

Planning physical-technical orientation loads in the special physical preparation of Taekwondo

La planificación de las cargas de orientación físico-técnicas en la preparación física especial del Taekwondo

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ABSTRACT

The special physical preparation loads in Taekwondo require methodological depth in their planning. From there, the following scientific problem was found: How to contribute to the improvement of the planning of physical-technical orientation loads in the special physical preparation of Taekwondo? A methodology was designed for its solution. Analytical-synthetic, hypothetical-deductive, document analysis, scientific modeling, systemic-structural-functional, specialist criteria, survey and the Delphi statistical method were used. The results of the specialist criteria revealed high agreement in the theoretical relevance and prognosis of feasibility of practical application of the methodology.

Keywords

Methodology; Planning; Physical-technical loads; Special physical preparation; Taekwondo.

RESUMEN

Las cargas de preparación física especial en el Taekwondo requieren de profundización metodológica en su planificación. De ahí, se constató el siguiente problema científico: ¿Cómo contribuir al perfeccionamiento de la planificación de las cargas de orientación físico-técnicas en la preparación física especial del Taekwondo? Para su solución se diseñó una metodología. Se emplearon los métodos y/o técnicas de investigación analítico-sintético, hipotético-deductivo, análisis de documentos, modelación científica, sistémico-estructural-funcional, criterios de especialistas, encuesta y el método estadístico Delphi. Los resultados del criterio de especialistas revelaron alta concordancia en la pertinencia teórica y pronóstico de factibilidad de aplicación práctica de la metodología.

Palabras clave

Metodología; Planificación; Cargas físico-técnicas; Preparación física especial; Taekwondo.

INTRODUCTION

One of the key components of performance in Taekwondo sport to meet the high competitive demands is the development of training with physical-technical orientation loads as a key or determining accent in the special physical preparation (PFE) stage. These loads play a crucial role in the performance of taekwondo players, since they must manifest high power, speed and specific resistance in the actions, which is essential for achieving precision and effectiveness in attacks, counterattacks and defenses. Therefore, it is revealed that to achieve high performance it is not enough to just work on technique, but also an exceptional physical condition that allows technical actions to be carried out effectively and efficiently.

The importance of PFE lies in the fact that it allows sports performance to be significantly improved through physical-technical oriented loads. These special loads have as their essential objective the development of physical qualities that are directly applicable to the techniques and tactics of Taekwondo. Among these qualities are speed of reaction and action, explosive strength, specific resistance, joint mobility and agility, all essential to execute fast, powerful and precise movements during combat.

For example, explosive strength is essential for executing fast, powerful kicks, while quickness and agility allow athletes to move quickly around the combat area, dodging attacks and strategically positioning themselves to attack or counterattack. In addition, PFE contributes to the prevention of injuries.

In the context of Taekwondo PFE, the physical-technical load, which combines physical work with sport-specific techniques, is particularly effective. This didactic-methodological conception of training content allows athletes to simultaneously improve their physical condition and technical skills, ensuring that physical development translates directly into improvements in combat capabilities and skills. For example, exercises that mimic or model the energy demands and movements of actual combat can improve specific endurance, allowing taekwondo athletes to maintain a high level of performance throughout the duration of a competition's bouts. Given the vital importance of PFE with physical-technical oriented loads, these must be conceived from adequate planning.

In this research, the studies or theoretical and investigative background of important authors in the field of action of planning physical-technical orientation loads in the special physical preparation of Taekwondo were analyzed. Among them, the contributions of: Gómez (2004), González & Leiva (2006), González & Pedroso (2016), Fernández (2016), Gómez et al (2018) and Merlo (2019) were analyzed. In their works they present important general foundations, training periodization models,

didactic suggestions and recommendations, characterization of the energetic, physical and technical demands of sport, exercises for physical abilities adapted to the context of sport, but they do not address enough elements that guarantee the correct procedure. ideal methodological method for the adequate preparation of special physical preparation load plans.

The above is revealed in that the cited authors have used general procedures for the distribution and dosage of special physical loads in the different temporal structures of planning (periods, stages, mesocycles, microcycles and training sessions) based on different perspectives or ways explained below:

1. Distribution and dosage of the physical strength load based on percentages of the general volume of the macrocycle using the training time as magnitude (based on methodological procedures of Forteza and Ranzola, 1988; Forteza, 2001; Forteza and Ramírez, 2007).
2. The main limitation of this methodological procedure is that time is not the appropriate magnitude to plan the volume, since it only reveals the duration of the training, for example, 2 hours for special anaerobic resistance training. Therefore, the volume expressed in time is not real, nor does it allow real control or individualization.
3. Distribution and dosage of the physical load based on percentages of the theoretical volume of the macrocycle using as magnitude the repetitions of each manifestation of strength, resistance, speed, joint mobility, and coordinative abilities (based on methodological procedures of García et al, 1996).

This methodological procedure manages to give adequate magnitude to the content of the different manifestations of physical abilities. But it does not guarantee that when the breakdown of the percentages of the general volume given in the appropriate magnitudes (repetitions, distances, jumps, hits, etc.) is developed, the ideal number of these will reach the microcycle or training session to achieve the objectives and for the application of a specific method, since in general there may be excess or lack of repetitions, time, jumps, hits, among other magnitudes of volume of the contents.

In addition to what was stated, it is also observed that not all stages or mesocycles have the same number of weeks or microcycles, which can create mathematical conflicts when distributing and dosing the physical load. It is also not clear how to give an outlet to individualization in planning.

The methodological limitations evident from the application of the documentary analysis method allowed the following scientific problem to be formulated: how to contribute to the improvement of the planning of physical-technical orientation loads in the special physical preparation of Taekwondo?

Since, the essential cause of the manifestation of the scientific problem lies in the methodological aspect so that the planning of the special physical preparation loads is real, controllable and individualized, and in correspondence with the energetic, physical, technical and competitive demands of the sport. object of study, the general objective was proposed: to design a methodology that contributes to the improvement of the planning of physical-technical orientation loads in the special physical preparation of Taekwondo.

METHODS

The investigative work was developed from the use of scientific research methods and/or techniques, which are explained below and justify their use:

- Analytical-synthetic: for the analysis of the theoretical and investigative background in the object of study and its corresponding field of action, for the study of the foundations that must support the proposed methodology; and for the interpretation of the results of the application of the survey to specialists and the statistical processing on the relevance and prognosis of practical feasibility.
- Hypothetical-deductive: to establish the generalizations and conclusions that were derived from the results of the application of the survey to specialists on the relevance and forecast of practical feasibility of the methodology that was designed.
- Document analysis: to analyze planning documents for physical-technical orientation loads in special physical preparation in the sport under study.
- Scientific and systemic-structural-functional modeling: for the determination of the structural components of the designed methodology and the systemic relationships between the components that make it up that allowed the ideal representation of the planning process of the physical-technical orientation loads in the special physical preparation of the Taekwondo sport.
- Specialist criteria: for the assessment of the theoretical relevance and the forecast of feasibility of practical application on different aspects of the designed methodology.
- Survey: used as a technique to obtain the criteria of the specialists who assessed the theoretical relevance and the forecast of feasibility of practical application of the methodology presented to them.
- Delphi Method: for the statistical processing of the results of the criteria of the selected specialists.

RESULTS

To solve the formulated scientific problem, a methodology was provided. This scientific research result describes, as assumed by Valle (2007), how to do something, the establishment of ways, methods and procedures to achieve an end, taking into account the contents to achieve a specific objective.

The methodology designed in the context of this research is aimed at answering how to ideally develop the planning process of the physical-technical orientation loads in the special physical preparation of Taekwondo.

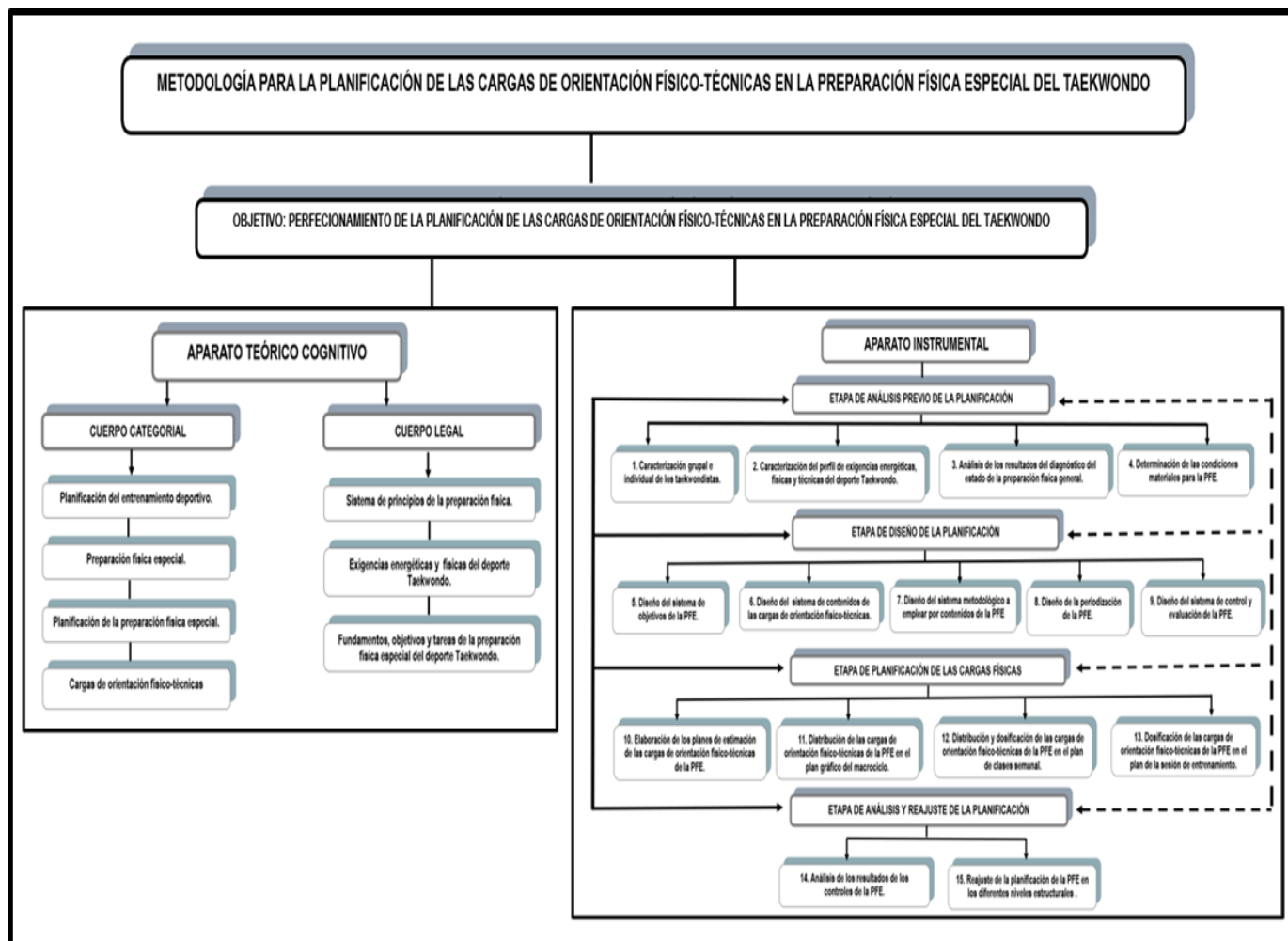
For the structuring and determination of the cognitive and procedural content of the methodology that was designed, the theoretical-methodological guide proposed by De Armas et al (2001) was used. This reference suggests that the methodology as a scientific result of a research is made up of two structural apparatuses: the theoretical or cognitive apparatus and the methodological or instrumental apparatus.

De Armas et al (2001) guide that the cognitive theoretical apparatus is made up of the categorical body, which in turn includes the categories and concepts and the legal body, which is made up of laws, principles or requirements. The concepts and categories that are part of the cognitive theoretical apparatus of the methodology are those that define essential aspects of the object of study. On the other hand, they explain that the legal body is made up of the principles or requirements that regulate the process of applying methods, procedures, techniques and means.

Also, De Armas et al (2001), describe that the methodological or instrumental apparatus is made up of the theoretical and empirical methods, the techniques, procedures and means that are used to obtain knowledge or to intervene in practice and transform the object of study.

Figure 1

General representation (model) of the methodology for planning physical-technical orientation loads in the special physical preparation of Taekwondo.



The designed methodology projects as a general objective: the improvement of the planning of physical-technical orientation loads in the special physical preparation of Taekwondo. Hence, the proposed methodology contains a system of well-founded procedures organized sequentially by stages, which must be developed to achieve the stated objective (figure 1).

As can be seen in the graph of the methodology model, the cognitive theoretical apparatus is made up of its categorical body and its legal body. The categorical body contains the concepts of sports training planning, special physical preparation, planning of special physical preparation and physical-technical orientation loads. They are then conceptualized to guide the context of the area of knowledge where the methodology is developed:

Sports training planning: “(...) represents the plan or action project that is carried out with the training process of an athlete (or sports team) to achieve a specific objective (high performance).” (García et al, 1996)

Physical preparation: “biopsychopedagogical process aimed at improving morphofunctional potential through the adequate, balanced and progressive development of physical capabilities which are manifested in the muscular and functional strengthening of the organism.” (Collazo et al, 2006)

Special physical preparation: “training stage aimed at enhancing the specific functions of competitive exercise.” (Collazo et al, 2006)

Planning of special physical preparation: “is the development of a plan or action project aimed at improving the morphofunctional potential of the athlete so that he can develop high performance in exercises or actions of a competitive nature.” (Heredia, 2023)

Physical-technical orientation loads: “are content or directions of sports training aimed at developing physical capabilities through stimuli or exercises similar to the competitive technical actions of a sport from an energetic and/or biomechanical point of view.” (Heredia, 2023)

For its part, the legal body of the methodology is made up of the system of principles, provided by Collazo (2020), that allow the direction of the physical preparation process and its planning, as they are fully applicable to the context of the field of action of the research:

1. Principle of appropriate selection of content.
2. Principle of the relationship between training potential and recovery.
3. Principle of gradual and gradual increase in loads.
4. Principle of repetition and continuity of the exercise.
5. Principle of the multilateral nature of charges.
6. Principle of proper dosage of loads.
7. Principle of the individualized nature of the loads.
8. Principle of alternation of charges.
9. Principle of adequate use of sensitive periods for the development of physical abilities.
10. Principle of the need for balance between energy expenditure and consumption during the practice of sports physical exercises.
11. Principle of frequent control and evaluation of loads.

It is also considered essential to include in the legal body of the cognitive theoretical apparatus of the designed methodology the requirement of the energetic and physical demands of the Taekwondo sport,

which were identified in the works of Gómez (2004), González & Leiva (2006), Carazo (2013), González & Pedroso (2016), Fernández (2016), Cardoso et al. (2017).

The energy demands in Taekwondo are high and varied, due to the explosive and high-intensity nature of this sport. Actions in Taekwondo, such as kicks, strikes, evasive movements and counterattacks, require a combination of strength, speed, endurance and flexibility. The efficiency in the use of these physical capacities depends on the predominant energy system, which varies depending on the duration and intensity of the activity. Each energy system contributes to the physical and technical demands of Taekwondo.

It is essential that to develop effective and efficient planning of physical-technical orientation loads, Taekwondo coaches must master the relationship between energy systems, their power and capacity zones, with physical capabilities and technical actions. Understanding and optimizing physical preparation in relation to energy systems is essential for performance in Taekwondo, this allows athletes to tolerate fatigue and maintain a high level of intensity throughout each fight and throughout the competition.

Table 1

Relationship between the energy zone of alactic (or phosphagenic) power, physical capabilities and examples of physical-technical orientation loads in Taekwondo sport.

Energy zone of stimulation	Physical Abilities	Examples of physical-technical orientation loads in Taekwondo
Alactic or phosphagenic power. (≤ 10 s)	❖ Quick force	❖ Imitation of punching with dumbbells or elastic bands at maximum speed for 10 s. ❖ Imitation of kicking with overweights or elastic bands at maximum speed for 10 s.
	❖ Explosive strength.	❖ Vertical plyometric jumps followed by punches and kicks for 10 s. ❖ Plyometric drop jumps followed by vertical jumps and powerful punches and kicks for 10 s.
	❖ Speed of reaction	❖ Continuous defensive reactions to attacks and hits from the opponent for 10 s. ❖ Continuous offensive reactions to attacks or hits from the opponent for 10 s.
	❖ Speed of action	❖ Combinations of powerful kicks and/or punches at maximum speed for 10 s.
	❖ Motor coordination in rapid actions (≤ 10 s)	❖ Quick agility actions that combine starts, jumps, turns, hits, pushes and defensive and offensive actions with technical hits for 10 s.

Table 2

Relationship between the energy zone of alactic (or phosphagenic) capacity, physical capabilities and examples of physical-technical orientation loads in Taekwondo sport.

Stimulus energy zone	Physical Abilities	Examples of physical-technical orientation loads in Taekwondo
Ability alactic or phosphagenic. (≥11-20s)	❖ Resistance to rapid force.	❖ Imitation of punching fists with dumbbells or elastic bands at maximum speed for 20 s. ❖ Imitation of kicks with weights or elastic bands at maximum speed for 20 s.
	❖ Short-term anaerobic resistance	❖ Continuous hitting of implements with a kicking technique (with one leg or alternating legs) at maximum speed for 20 s. ❖ Combination of continuous hitting of implements with various kicking techniques (with one leg or alternating legs) at maximum speed for 20 s.
	❖ Resistance to the speed of reaction.	❖ Continuous defensive reactions to attacks and blows from the opponent for 20 s. ❖ Continuous offensive reactions of attacks or hits for 20s.
	❖ Resistance to speed of action.	❖ Combinations of kicks and/or punches at maximum speed in 20 s.
	❖ Motor coordination in quick actions (≥ 11-20 s).	❖ Quick agility actions combining starts, jumps, turns, hits, pushes and defensive and offensive actions with technical hits for 20 s.

Table 3

Relationship between the energy zone of lactic (or glycolytic) power, physical abilities and examples of physical-technical orientation loads in Taekwondo sport.

Stimulus energy zone	Physical Abilities	Examples of physical-technical orientation loads in Taekwondo
Power lactic or glycolytic. (≥21-60s)	❖ Resistance to rapid force.	❖ Imitation of punching fists with dumbbells or elastic bands at maximum speed for 45 s. ❖ Imitation of kicks with weights or elastic bands at maximum speed for 45 s.
	❖ Resistance to force.	❖ Imitation of hitting fists and legs against implements with elastic bands or overweight at a moderate pace for 45 seconds.
	❖ Medium-duration anaerobic resistance.	❖ Continuous hitting of implements with a kicking technique (with one leg or alternating legs) at a fast pace for 45 s. ❖ Combination of continuous hitting of implements with various kicking techniques (with one leg or alternating legs) at a fast pace for 45 s.
	❖ Motor coordination in quick actions (≥ 21-60 s).	❖ Quick agility actions combining starts, jumps, turns, hits, pushes and defensive and offensive actions with technical hits for 45 s.

Table 4

Relationship between the energy zone of lactic (or glycolytic) capacity, physical capacities and examples of physical-technical orientation loads in Taekwondo sport.

Stimulus energy zone	Physical Abilities	Examples of physical-technical orientation loads in Taekwondo
Ability lactic or glycolytic. (≥61-120s)	❖ Resistance to rapid force.	❖ Imitation of fist bumps with dumbbells or elastic bands at a fast pace for 90 s. ❖ Imitation of kicks with weights or elastic bands at a fast pace for 90 s.
	❖ Resistance to force.	❖ Imitación de golpes continuos de puños y piernas a implementos con bandas elásticas o sobrepeso a ritmo rápido durante 90 segundos.
	❖ Long-lasting anaerobic resistance	❖ Continuous hitting of implements with a kicking technique (with one leg or alternating legs) at a fast pace for 120 s. ❖ Combination of continuous hitting of implements with various kicking techniques (with one leg or alternating legs) at a fast pace for 120 s.
	❖ Motor coordination in quick actions (≥ 61-120 s).	❖ Quick agility actions combining starts, jumps, turns, hits, pushes and defensive and offensive actions with technical hits for 120 s.

Table 5

Relationship between the energy zone of aerobic (or oxidative) power, physical capabilities and examples of physical-technical orientation loads in Taekwondo sport.

Stimulus energy zone	Physical Abilities	Examples of physical-technical orientation loads in Taekwondo
Power aerobic or oxidative. (≥121-180s)	❖ Resistance to rapid force.	❖ Imitation of punching fists with dumbbells or elastic bands at a fast pace for 180 s. ❖ Imitation of kicks with weights or elastic bands at a fast pace for 180 s.
	❖ Resistance to force.	❖ Imitation of continuous blows of fists and legs to implements with elastic bands or overweight at a moderate pace for 180 seconds
	❖ Mixed resistance with anaerobic predominance.	❖ Continuous hitting of implements with a kicking technique (single leg or alternating) at a fast pace for 180 s. ❖ Combination of continuous hitting of implements with various kicking techniques (single leg or alternating) at a fast pace for 180 s.
	❖ Motor coordination in quick actions (≥ 121-180 s).	❖ Quick agility actions combining starts, jumps, turns, hits, pushes and defensive and offensive actions with technical hits for 180 s.

Table 6

Relationship between the energy zone of aerobic (or oxidative) power, physical capabilities and examples of physical-technical orientation loads in Taekwondo sport.

Stimulus energy zone	Physical Abilities	Examples of physical-technical orientation loads in Taekwondo
Ability aerobic or oxidative. (≥121-360s)	❖ Resistance to force.	❖ Imitation of continuous blows of fists and legs to implements with elastic bands or overweight at a moderate pace for 300 seconds.
	❖ Mixed resistance with anaerobic predominance.	❖ Continuous hitting of implements with a kicking technique (single leg or alternating) at a fast pace for 180 s. ❖ Combination of continuous hitting of implements with various kicking techniques (single leg or alternating) at a fast pace for 180 s.
	❖ Mixed resistance with aerobic predominance.	❖ Continuous hitting of implements with a kicking technique (single leg or alternating) at a moderate pace for 360 s. ❖ Combination of continuous hitting of implements with various kicking techniques (single leg or alternating) at a moderate pace for 360 s.
	❖ Motor coordination in quick actions (≥ 121-360 s).	❖ Agility actions at a moderate pace that combine starts, jumps, turns, hits, pushes and defensive and offensive actions with technical hits for 360 s.

Returning to the structure and content of the methodology, **Figure 1** shows that the instrumental apparatus is organized systemically by stages with their corresponding methodological procedures. Therefore, this structure of the methodology reveals the procedure to develop the planning of the physical-technical orientation loads in the special physical preparation of Taekwondo. The system of methodological procedures that is structured by stages in the methodology is an organized and structured set of steps or actions, detailed and sequential, to guide the execution of the procedures in an efficient, coherent and, with the objective of obtaining performance and results. consistent sports.

The prior analysis stage of the planning has the specific objective: to identify the key information of the context in which the planning of the physical-technical orientation loads in special physical preparation must be developed.

The methodological procedures to be developed in this stage are:

1. Group and individual characterization of the taekwondo players.
2. Characterization of the profile of energetic, physical and technical demands of the Taekwondo sport.
3. Analysis of the results of the diagnosis of the state of general physical preparation.
3. Determination of the material conditions for the PFE.

The specific objective of the planning design stage is: to design the planning process, based on the information provided by the development of the prior analysis stage, to determine the objectives, the temporal structure of the planning, the contents, the methods, and the forms of control and evaluation that will be used in the development of the planning of physical-technical orientation loads in special physical preparation.

The methodological procedures to be developed in this stage are:

1. Design of the PFE objective system.
2. Design of the content system of the physical-technical orientation loads.
3. Design of the methodological system to be used for the contents of the PFE.
4. Design of the PFE periodization.
5. Design of the PFE control and evaluation system.

The physical load planning stage shows the specific objective: to develop the scientific-methodological treatment of the planning of the physical-technical orientation loads in the special physical preparation in the different temporary structures and/or planning documents.

The methodological procedures to be developed in this stage are:

1. Preparation of the estimation plans for the physical-technical orientation loads of the PFE.
2. Distribution of the physical-technical orientation loads of the PFE in the graphic plan of the macrocycle.
3. Distribution and dosage of the physical-technical orientation loads of the PFE in the weekly class plan.
4. Dosage of the physical-technical orientation loads of the PFE in the training session plan.

The specific objective of the planning analysis and readjustment stage is to provide feedback to the process based on systematic control and evaluation of the planning carried out in each stage, microcycle or work week and training sessions.

The methodological procedures to be developed at this stage are:

1. Analysis of the results of the PFE controls.
2. Readjustment of PFE planning at different structural levels.

To evaluate the theoretical relevance and predict the feasibility of practical application of the proposed methodology, the specialist criteria method was applied. The group of 15 selected specialists presents the following characterization: eight (6) of them have the title of Doctor in Physical Culture and Sports, five (9) of them have a Master's Degree in Sports Training, all have 10 or more years of professional experience.

A survey was applied to the selected specialists aimed at evaluating the theoretical relevance and the prognosis of the feasibility of practical application of the methodology. Statistical processing was applied to the results obtained in the surveys, as proposed by the Delphi method.

Table 8

Results of the evaluation of the methodology by the specialist criterion method (cut-off points obtained with the Delphi statistical method).

ASPECTOS A VALORAR POR LOS ESPECIALISTAS	MA	BA	A	PA	NA	SUMA	P	N-P	VALORACIÓN
1. La fundamentación teórica y metodológica.	0.84	1.50	3.49			5.83	1.46	-0.35	Muy adecuado
2. Formulación del contenido y secuencia lógica de los procedimientos de la metodología.	0.62	1.11	3.49			5.22	1.31	-0.20	Muy adecuado
3. Los efectos de la metodología.	0.43	1.11	3.49			5.03	1.26	-0.15	Muy adecuado
4. La aplicabilidad de la metodología.	0.84	1.50	3.49			5.83	1.46	-0.35	Muy adecuado
5. La viabilidad de la metodología.	0.62	1.11	3.49			5.22	1.31	-0.20	Muy adecuado
6. La relevancia de la metodología.	1.11	1.50	3.49			6.10	1.53	-0.42	Muy adecuado
PUNTOS DE CORTE	0.75	1.31	3.49	0	0	33.25	1.11		Muy adecuado

Legend: MA - Very Suitable, BA - Fairly Suitable, A - Suitable, PA - Poorly Suitable, NA - Not Suitable.

According to the cut-off points obtained, the score values given to each aspect of the designed methodology were concentrated in the Very Adequate range, indicating a very high level of adequacy according to the established criteria, therefore, a consensus or agreement among specialists. The results presented demonstrate the high level of theoretical relevance of the methodology to achieve positive effects in its subsequent practical application.

DISCUSSION

A methodology was designed to contribute to the improvement of the planning of physical-technical orientation loads in special physical preparation in Taekwondo sport.

The scientific result achieved in this research with respect to the studies that constituted theoretical and investigative background, overcomes the existing limitations. The theoretical relevance and the prognosis of the feasibility of practical application of the methodology designed by 15 specialists of high academic and scientific level were positively assessed. The results obtained from the application of the specialist criterion method denote a high level of acceptance of the proposal.

It is recommended to develop prior training and practical application of the methodology in different populations of physical-sports trainers in Taekwondo to measure its impact on professional planning skills and sports performance.

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