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TRAINING PERIODIZATION MODELS USED IN SWIMMING AND PARA SWIMMING: A REVIEW

MODELOS DE PERIODIZACIÓN DEL ENTRENAMIENTO EMPLEADOS EN LA NATACIÓN CONVENCIONAL Y PARA NATACIÓN: UNA REVISIÓN SISTEMÁTICA

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ABSTRACT

This study aimed to carry up a systematic review of the literature on periodization models used in competitive swimming and paraswimming. A search was performed in electronic databases including Google Scholar, Dialnet, SportDiscus ans SciELO, following PRISMA guidelines. Inclusion criteria were: (1) studies that implemented a periodization structure or model, (2) included competitive swimmers or paraswimmers, (3) were published in scientific journals, (4) and less than 10 years old. A total of 56 potential studies were identified, of which 7 met the inclusion criteria. Of the 7 included studies, 6 were conducted with swimmers and 1 with paraswimmers. In swimming, 5 periodization models were identified: traditional periodization, ATR, inverse periodization, polarized and modeling periodization. On the other hand, in paraswimming, the traditional periodization model was used. In both sports, the periodization models used showed significant improvements in athlete performance. The results of this study show that the periodization models are effective for improving the performance of competitive swimmers and paraswimmers, however, more studies are needed to determine the effect of periodization models on athlete experience level.

Additionally, more studies are needed to determine the use of other periodization models in paraswimming.

RESUMEN

Palabras clave:
natación, para natación, modelos de periodización, deporte adaptado, deportes individuales.

El objetivo de esta investigación es realizar una revisión sistemática de la literatura acerca de los modelos de periodización empleados en la natación y la para natación en deportistas de alto rendimiento. Se realizó la búsqueda en diferentes bases de datos electrónicas como Google Académico, Dialnet, SportDiscus y SciELO, siguiendo las directrices PRISMA. Los criterios de inclusión fueron: (1) estudios que implementaran una estructura o modelo de periodización, (2) que incluyeran nadadores de nivel competitivo en Natación carreras o para natación, (3) con menos de 10 años de antigüedad, (4) publicados en revistas científicas. Se identificaron un total de 56 estudios potenciales, de los cuales 7 cumplieron con los criterios de inclusión. De los 7 estudios incluidos, 6 fueron realizados con deportistas de natación y 1 con deportistas de para natación. En la natación se evidenció 5 modelos de periodización utilizados: periodización tradicional, ATR, periodización inversa, polarizado y modelamiento, por otro lado, en la para natación, se utilizó el modelo de periodización tradicional. En ambas modalidades deportivas, los modelos de periodización empleados evidenciaron mejoras significativas en el rendimiento de los deportistas. Los resultados de esta investigación muestran que los modelos de periodización son efectivos para la mejora del rendimiento de los deportistas de natación y para natación, no obstante, son necesarios más estudios para determinar el efecto de los modelos de periodización en relación al nivel de experiencia de los deportistas. Además, se necesitan más estudios para determinar el uso de otros modelos de periodización en la para natación.

Introduction

This study aims from a literature review to explore the periodization models used in swimming and para-swimming, taking into account the theoretical foundations of different authors that support these models, providing also, an overview of the characteristics associated with each model, passing through the traditional periodization model, inverse, block, ATR, polarized, and modeling, so that coaches and sports professionals can make informed decisions regarding the periodization of training in swimming and para-swimming.

While it is true that swimming races is one of the oldest known sports, according to some historians it was present at the first modern games in Athens in 1896. According to the International Olympic Committee (IOC), swimming is both an individual and a team sport, in which swimmers propel their bodies through the water in a pool (50 m), either outdoors or indoors, using different swimming techniques such as freestyle, backstroke, breaststroke and butterfly. On the other hand, Domínguez & Saraví (2013), indicate that swimming is an individual sport in which there is no partner, adversary or uncertainty in the environment. On the other hand, this sport comprises four techniques, which, according to Astray (2014), are:

- Free: consists of the swimmer moving the arms in the air with the palm down to enter the water while the other arm moves underwater, at the same time, moving the legs in a swinging kicking motion. This is the fastest technique and the most used in the different events, being 50m, 100m, 200m, 400m, 800m, 1500m and 3000m.
- Backstroke: consists of swimming floating face up in the water, with a sequence of movements similar to the free technique.
- Breaststroke: consists of opening the arms backwards until they are in line with the shoulders above or below the surface of the water, while shrinking the legs closer to the body, with the knees and feet out, then stretching with an impulse while the arms return to the starting point.
- Butterfly: this technique is a variation of the breaststroke or breaststroke technique where both arms are brought forward over the water and then backward in a coordinated manner.

Swimming stands out as one of the oldest disciplines within the field of adapted sports, since, after the Second World War, the rates of people with physical disabilities were high, which is why adapted sports were developed and swimming, which is part of the Paralympic Games, became popular among them (Ruiz, 2011).

Currently inclusion has acquired great relevance, transcending even to sports, trying to accommodate all people regardless of their social, physical and even mental conditions, as mentioned by Forest & Pearpoint (as cited in Macías $ Gonzales, 2012) "It is a fact that people who have some kind of disability, historically have suffered some kind of marginalization and social exclusion", and further specifies that, "in the face of this trend, a large number of authors defend a society for all, that is, a society in which we are all part of it, since inclusion entails the acceptance of diversity". Thus, trying to cover especially the physical and mental aspect of the athlete, adapted sport arises, being understood according to Perez, et al. (2012), Como:

> That sport modality that is adapted to the group of people with disabilities or special health conditions, either because a series of adaptations and/or modifications have been made to facilitate the practice of those, or because the structure of the sport itself allows its practice. Thus, the different adaptations or

modifications of the sport are intended to adjust to the conditions of the athlete so that he/she can be competent.

Among the variety of existing adapted sports, para-swimming, presents various benefits, as mentioned by Catala (2015), it can help reduce both physical and psychological impairments, taking into account the social, occupational, functional, recreational benefits, in short, it helps the integral development of people with physical, visual and intellectual disabilities. This sport has been practiced since the first Paralympic Games, and it should be noted, as mentioned by Gómez & Prada (2019), that swimming is the only sport that, since its regulatory classification, groups athletes according to their ability to compete, allowing the participation of people with various disabilities, including cerebral palsy, spinal cord injuries, among others.

As indicated by the International Paralympic Committee, para-swimming emerged as a Paralympic sport in Rome 1960, which is defined as the sport modality that through adaptations of conventional swimming can be directed to people with disabilities, or in special health conditions so that they can be competent (Perez, et al., 2012). In addition, it should be noted that swimming is the only sport that groups athletes according to their ability to swim, regardless of the cause of their disability, cerebral palsy, spinal cord injury, and other disabilities (Gómez & Prada, 2019).

Thus, race swimming and para-swimming are sports that involve the athlete as a whole, so the athlete's preparation process is immersed in the use of the appropriate periodization models according to the stage of the athlete's life, in this sense González (2022) mentions that traditional periodization is still valid for athletes and is the predominant training methodology among individual sports.

In the sports field, periodization is a fundamental tool to reach the peak of the athlete's form and minimize the risk of injury, therefore, planning encompasses on the one hand making forward-looking decisions regarding the improvement and effectiveness of sports training depending on the context in which we find ourselves, whether in initiation or in high performance sports (González, Navarro, & Pereira, 2015), in the same sense, Navarro (2001) suggests that in order to achieve adaptation in the specific capabilities of each sport modality in search of maximum performance, the application of training loads should be taken into account according to their nature, magnitude, orientation and organization, which are conditioned in turn, by the individual characteristics of the athlete, the sport specialty and its respective system of competitions. In addition, it is important to highlight that within the periodization process there are several principles that support the training that the athlete fulfills, these principles are overload, progressive increase of the load, recovery, reversibility, specificity, individuality, periodization and the active and conscious participation of the athlete (Puga, 2022). Thus, the training process of athletes is conditioned by the selected periodization model, which over time affects the sports results (Beltrán Rodríguez & Agudelo, 2020).

In recent years, there has been a growing interest in the former concept of periodization; so the traditional periodization of Matveev (1977, as cited in Marques Junior, 2022) shows the logic from his concept, dividing the training process into multiple periods with variation of volume and intensity, based on the development of multiple physical abilities in an extensive period of time (Ordiñana, Cuquerella, 2018). The first period is called the preparatory period, which is divided into two stages, general preparation and special preparation, this period is characterized by the application of general loads; the second period is the competitive period, similarly, it is divided into two stages, pre-competitive and competitive, it is in this period where the athlete seeks to reach the state of sporting form and competes in competitions of minor and major

importance. Finally, the transition period, in which, through active or passive rest, the aim is to temporarily lose sporting form (Marques Junior, 2022). The duration of these periods should be adapted to the needs of today's sport so that athletes achieve an adequate sporting form for sport competition (Marques, 2022). On the other hand, in para swimming, the traditional periodization adapted by Maglischo et al., (1992, as cited in Arroyo, 2014) presents four periods denominated as follows: general resistance, specific resistance, competitive period and fine-tuning period, being one of its main characteristics the high volume of work used in the general and specific resistance periods (Arroyo, 2014).

Currently, there is a growing interest in inverse periodization as an alternative to traditional periodization. This new training model also presents the application of high volumes and low intensities, but unlike traditional periodization, the training program starts with high intensity and low volume and, in the following periods, a decrease in intensity and an increase in volume is evident, or intensity is maintained and volume is increased depending on the sport discipline (Clemente Suárez et al., 2018).

However, the increase in the number of competitions per year and the specificity within the different sports disciplines, has led to the emergence of new periodization models, among them, the block models of verkhoshansky and the ATR of Issurin and Kaverin, which present shorter preparation times (Ordiñana, 2018), where concentrated and selective loads are administered, maintaining a unilateral objective, leading the training in a single direction (Ortiz, 2016). This type of periodization has proven to be very beneficial in high performance sports, however, its use is not advised in beginner athletes, but in experienced athletes, athletes whose capabilities and results have proven to tolerate concentrated loads (Ortiz, 2016). On the other hand, modeling focuses on the training process taking into account the particular characteristics of the swimmer, his strengths, weaknesses, motivations, environment and other aspects that allow enhancing his performance towards high sporting achievements (Agudelo, 2020).

Based on the above, the present research aims to conduct a systematic review of the periodization models used in swimming and for swimming.

Method

A systematic review was carried out in order to obtain relevant information about the implementation of periodization models used in swimming and for swimming, in the electronic databases Google Scholar, SportDiscus, Dialnet and SciELO, this review was performed following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. The keywords used in the search were: Swimming, for swimming, periodization models, adapted sports, individual sports.

Once the search was performed, duplicate articles were eliminated, then the remaining records were filtered by title and abstract to exclude research unrelated to the objective of the study. Studies were then selected according to the following inclusion criteria:

- Publications that featured competitive level athletes in swimming and/or para-swimming.
- Studies in which a training periodization structure or model was implemented
- Studies published in scientific journals
- Studies less than 10 years old

Descriptive data were extracted from the selected studies, based on the periodization model used, the number of athletes included in the study, the duration of

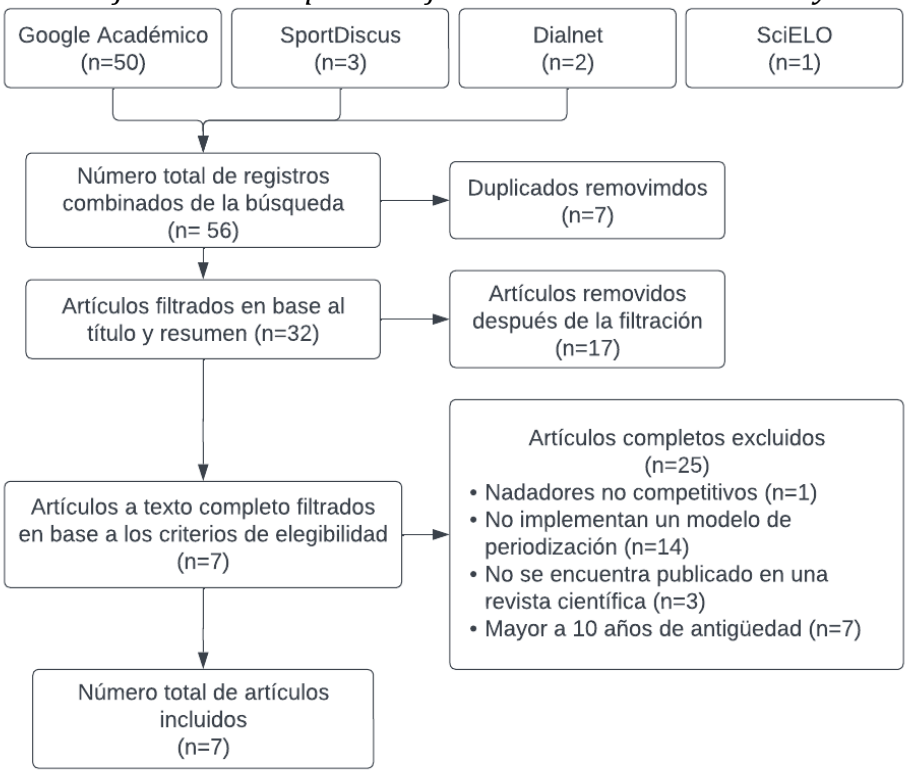
the training periodization used and the main findings once the intervention had been carried out.

Results

A total of 56 potential studies were identified after searching the databases; after elimination of duplicate studies and according to the title and abstract, 32 articles remained, of which 7 met the inclusion criteria and were therefore included in the present review (Fig. 1)

Figure 1

PRISMA flowchart of the selection process of the articles included in the systematic review



Characteristics of the studies

The characteristics of the articles are shown in Table 1. A total of 7 articles met all the inclusion criteria, of which the study by Pla, et al. (2019) presents a polarized periodization in swimming, Arroyo et al., (2021) compared the pyramidal and polarized periodization, Rodríguez & Velásquez, (2020) applied a plan by modeling, Zacca, et al. (2020) implemented a traditional training plan, Usma & Tamayo, (2022) applied a reverse periodization, while, Clemente, et al., (2018) compared traditional and reverse periodization, finally, Gonzales, et al., (2022). implemented a mixed periodization structure with a traditional and polarized training load distribution.

All studies were conducted on competitive swimmers, there were a total of 87 athletes in the included articles. six studies were conducted on swimmers without any disability, while only one study took into account a para-swimming athlete, moreover, only three studies used a control group to evaluate the implemented periodization model. The mean duration of the training interventions was 20.57±15.95 weeks, one of the studies was 28 weeks (Pla, et al., 2019), one study had a duration of 22 weeks (Rodriguez

& Velasquez, 2020), one study 12 weeks (Arroyo, Sortwell & Clemente, 2021), one study lasted 10 weeks (Clemente, et al., 2018), one study lasted 4 weeks (Usma & Tamayo, 2022), one study lasted 52 weeks (Gonzales, et al., 2022), finally, one study lasted 16 weeks (Zacca, et al., 2020).

Effects on performance

Polarized training presented a moderately greater improvement with less fatigue than threshold training in the 100 m test (0.97 % ± 1.02 %; within-group change: ± 90 % CI vs. 0.09 % ± 0.94 % respectively) (Pla, et al., 2019), likewise, compared to a pyramidal distribution, the polarized training presents a greater improvement in the 100 m test, however the pyramidal training presents a greater improvement in the 800 m test (Arroyo, Sortwell & Clemente, (2021), on the other hand, the periodization by modeling implemented by Rodríguez & Velásquez, (2020), presented significant improvements in the 100 m test compared to traditional periodization ($p < 0.05$), while Usma & Tamayo, (2022) obtained improvements in the 100 m test and in the jumping capacity of the athletes through inverse periodization, while Zacca, et al., (2020) obtained improvements in technique and swimming performance in the 400 m event, in turn, Clemente, et al, (2018), evidenced that the inverse periodization is more effective in improving VO2max in swimmers than the traditional one, however, the latter is more effective in improving technique, finally, a reverse periodization (Traditional-polarized) has shown significant improvements in strength and fitness in swimming athletes, Gonzales, et al., (2022).

Table 1
Description of the studies

Authors	Periodization model	Duration	Main findings
Pla, et al., (2019)	Polarized	22 elite junior swimmers participated in a 28-week crossover intervention study involving 2 x 6-week training periods, separated by 6 weeks.	Polarized training (POL) resulted in a moderately greater improvement in 100 m performance than threshold training (THR) with less fatigue and better recovery quality. No clear differences in physiological adaptations were observed between the groups.
Rodríguez & Velásquez, (2020).	Modeling	10 elite female swimmers participated in a 22-week modeled training plan, six sessions per week of three hours per session (experimental group) and a traditional training plan (control group) of equal duration.	They showed significant differences in the times of the 100 m crawl test between the groups that trained with the traditional plan and the periodization by modeling.
Arroyo, Sortwell & Clemente, (2021)	Pyramidal and Polarized	12 swimmers from a nationally competitive program participated in the 12-week plan. They were divided into a control group and experimental group. The control group performed a pyramidal training intensity distribution and the experimental group performed a polarized training intensity distribution.	Changes in t100c were significantly greater in polarized distribution and t800c greater in pyramidal, as well as decreases in fat mass and increases in fat-free mass.
Clemente, et al., (2018)	Inverse and traditional	17 athletes participated in two training plans, one group (N.=7) performed 10 weeks of traditional periodization (TTP) and the second (N.=10) participated in a similar period of reverse periodization (RTP).	RTP performed for 10 weeks was more effective than TTP in increasing VO2max in trained swimmers, but TTP produced greater swimming efficiency, probably due to the greater volume of technical training performed during the training program.
Usma & Tamayo, (2022)	Inverse	A swimming athlete with motor functional disability participated in a 4-week plan of traditional periodization.	The results of the program show improvements in the 4 times evaluated in 100 meters, increases in the explosive strength of the power jump and changes in the athlete's body composition.
Gonzáles, et al., (2022)	Mixed (Traditional - Polarized)	An international male swimmer participated in a 52-week plan in a traditional periodization model using three macrocycles. The training intensity distribution (TID) followed the pattern of a traditional pyramidal model in general training and polarized and threshold models during specific training before competitions.	The season was successful with substantial improvements in strength, fitness and competitive performance. Regular monitoring of both training and competitive swimming performance, power and selected physiological measures informed training decisions.
Zacca, et al., (2020)	Traditional	24 swimmers participated in a traditional 16-week macrocycle in a competitive season.	Improvements in technique had the greatest influence on swimmers' T400 performance, supported by improvements in energy (fitness) and underlying physical growth and maturation.

Discussion and conclusions

There are some descriptive studies of periodization models in the literature, such as the one conducted by Ramos et al. (2012), which was carried out with the coaches participating in the South American Games Medellin-2010, concluding that the most used periodization models were traditional, cycles, blocks and individual, although the

traditional periodization model predominates, in addition, they state that differences were recorded depending on the group of sport and the final classification of countries by gold medals. It should be noted that it was carried out for all the sports that take place in the competition, both individual and collective.

In relation to the purpose of this study, which is to identify the periodization models used in swimming training and for competitive level swimming, the periodization models used in each of the documents that make up this review are related to competitive level populations of various ages and with different application times, some applied throughout the season, others applied in different periods, however, all obtained significant improvements for their athletes.

In a review conducted by Bolaños (2020), based on the results obtained from ten studies, it is evident that the different periodization models; traditional, inverse, polarized and block, positively influence the performance of athletes in terms of improving their physical abilities, likewise, it was determined that the use of one or another periodization model depends on the objectives set, as well as the preparation time to which the athlete is subjected. However, this review does not discriminate the level of performance or experience of the athletes and did not include in its search which periodization models have been used in para-swimming. On the other hand, Galeano, Orejuela & Cardona (2023), describe the periodization models used by coaches in Valle del Cauca, in different sports modalities, finding that the periodization models most used by coaches in Valle del Cauca are the contemporary models and, of the traditional models, the one considered most valid is the classical model, proposed by Matveiev.

In relation to the results obtained from the present review, studies such as the one carried out by Zacca et al. (2020), demonstrated that, by using the traditional periodization model, improvements in technique can be obtained, which were evidenced in T400 performance. Similarly, as evidenced by Neto, et al., (2016), the effects of a linear (traditional) intensity distribution presents improvements in critical speed in well-trained young swimmers. Although the traditional periodization model has proven to be effective in training swimmers, a major limitation is its inability to obtain multiple peaks of performance during a competitive season, as required by contemporary elite sport (Ravé, 2021).

Likewise, Guerrero, Ubaque & Gómez (2021), state that the classical periodization is not the most appropriate for the training of swimmers, because in swimming it is necessary that intensity prevails over volume due to the short distance and duration of the tests, so they suggest that the ATR model is more accurate to design a training plan in elite swimmers (finswimming) since the adaptations to concentrated loads are more significant. In other research, such as that conducted by Calderón & Lozano (2017), the ATR model has been implemented, finding that after 14 weeks of the application of this model, cardiovascular adaptations are evidenced, represented in the improvement of aerobic capacity and specific swimming power, as well as improvements in aerobic and anaerobic endurance.

On the other hand, some authors have compared the benefits of traditional and inverse periodization, Clemente & Ramos (2019), indicate that inverse and traditional periodization are effective for the improvement of biomechanical, performance and physiological variables during the 2km race in triathletes, as well as in aerobic and anaerobic swimming performance. Arroyo (2011) found that after 14 weeks of training, inverse periodization was more effective for improvement in the 100m crawl than a program based on the traditional periodization model. In addition, it reduces the risk of muscle damage and MME loss (Arroyo, 2012). Likewise, Arroyo, Clemente & González (2013), compared 10 weeks of inverse and block periodization, finding improvements in

the time of the 100m race by the inverse periodization, so this model indicates a successful result in competitive performance, while block training showed a significant decrease in terms of body composition of athletes, being a good alternative for improving the body composition of swimmers. In contrast, Arroyo, (2014c) found that, in terms of 100 m crawl performance, specific swimming power (SSP) and maximum drag load (MDC), reverse periodization proved to be more effective in training sprinters, while greatly reducing the volume of the load.

Some research conducted on the implementation of inverse periodization, have shown that this type of periodization allows improvements in the time of the 100-meter races, increase in the explosive strength of the power jump and changes in the body composition of swimmers (Usma & Tamayo, 2017), as well as significant improvements in the 200 and 400-meter crawl races (Riaño & Arroyo, 2021), demonstrating the effectiveness of the application of inverse periodization. However, in the study conducted by González et al. (2022) found that reverse periodization does not provide superior improvements in swimming, running, muscular endurance, maximal strength and VO2max performance compared to traditional or block periodization.

In relation to polarized periodization, it is indicated that implementing polarized training in swimming, causes improvements in performance in the 100 m time trial, accompanied by less fatigue perceived by athletes (Pla, et al., 2018), similarly, it has been shown that polarized training intensity distributions produce improvements in swimming performance, body composition and VO2max in swimmers Arroyo, Sortwell & Clemente (2021), constituting itself as a viable alternative for the periodization of swimming training.

In contrast to the above, Sitko & Laval (2019), conducted a systematic review, in which they found that the scientific evidence indicates that a polarized training distribution is more effective in improving performance in endurance sports, such as cycling, where Rivera, et al, (2021), evidenced that in comparison with the periodization between thresholds, a polarized distribution presents significant improvements in the performance of athletes in terms of power at functional threshold (PUF) and watts per kilogram (V/kg), likewise, in the review conducted by Rosenblat, Perrotta & Vicenzino (s.f.), mention that a polarized distribution is more effective in the improvement in time trials, VOmax/peak and tests to exhaustion, compared to a distribution between thresholds, however, these show no difference in the economy of exercise.

According to the findings of this review, another possible way for swimming training is periodization by modeling, which has proven to be effective in improving the performance of swimmers, because, as evidenced by Beltrán & Agudelo (2020), there is a significant difference in the performance of the 100-meter crawl by implementing this model compared to traditional periodization. Idárraga (2021), mentions that an important aspect that leads to choose periodization by modeling is the specificity that can occur in the sport modality and the reality of situations that may not be common in sport.

On the other hand, when researching the literature on periodization models for swimming, Paralympic or adapted swimming, some related articles were found, however, very few present a periodization model, instead they present methods and methodologies. Thus, researches such as the one conducted by Reyes & Solange (2021), present analytical methods but do not present periodization models, alluding to the lack of preparation of professionals in the area. In the same line Caballero and Aguilar (2020), present a teaching methodology but do not shed any light on the periodization model. However, Gomez & Prada, (2019), in their research make use of a traditional Matveiev model, likewise, Fulton, et al., (2010), quantified the weekly intensity and volume pattern in Olympic para-swimming athletes, determining that they follow a traditional training

distribution pattern, observing high volumes at the beginning of the season with a substantial decrease as competition approaches. In addition, Querido Santos & Silva (2009), propose a classic Macrocycle, but in a superficial manner. In this sense, Oyola & Solís (2020), make a very significant contribution, although what they do is an adaptation of a training program, and recommend designing training models adapted for a greater volume of time since the experience generated, taking into account the characteristics and needs of the population, requires more time dedicated to each objective.

Finally, because the periodization of training remains in constant change, due to the high standards and modern competitiveness that occur in sport today (Camacho, Ochoa & Rincón, 2019), it is the job of coaches to choose the periodization model that best fits the demands of the sport, as well as the needs of the athletes.

The present review, has allowed to attend from the literature, on the models of periodization in Swimming races and for swimming of high performance, configuring in completion of the level of sport specialization and mastery of the same; carrying out searches in different databases, following the PRISMA guidelines. As a result, only seven (7) studies were found that met the inclusion criteria. In these studies, it has been shown that the periodization models used in swimming races are the traditional, polarized, modeling and inverse model, and in swimming the traditional model was used, according to its competition system. Based on the above, it is possible to conclude that there is a need to expand the investigation of periodization models in the sport of para-swimming, in order to evaluate the relationship between periodization models and athletes' performance experience, as well as to explore the application of other models in this emerging field of study.

This study analyzed, based on previous research, the periodization models used in swimming races and para-swimming, taking into account the research carried out in this context, the use of traditional, polarized, modeling and inverse models was observed, in which it is evident that the traditional model is present in the authors' discussions. In general, it can be concluded that the models applied in the different studies provided significant improvements in their respective populations. Even though the researches include competitive level athletes, they do not express in detail the level of experience in the sport of each athlete.

As for the para-swimming, the periodization model used is the traditional one, demonstrating improvements in T400 performance with the adjustment of loads from the traditional theory, during a period of 52 weeks, which makes it have a tune-up for the main competition. This study has shown that the choice of a traditional periodization should obey the achievement of the peak of form in competition, which indicates that in this case they did not have a high competition system for their tuning. Although traditional periodization has proven to be effective in swimming athletes, there is little information in this regard, so it is unknown whether the application of other periodization models can also provide improvements in the performance of athletes.

Limitations

A number of important limitations need to be considered in the present review. In the first place, a greater number of studies in conventional swimming races was evidenced. Secondly, in the for swimming only one study was found against performance, which allows addressing the research interest itself on the effects of classical, contemporary or emerging periodization models. Thirdly, an issue that is not addressed is the one referred to load undulation, since it is mainly specified on periodization, so it is clear that it focuses on the effects of models already studied in terms of weekly volume; in short, it remains a challenge to solve variables in load, model and performance reviews.

Continuity proposals

It is recommended that research be undertaken in the areas of Paralympic sport, since there is little evidence on the periodization models used in para-swimming; the analysis of loads versus the applied model, the distribution or periodization of the load from the theorization of the model to be applied, since the lack of research in this field limits to discuss broadly on the models used in Paralympic swimming, in each of its classifications.

Despite certain limitations mentioned above, this study helps swimming and para-swimming coaches to take into account when planning their competitive calendar, the theory of the model they are going to follow and the performance implications according to their discipline, i.e., whether it is swimming races or para-swimming, since the model has its own characteristics of design, application and distribution of training loads.

The results of this review have a series of important implications for the future practice of periodization in swimming races and para-swimming, such as the fine-tuning with the approach of the theory and scientific review of the same. It is also evident that field diaries of practical findings and veracity of the load must be kept to identify whether the correct model is being addressed or whether another should be addressed from the performance point of view, all to seek fine-tuning in the context in which the model is being applied.

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