to display the best competitive fitness possible several times during the season.

Alternating between basic and specific loads to achieve better competitive skills was recommended in the Matveev model and referred to as pendular training because specific loads grow at each training cycle, unlike basic loads, which decrease until they become significantly lower. This is based on the premise of adaptation and continuity, whereby individuals constantly undergoing training react by adapting to stimuli, forming a foundation that enables alternating loads with greater emphasis on high-intensity loads.

The shorter the duration of the pendulums, the more often the athlete will be fit to compete. If the pendulums are longer, sports fitness will be sustained longer.

This is one of the models that solves the current problem of obtaining peaks in several events, but it should be understood that it is restricted to the need for several peaks during the season. If the situation allows a considerable preparation period for a competitive event whose duration is less than the preparatory period, the performance achieved in Matveev's periodization will be significantly higher.

It is reasonable to suppose that a pendular structure can be successively applied in several sports (individual and/or team, cyclical, non-cyclical and/or combined non-cyclical).

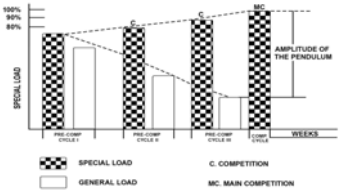

Figure 8. Arosiev and Kalinin`s pendular periodization model. Source: Granell and Cervera (2003).

h. Priority (Bompa)

This periodization model seeks to solve a serious problem, namely, the need to obtain several peaks in different events throughout the season.

It was originally applied to sports involving power and speed whose events are typically of short duration. Thus, without the necessary precautions the model may not be a suitable parameter for sports in specific situations, such as prolonged competition and/or events predominantly requiring strength (Sequeiros et al., 2004).

Bompa also sought to solve the problem with simple, double, triple and multiple training cycles, as depicted in figure 10.

The traditional structure is maintained even in Bompa's multiple periodization, but how the variation in loads is applied is not determined.

«Simple periodization is reserved for beginner athletes and youth categories, double periodization for experienced athletes, who qualify at the national level, and triple and multiple periodization for high-performance or international levels only» (Bompa & Buzzichelli, 2018).

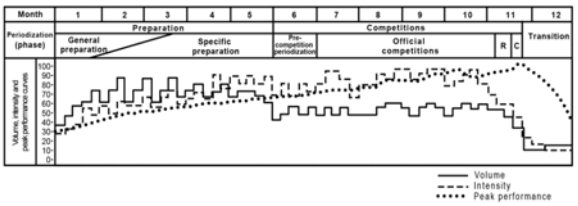

Figure 9. Bompa Priority Periodization Model. Source: Bompa (2010).

Annual periodization with several performance peaks (four main peaks) in which 1 = preparatory period; 2 = intensification or specific concentrated training; 3 = recovery and supercompensation and 4 = recovery-regeneration

Figure 10. Bompa Priority Periodization Model for tennis players. Source: Bompa (2004).

Results and Discussion

Despite some conceptual differences, most of the contemporary training periodization models derive from the Matveev model, seeking to meet the demands currently imposed by sports and exhibiting the following common characteristics:

1. Less time for basic or general preparation, in order to increase the time spent on specific preparation.
2. Specialization per modality, or per characteristics of the sport demands.
3. Preponderance of intensity over volume.
4. Adaptation of the recovery processes to the temporal structure of the sports calendar.
5. Greater structural flexibility, with systems exhibiting increasingly individualized aspects.
6. Larger number of peaks per season.

In addition to these aspects resulting from the directed discussion, Konarski et al. (2012) and Marques Junior (2020), also describe the integration of physical training, tactical techniques and greater control over the occurrence and prevention of lesions.

In the sports training literature, Gomes (2002), proposed dividing models into traditional and contemporary, based on historical classification.

A trial conducted by Barbosa et al (2004), determined the relevant aspects to be used as methodological classification criteria. These included being specific regarding structure; a specific type of activity; load distribution; macro, meso and microcycle format; meeting the level of demand; being in line with the athlete's performance; achieving the objectives; and the stage of the performance expectation plan.

Based on this preliminary framework, the present study sought to establish the identification/classification criteria of periodization models using a knowledgeable directed discussion (table 2).

Table 2.
Classification criteria for periodization models.

Identification criteria for periodization models			
Periodization structure	Traditional	Adapted	Undefined
Load variation in the cycle	Emphasis on volume	Emphasis on intensity	Variation
Sport level	High performance	Amateur	Beginner
Performance duration	Short	Multiple	Long
No. of peaks per season	Up to 3 peaks		More than 3 peaks
Model applicability	Monastic		Eclectic

The debate culminated in the creation of a table with the characteristics of each model identified. Other classification criteria do not lose their importance, since they increasingly identify the models historically and chronologically, among others. Moreover, the classification criteria created facilitates better understanding of the exact function of each model and is applicable to any existing periodization model.

This allowed us to form a clear picture, segmented by several viewpoints, of the use, structure, and application of the different periodization models.

In addition, they help create new proposals regarding sports training structures, according to the goals established, as illustrated in table 3.

Table 3.
Summary of main ideas and results.

Models	Structure	Load variation	Peaks	Level	Applicability
MATVEEV (Classic)	Traditional	Variation Vol X Int	Up to 3	All	Eclectic Short performance
VERKOSHANSKY (Blocks)	Adapted	Variation Vol X Int	Up to 3	High performance	Monastic Multiple performance
VALDIVIELSO (ATR)	Adapted	Variation Vol X Int	More than 3	High performance	Eclectic Multiple performance
VOROBIEV (Modular)	Undefined	Predominance of intensity	More than 3	High performance	Monastic Multiple performance
PLATONOV (Multicycle)	Traditional	Variation Vol X Int	Both	All	Eclectic Short, long or multiple performance
TSCHIENE (High Loads)	Traditional	Variation Vol X Int	More than 3	High performance	Eclectic Long or multiple performance
AROSIEV AND KALININ (Pendular)	Adapted	Predominance of intensity	More than 3	High performance	Eclectic Multiple performance
BOMPA (Priority)	Traditional	Predominance of volume High variation Vol X Int	Both	All	Eclectic Short, long or multiple performance

The aims and results of this study differ from others found in the literature since the focus on model classification contributes to the selection of the planning structure to be applied by trainers.

Comparing periodization models in search of the best option without understanding the classification presented here, and analyzing only the results obtained from manipulating training loads, demonstrates that the concepts of periodization models are used interchangeably, lack proven results, reports and/or control of intervening factors, and compromise the findings due to individual variations. As such, they contribute little to the aforementioned selection process.

Studied the effects of 3-weeks intensified training, similar to block model, on female age group basketball players and describe benefits on performance readiness. (Lukonaitiené et al., 2020).

In another longer study, during four consecutive seasons in professional soccer, Mallo observed that ATR model promoted greater performances during Realizations phases (Mallo, 2011).

Although there is evidences of improvements of performance with short periods of high intensity training, sometimes this not occurs. Barbosa did not obtained improvements in swimming performance, after four weeks of higher intensity using hand paddle, suggesting that there are another parameters involved (Barbosa, et al., 2020).

Despite not naming the periodization model applied, a recent study by Black et. al. (2017), demonstrates that a variation in basic, specific and competition preparation cycles is suitable for rugby teams and that the prescription of external loads can be better optimized using current technologies such as GPS to control loads during training and competition. The use of technology goes beyond the simple control of external loads, since, according to Owens et al. (2017), it is possible to determine internal and external load specificities in order to better plan training regimes.

Conclusion

Analysis of the periodization models investigated reveals that despite their variety, there are some common characteristics that help distinguish one from another, such as structure, load variation, number of peaks, sports level

and applicability.

Thus, we can classify them as follows:

1. Structure:

a. Traditional – when preparation, competition and transition periods are identified.

b. Adapted – when some of the traditional periods are omitted.

c. Undefined – when not mentioned by the author.

2. Load variation during periodization (volume X intensity):

a. Predominance of volume – when it exceeds intensity during training.

b. Predominance of intensity – when it exceeds volume during training.

c. Variation in predominance – when the type of predominant load changes during training.

3. Number of peaks:

a. Up to 3 peaks.

b. More than 3 peaks.

4. Sport level:

a. High performance.

b. Amateur.

c. Beginner.

5. Model applicability:

a. Monastic – when the aim is to develop capacity in sports with relatively simple demands and/or with a predominance of one physical quality.

b. Eclectic – when the aim is to develop competitive capacity in sports with complex demands, requiring several physical qualities simultaneously.

c. Short performance – situations involving a long training period for a short-duration competition.

d. Long or multiple performance – for situations when a long training period is not possible due to the demands of a prolonged event or multiple events occurring one after the other, or even simultaneously.

Thus, with the present study, the Sports Training Study and Working Group (GETTE) of the Human Motricity Bioscience Laboratory (LABIMH) has contributed to the systematization and consolidation of knowledge obtained in the field of Sports Training, helping address the lack of integrated periodization approaches underscored by Mujika et.al. (2018) in a recent review.

References

Afonso, J., Nikolaidis, P.T., Nikolaidis, P., Sousa, P. & Mesquita, I. (2017). Is Empirical Research on Periodization Trustworthy? A Comprehensive Review of Conceptual and Methodological Issues. *Journal Sports Science & Medicine, 16*: 27-34. Recovered from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5358028/

Augustsson S.R., Augustsson J, Thomeé R, Karlsson J, Eriksson, B.I. & Svantesson, U. (2011). Performance Enhancement Following a Strength and Injury Prevention Program: A 26-Week Individualized and Supervised Intervention in Adolescent Female Volleyball Players. . *6*(3): 398-417. https://doi.org/10.1260%2F1747-9541.6.3.399

Azevedo, R.C. & Godoy, E.S. (2004). Proposed Adaptation of the ATR Periodization Model for use in Team and Acyclic Sports. *Fitness & Performance Journal, 3*(6): 393. Recovered from: https://www.scielo.br/j/rbce/a/n6T44s4Lp95CmctX6vDtFYD/?lang=pt

Azevedo, R.C., Rabelo, A.S. & Silva, M.J.S. (2004). The use of Modular Training according to Vorobiev. *Fitness & Performance Journal, 3*(6): 365.

Barbosa, A.C., Ferreira, T.H.N., Vassilios, L.V. & Barroso, R. (2020). Does a 4-week training period with hand paddles affect front-crawl swimming performance? Journal of Sports Sciences 2020; 38 (5). Recovered from: https://doi.org/10.1080/02640414.2019.1710382

Barbosa, L.O., Rabelo, A. S., Oliveira, A. L. B., Serqueira. J. L. S., Costa, L. E. A. M, Nobrega, L. F. M., Portal, M.N.D. & Dantas, E. H. M. (2004). Fundamentos da Elaboração de Critérios de Classificação dos Modelos de Periodização do Treinamento Esportivo. *Fitness & Performance Journal,* , 3(6):384-384.

Barrero, A. & Martínez-Cabrera, F. (2019). Fútbol: el modelo de juego... «de la pizarra al entrenamiento».

Black, C.J., Till, K., O'Hara, J.P., Davidson, J. & Jones, B. (2017). Top secret training data? External training loads of a cup winning English Super League rugby league team. International Journal of Sports Science & Coaching, 13(2): 236-242. https://doi.org/10.1177/1747954117711094

Bompa, T.O. & Buzzichelli, C. (2018) Periodization: theory and methodology of training. New York, Human kinetics.

Brasil (1997). Manual do Instrutor: T 21-250. 3rd ed. Brasília: Ministério do Exército, Estado-Maior do Exército, September. Recovered from: http://www.decex.eb.mil.br/port_/leg_ensino/2_educacao_eb-decex/

2_port_092_EME_26Set1997.pdf

Chevrier, J., Roy, M., Turcotte, S., Culver, D.M. & Cybulski, S. (2016). Skills trained by coaches of Canadian male volleyball teams: A comparison with long-term athlete development guidelines. International Journal of Sports Science & Coaching. 11(3): 1–12. https://doi.org/10.1177/1747954116645013

Cunanan, A., Deweese, B.H., Wagle, J.P., Carrol, K.M., Sausaman, R., Hornsby, W.G., Haff, G.G., Triplett, T.T., Pierce, C. K. & Stone, M. (2018). The General Adaptation Syndrome: A Foundation for the Concept of Periodization. Sports Medicine, 48: 787-797. Recovered from: https://link.springer.com/article/10.1007/s40279-017-0855-3

Dantas, E.H.M. (2021). A Prática da Preparação Física. 7th ed. Manole.

De La Rosa, A.F. & Farto, E.M. (2017). Teoría, Metodología y Planificación del Entrenamiento: De lo ortodoxo a lo contemporáneo. Sevilla: Wanceulen Editorial, 2017. Recovered from: https://www.redalyc.org/pdf/1630/163017601007.pdf

Driggers, A.R. & Sato, K. (2017). The effects of vertically oriented resistance training on golf drive performance in collegiate golfers. *International Journal of Sports Science & Coaching*, *13*(4): 1–9.

Enoksen, E., Tjelta, A.R. & Tjelta, L.I. (2011). Distribution of Training Volume and Intensity of Elite Male and Female Track and Marathon Runners. *Int J Sports Sci Coach*, *6*(2): 273-293. https://doi.org/10.1260/1747-9541.6.2.273

Fernandes, A.R. & Pinheiro, V. (2011). Modelos de periodização convencionais e contemporâneos.159: 6. Recovered from: https://www.efdeportes.com/efd159/modelos-de-periodizacao-contemporaneos.htm

Garzón, T. O. U. & Fajardo, J. A. T. (2017). Mejora en pruebas de velocidad de nadador con diversidad funcional motriz. *Retos. Nuevas Tendencias en Educación Física, Deporte y Recreación*, (32), 219-223. https://doi.org/10.47197/retos.v0i32.56055

Godoy, E. S., Dantas, E.H.M, Oliveira, A.L.B., Azevedo, R. C., Rabelo, A.S., Silva, J.J. S., Barbosa, L.O., Araújo, C.A.S., Portal, M.N.D., Costa, L.E.A.M. & Siqueiros, J.L.S. (2002) Verificação da Consistência das Críticas à periodização Clássica. In Congresso. Paulista de Educação Física, 2004, Jundiaí. Pesquisa em Educação Física: Especialização Precoce. Jundiaí - SP: Fontoura Editora Ltda, 2004. v. I. p. 397-397.

Gomes, A.C. (2002). *Treinamento desportivo: estruturação e periodização*. Artmed. Recovered from: https://edisciplinas.usp.br/pluginfile.php/5281087/mod_resource/content/1/Treinamento%20Desportivo%20Estrutura%C3%A7%C3%A3o%20e%20Periodiza%C3%A7%C3%A3o.pdf

Granell, J.C. & Cervera, V.R. (2003). *Teoria e planejamento do treinamento desportivo*. Artmed.

Hernandes, J.B.D.O. (2000). *Treinamento Desportivo*. Rio de Janeiro: Sprint.

Kiely, J. (2018). Periodization Theory: Confronting an Inconvenient Truth. *Sports Medicine*, 48: 753-764. https://doi.org/10.1007/s40279-017-0823-y

Konarski, J, Krzykala, M, Podgórski, T. Pawlak, M., Strzelczyk, R. & Malina, R.M. (2012). Variations in functional and morphological characteristics of elite Polish field hockey players in a complete macrocycle. *International Journal of Sports Science & Coaching, 7*(3): 527-542. https://doi.org/10.1260/1747-9541.7.3.527

Lacórdia, R.C., Godoy, E.S., Vale, R.G.S, Sposito-Araújo, C.A. & Dantas, E.H.M. (2011). Periodized Training Programme and Technical Performance of Age-Group Gymnasts. *International Journal of Sports Science & Coaching, 6*(3): 387-398. https://doi.org/10.1260/1747-9541.6.3.387

López, J. A. H., Martínez, P.Y. O., Monzon, C. O. L. & de Souza Vale, R. G. (2018). Effects of four months of periodized aquatic exercise program on functional autonomy in post-menopausal women with parkinson's disease. *Retos: nuevas tendencias en educación física, deporte y recreación,* (33), 217-220. https://doi.org/10.47197/retos.v0i33.53000

Lukonaitienė, I., Kamandulis, S., Paulauskas, H., Domeika, A., Pliauga, V., Kreivytë, R. & Stanislovaitienë, J. (2020). Conte D. Investigating the workload, readiness and physical performance changes during intensified 3-week preparation periods in female national Under18 and Under20 basketball teams. *Journal of Sports Sciences. 38*(9). https://doi.org/10.1080/02640414.2020.1738702

Mallo, J. (2011). Effect of block periodization on performance in competition in a soccer team during four consecutive seasons: A case study International Journal of Performance Analysis in Sport, 11(3). Recovered from: https://www.tandfonline.com/doi/abs/10.1080/24748668.2011.11868566

Manso, J.M.G., Valdivielso, M.N. & Caballero, J.A.R.(2010). *Planificación del Entrenamiento y su Control*. Madrid: Cultiva.

Marques Junior, N. (2020) Treino de força da antiga União Soviética. *Revista Peruana de Ciencias de la Acti-*

vidad Física y del Deporte, 6(4): 832–41. Recovered from: https://rpcafd.com/index.php/rpcafd/article/view/69/104

Marques Junior, N. (2020). Periodization models used in the current sport. *MOJ Sports Medicine 4*(2): 27 34, 2020. Recovered from: https://www.researchgate.net/publication/340834218_Periodization_models_used_in_the_current_sport

Marquez Junior, N., Arruda, D. & Api, G. (2019). Periodização tradicional no voleibol (parte 1). *Rev Con–Ciencias del Deporte*, *1*(2): 31–55.

Martín-Barrero, A. M., & Martínez-Cabrera, F. I. M. (2019). El modelo de juego en el fútbol: de la concepción teórica al diseño práctico. Retos: nuevas tendencias en educación física, deporte y recreación, (36), 543-551. https://doi.org/10.47197/retos.v36i36.71021

Matveev, L. (1986). *Fundamentos do treino desportivo*. Horizonte.

Mujika, I., Halson, S., Burke, L.M., Balagué, G. & Farrow, D., (2018). An integrated, multifactorial approach to periodization for optimal performance in individual and team sports. *International Journal of Sports Physiology and Performance,* 13: 538-561. 10.1123/ijspp.2018-0093

Oliveira, A.L.B., Sequeiros, J.L.S., Godoy, E.S. & Dantas, E.H.M (2004). Estudo Comparativo sobre a Fundamentação dos Modelos de Periodização do Treinamento:Verkoshanski x Matveev. *Fitness & Performance Journal*, 3(6):366-366. Recovered from: https://www.redalyc.org/pdf/751/75117062006.pdf

Owen, A., Lagopeñas, C., Gomez, M.A., Mendes, B. & Dellal, A., (2017). Analysis of a training mesocycle and positional quantification in elite European soccer players. *International Journal of Sports Science & Coaching*, *12*(5): 1-8. https://doi.org/10.1177/1747954117727851

Platonov, V.N. & Bolshakova, I.V., (2013). Long-term preparation of athletes and youth Olympic Games. *Íàóêà è ñïîðò: ñîâðåìåííûå òåíäåíöèè*, 1: 22-29. Recovered from: https://cyberleninka.ru/article/n/long-term-preparation-of-athletes-and-youth-olympic-games

Platonov, V.N. (2004) Teoria geral do treinamento desportivo olimpico. Porto Alegre, Artmed.

Portal, M.N.D., Barbosa, L.O. Godoy, E. S., & Dantas, E. H. M. (2004). Modelo de Carga Intensiva Segundo Tschiene. *Fitness & Performance Journal*, 3(6): 388-388.

Romero-Caballero, A., Varela-Olalla, D., Collado-Lázaro, I., & Álvarez-Salvador, D. (2022). Technical staff structure, planning methods, methodological practices and load management in soccer Estructura de los cuerpos técnicos, métodos de planificación, prácticas metodológicas y gestión de la carga en fútbol. *Retos*, 43, 788-796. https://doi.org/10.47197/retos.v43i0.89044

Santos, P., Castelo, J. & Silva, P.M. (2011). O processo de planejamento e periodização do treino em futebol nos clubes da principal liga portuguesa profissional de futebol na época 2004/2005. *Revista Brasileira de Educação Física e Esporte*, *25*(3): 455-472. https://doi.org/10.1590/S1807-55092011000300010

Sequeiros, J.L.S., Oliveira, A.L.B. Godoy, E.S. & Dantas, E.H.M. (2004). Estudo sobre a Fundamentação do Modelo de Periodização de Bompa do Treinamento Esportivo. *Fitness & Performance Journal,* 3 (6): 378-378.

Stone, M.H., Pierce, K.C. & Haff, GG (1999). Periodization: Effects Of Manipulating Volume And Intensity. Part 1. *Strength Conditioning Journal* 21(2): 56. Recovered from:https://paulogentil.com/pdf/TREINO%20DE%20FORC%CC%A7A/Treinamento%20com%20pesos/S27.pdf

Tavares, A.(2 014). A formação profissional e a aplicação dos modelos de periodização do treinamento desportivo, por treinadores de judô de atletas de elite. Universidade Estadual Paulista, Instituto de Biociências de Rio Claro, 2014. Disponible en: http://hdl.handle.net/11449/121951.

Verkhoshansky, Y.V. (2005). Theory and methodology of sports training: block system of training high-class athletes. *Theory Pract Phys Cult*, *4*: 2-14.