PODIUM
Journal of Science and Technology in Physical Culture

EDITORIAL LIBERCIENCIA

Volume 18
Issue 2
2023

University of Pinar del Río "Hermanos Saíz Montes de Oca"

ISSN: 1996–2452 RNPS: 2148
PODIUM Journal, *May-August 2023; 18(2): e1477*

Translated from the original in spanish

Original article

Perception of central and peripheral distance in athletes of the national table tennis team

Percepción de distancia central y periférica, en atletas del equipo nacional de tenis de mesa

Percepção da distância central e periférica em atletas da equipe nacional de tênis de mesa

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Received: 2023-02-07.

Approved: 2023-06-04.

ABSTRACT

This paper research perception studies in athletes from the national table tennis team. Its objective was to propose perceptual-visual exercises to improve the perception of central and peripheral distance in said team, based on the detection of the difficulties presented in the game in the qualifying controls, 2019. The need to carry out studies that explore the perception of central and peripheral distance in the field of sports psychology reveals the importance and topicality of the subject, due to the contribution of this component of the psychoregulatory system of motor actions, to the performance of athletes during the training and competition process. Theoretical level methods such as analysis-synthesis, as well as observation, interview and Vera and Saínz de la Torre test from the empirical level were used to determine the perception of distance adjusted to the specific characteristics of table tennis and tennis, also the specialist criteria method was used. The main results allowed to verify an inadequate level of development of the perception of distance, in relation to optical motor calculations, central-peripheral vision and unbalanced movements in displacements. In addition, there are difficulties in coordination and reactions that affect the precision, power and placement of the shots. Perceptual-visual exercises were developed to improve the perception of central and peripheral distance in the national table tennis team, which were valued as very adequate by specialists.

Keywords: Central and peripheral distance, perception, visual perception, table tennis.

RESUMEN

El presente trabajo investiga sobre los estudios de percepción en atletas del equipo nacional de tenis de mesa. Tuvo como objetivo proponer ejercicios perceptivo-visuales para la mejora de la percepción de la distancia central y periférica en dicho equipo, a partir de la detección de las dificultades presentadas en el juego en los controles clasificatorios, 2019. La necesidad de realizar estudios que exploren la percepción de la distancia central y periférica en el ámbito de la psicología del deporte revela la importancia y actualidad del tema, por la contribución de este componente del sistema psicorregulador de las acciones motrices, al rendimiento de los atletas durante el proceso de entrenamiento y competencia. Se utilizaron

métodos del nivel teórico como el análisis-síntesis y del nivel empírico la observación, la entrevista, la prueba de Vera y Saínz de la Torre para la determinación de la percepción de la distancia ajustada a las características específicas del tenis de mesa y el criterio de especialistas. Los principales resultados permitieron constatar un nivel inadecuado de desarrollo de la percepción de la distancia, en lo referente a los cálculos ópticos motriz, la visión central-periférica y los movimientos desequilibrados en los desplazamientos. Además, se aprecian dificultades en la coordinación y en las reacciones que afectan la precisión, potencia y colocación de los golpeos. Se elaboraron ejercicios perceptivo-visuales para la mejora de la percepción de la distancia central y periférica en el equipo nacional de tenis de mesa que fueron valoradas de muy adecuadas por los especialistas.

Palabras clave: Distancia central y periférica, percepción, percepción visual, tenis de mesa.

RESUMO

O presente trabalho investiga os estudos da percepção em atletas da seleção nacional de tênis de mesa. Teve como objetivo propor exercícios perceptivo-visuais para a melhoria da percepção da distância central e periférica nessa equipe, a partir da detecção das dificuldades apresentadas no jogo nos controles classificatórios de 2019. A necessidade de realizar estudos que explorem a percepção da distância central e periférica no campo da psicologia do esporte revela a importância e a atualidade do tema, devido à contribuição desse componente do sistema psicorregulatório das ações motoras para o desempenho dos atletas durante o processo de treinamento e competição. Foram utilizados métodos teóricos como análise-síntese e métodos empíricos como observação, entrevista, teste de Vera e Saínz de la Torre para a determinação da percepção da distância ajustada às características específicas do tênis de mesa e aos critérios dos especialistas. Os principais resultados mostraram um nível inadequado de desenvolvimento da percepção de distância, com relação a cálculos ópticos motores, visão centro-periférica e movimentos desequilibrados ao se movimentar. Além disso, há dificuldades na coordenação e nas reações que afetam a precisão, a potência e a colocação dos chutes. Exercícios perceptivo-visuais para a melhoria

da percepção da distância central e periférica na equipe nacional de tênis de mesa foram elaborados e avaliados como muito adequados pelos especialistas.

Palavras-chave: Distância central e periférica, percepção, percepção visual, tênis de mesa.

INTRODUCTION

Perception is the most exact psychological sense through which we receive information about the movement of objects and the spatiotemporal characteristics of the environment. It is the best way to know reality, because through visual perception man receives more than two thirds of the sensory information that reaches the brain; this experience can be analyzed, trained, improved, targeted and educated based on performance (Russell, *et al.,* 2008).

According to Sainz de la Torre (2007), the effectiveness of sports visual capacity, which includes peripheral vision, is affected by factors such as fatigue and stress, light, glare, color and contrasts. The perceptions of space, when applied in the sports field, acquire a specialization character, where the personal characteristics of the perceiver, their interests, goals and feelings intervene, which can influence the result of what is perceived (Santillán and Barrazall, 2020).

According to Sainz de la Torre (2010) the success of many technical and tactical actions depends on the precision of the perceptions that the athlete makes, about the various environmental conditions where these actions are carried out. In sports practice, these special senses have, at their base, a very high differentiation of the activity of the analyzers that participate in carrying out the movements. The author herself refers that specialized perceptions arise from the identification that the athlete establishes with the balls or other objects, the environment in which he operates and some typical parameters of his event or sport.

For their part, Pérez and Fleitas (2020) consider that perception is a psychic process, of an active, constructive nature, related to higher cognitive processes that takes place over time and depends both on the information that the world delivers, and on physiology and the experiences of the subject affected by external, internal and proprioceptive stimulations; it

is the capacity to capture and know elements of our environment through the senses and is deeply linked to the five analyzers: visual (sight), auditory (hearing) and kinesthetic (smell, taste and touch).

According to these authors, perception, as an active process, takes place in constant comparison between what is perceived by the subject, at the moment, and the previous experience that he has of the object or phenomenon, his personal experience and knowledge. When perceiving, the traces of the observations made previously are activated, so that the same object or phenomenon can be appreciated in different ways, by different people.

From the present research, as a guide to the process, it is assumed that perception is the reflection that objects and phenomena of reality have in man's consciousness when they act directly on the sense organs (Russell, *et al.,* 2008).

According to the literature consulted, in the study of perception there are two theoretical approaches to understand the perception-action binomial in sports activities in general, and in the perception of trajectories in particular (Russell, et al., 2008). One is the ecologist whose maximum exponent is Gibson (1979) who states that perception is direct and consists of capturing information available in the optical conformation, as well as that the only thing necessary is to attend to the information that is in the environment; the other, the cognitivist or constructivist, points out that perception takes place in phases that complement each other and contribute to providing the necessary information. Adequate perception needs information from other psychological processes such as learning and memory (Sovero, 2017).

For the development of the present research, the theoretical conceptions of the historical-cultural approach are assumed, this psychological current proposes that cognitive processes, within which perception is included, are conceived as components of the psychoregulatory system of motor actions (Russell, et al., 2008), specifically of the guiding-executing regulation that enables the athlete, in his interaction with the environment in which he operates, to reflect in his consciousness the reality that surrounds him. In this approach, he defends the postulate that perception enables the learning of motor actions

and the formation of mental representations, from the elements that are captured, for example, in demonstrations when motor action is explained.

In table tennis, when the players manage to specialize their perceptions, the sensory-perceptual processes contribute to giving fast and exact solutions in the shortest possible time. When carrying out the study of the opponent, thanks to the specialized perception, it is possible to know the weaknesses and strengths that he possesses, the game system they use, their tactical thinking, character, as well as the state of their physical capacities; even when the opponent updates his individual offensive tactical system, it is possible to surprise him, play on his weak side, make mistakes, create difficulties for him, combine actions with strong attacks, play quickly in time and win the point in dispute.

Within the cognitive processes that are developed in the table tennis athlete, the perception of central and peripheral distance stands out, which is understood as the reflection in the consciousness of the space that separates the subject from objects or other subjects and from the space that exists between objects Rudik (2006); it is influenced by various factors such as linear and aerial perspective and the distribution of lights and shadows, from the reflection that in man has the set of properties of objects and phenomena of reality and their mutual interrelation.

The perception of distance is considered one of the most relevant psychological demands in this sport, since it allows greater reaction speed in the face of the variety of game situations, speed of action, calculation of visual perspectives of space, time and coordination; This contributes to making tactical decisions in the shortest possible time. In this sense, the visual condition of the athlete understood as that which is linked to vision (the act and result of seeing objects through the eyes thanks to light) plays a fundamental role, according to Sáez *et al.* (2018).

It should also be considered that, in order to raise the level of development of the perception of table tennis athletes, it is necessary to master not only the perception of time and movement, but it is also necessary to enhance the perception of space in the face of different game situations. In this way, the player is aware of the resources available to the opponent and can build his own game strategy that includes reading the movements, the direction

and placement of the ball and the opponent's movements in terms of distances, from your own placement.

The development achieved in the perceptions of time, space and movement influence the tactical performance of the tennis player in real game conditions; due to this, and due to the importance of the athlete's visual condition for the development of their specialized perceptions, the importance of visibility and lighting during training should be considered, as well as vision control (by the mobility of the ball, the opponent and the complexity of the tactical decisions that are made in the game).

In Cajigal *et al.* (2016), as part of the Comprehensive Table Tennis Athlete Preparation Program, guidelines are collected for the development of psychological preparation that contain general and specific aspects of the sport such as the study of the opponent, variable and invariable tactics, modeling and the individual psychological technique that are considered aspects that include the study and development of individual plans and psychological interventions, where perception is included as an essential aspect and it is considered necessary to carry out investigations of this process and contextualize them to this sport.

As antecedents in the study of perception in athletes, the contributions of Cajigal *et al.* (2016); Da Silva *et al.* (2006); Hernandez *et al.* (2012); Lalama (2011); Martin and Dieguez (2012); Molodzoff (2008); Russell *et al.* (2008) and Saínz de la Torre (2007), who have delved into the relevance of perception in sports results.

Within international research on the perception of central and peripheral distance, there is a study by Da Silva *et al.* (2006) who expressed that as physical distances increase by a few meters, systematic distortions begin to appear in the perceived space, where the perceived dimensions depend on both direction and orientation.

Particularly in table tennis, Lalama (2011) carried out a study where he evaluated whether the use of the visual training system can improve hitting performance in a sample of child players. Hernandez *et al.* (2012) proposed a perceptual-visual training, so that they learn to select the necessary stimuli from the sports context and initiate movements adapted to each

game situation in advance. These authors pointed out that decisions in this sport are mainly conditioned by their ability to perceive the sports environment, by the movement of the ball and by the opponent's actions.

In Cuba, Saínz (2007-2010) stand out in the field of sport, who found deficiencies in the perception of central and peripheral distance in baseball and basketball players. In the studies carried out by this author, it was concluded that the perception of distance worsens when the player reflects diagonal targets to the sides of the central point of vision, compared to when said target is directly in front; In addition, their investigations confirmed the predominance of default errors, that is, that players perceive objects and other athletes in the distance closer than they actually are.

On the other hand, also in the Cuban context, Russell *et al*. (2008) analyzed the boxer's attitudes during defensive actions. In this case, it was highlighted how the perception of the trajectories of the blows is difficult when the boxer is in motion, since his attention is divided between two different actions, thus reducing efficiency.

In general, in the research carried out on the perception of distance, the quality of spatial perceptions is determined, linked to the field of central and peripheral perception and it is evident that, to the extent that the optical calculation of the distance where the objective to be achieved is found (in a service or return) it is more precise, the player can anticipate, the motor effort to carry out the movement is more appropriate and the execution is more efficient.

At present, with the technological advances it is possible to carry out measurements of central and peripherical vision with electronic campimeter and the map of visual field and the external limits (peripheral zone) are drawn; however, Saínz de la Torre (2007) states that the information obtained with this equipment does not always coincide with the capacity to perceive in field conditions.

As has been specified, there are multiple researches developed around the subject; however, it is considered that despite the value of these studies, it still constitutes a current problem for table tennis. In Cuba, from the consulted bibliography, there are few studies on the

perception of central and peripheral distance in this sport, hence the need to investigate the subject.

In observations of qualifying competitions and in interviews with coaches and the psychologist of the team that made up the sample for this research, information was obtained that argued the existence of uncoordinated movements, insufficient anticipation and difficulties in moving and hitting the tennis players, since they could not correctly specify the reading in the contact of the racket with the ball and the impact of the ball on the table, which specifies the existence of an inadequate perception, by calculating distances .

Hence, it is established as a problematic situation that in internal controls of the national table tennis team, carried out in 2019, the athletes presented difficulties in visual-motor coordination and there are no specific exercises aimed at improving the perception of central and peripheral distance in said team and it is considered as a scientific problem how to improve the perception of central and peripheral distance in the players of the national table tennis team.

In order to respond to the scientific problem posed, the objective is defined to propose perceptual-visual exercises to improve the perception of central and peripheral distance in athletes of the national table tennis team.

MATERIALS AND METHODS

In the research, the qualitative methodology was predominantly used, with quantitative methods for data collection and qualitative methods for their interpretation. The study developed corresponds to a descriptive design.

Perception of distance was defined as the main category of the research. For the central distance perception dimension, central vision and optic-motor calculation were established as indicators. For the peripheral distance perception dimension, the defined indicators were peripheral vision and optic-motor calculation.

The indices, based on the established indicators, are:

- Appropriate level of development.
- Innapropiate level of development.

In the present research, methods of the theoretical level were used, such as analysis-synthesis for the foundation of the research problem and the analysis of the consulted bibliography, based on data and localized information; and from the empirical level, the interview to athletes, coaches, the national team psychologist, methodologists and the team doctor, with the aim of knowing the current state of perception control in the selected athletes.

Non-participant observation: three were carried out, in the controls of the 2019 preparatory period and three, in training and controls of the special period 2021; They were carried out by five sports specialists.

Participant observation: it was used during the application of tests to determine the perception of central and peripheral distance. It was carried out by three table tennis specialists, with the objective of determining the behavior of the perception of central and peripheral distance in the athletes of the 2021 national team, based on field observation and video recordings.

Test to determine the perception of central and peripheral distance: adjustments were made to the distance perception test validated by Vera and Saínz de la Torre (2006) in basketball players, according to the particularities of table tennis, in regarding its technique and dynamics.

The same principle of said test was maintained, since the visual references (ball, racket, direction of movement, scorers, player and opponent movements, referee, coach, among others) are part of the equipment studied. In this test, the athletes performed optical motor calculations based on central and peripheral distance perception; it was carried out with the objective of determining the current state of the perception of distance in the athletes of the national table tennis team.

For the peripheral distance perception test, athletes stand 2.74 meters (table length), directly across from each other in the center of the table, where performing backhand or forehand shots on the short distance, both straight and diagonal, will be made at 0.38 cm and 0.76 cm towards the center (Figure 1).

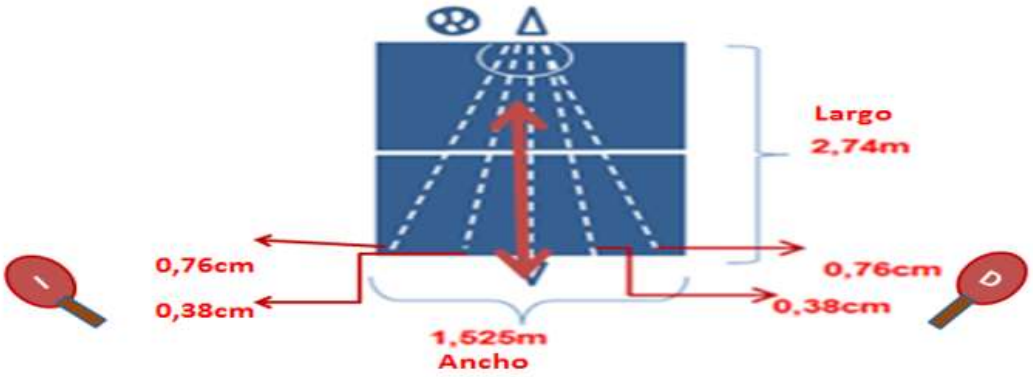

Fig. 1. - *Distance perception test for table tennis athletes*

Statistical-mathematical processing: descriptive statistics was used; percentage analysis was used as a measure for the quantitative analysis of the dimensions of the reserach.

Triangulation: methodological triangulation of different methods and techniques (quantitative and qualitative) was used.

To this analysis the qualitative one was added, carried out through a content analysis. Tables and figures were used to represent the information.

The study took place in the High-Performance Center located in the "Cerro Pelado" High Performance Athlete Training School (ESFAAR), in the table tennis room. The population consisted of 11 athletes from the national table tennis team of the Sub-18 and Sub-21 categories; five female athletes and six male athletes. The sample represented 91.6 % of the population, it was chosen intentionally, with the following selection criteria:

- Sub-18 and Sub-21 category athletes of the national table tennis team.
- Informed consent to take part in the research.

- Permanence in the category for a sports cycle.

The main limitations were directed at the athletes' time availability, since these athletes train on international bases and participate in competitions outside the country. The research carried out covered approximately two years and was developed in two stages.

First stage. As a starting point of the research, the first stage was directed mainly at the request for informed consent. The techniques foreseen in the initial verification were applied, a diagnosis of the current state of the perception of central and peripheral distance in the athletes of the studied team was made. In this sense, the interview was applied to athletes, coaches, methodologists, psychologist and team doctor. In addition, non-participant observation was carried out during the 2019 preparatory period and the special stage of 2021.

The participant observation was carried out during the training and controls of the 2021 special stage, directly in real training conditions, through the use of a previously structured protocol and the triangulation of the results obtained was carried out.

Second stage. In this stage, the perceptual-visual exercises were selected to improve the perception of central and peripheral distance in the equipment selected from the initial diagnosis. A guide was designed for consulting the specialist criteria and theoretical validation of the proposed exercises to improve the perception of central and peripheral distance in athletes from the national table tennis team.

As part of this process, nine specialists who meet the following requirements were selected to assess the proposal:

- Have more than 15 or more years of experience working in this sport.
- Be willing to collaborate in the investigation.

These specialists took into account the following indicators for the evaluation:

- Applicability of the proposal of the psycho-pedagogical action plan.
- Feasibility of the proposed psycho-pedagogical action plan.

- Relevance of application of the plan of psychopedagogical actions.
- Expected effectiveness of the proposal.
- Relevance of the proposal.

RESULTS AND DISCUSSION

Based on the applied techniques, the main findings were the existence of difficulties in the perception of central and peripheral distance in the national table tennis team.

Analysis of the results of non-participant observation. It was used during the training and controls of the 2019 preparatory period and in the controls in the 2021 special stage, with the aim of analyzing the behavior of the perception of distance in the athletes of the national table tennis team. Six non-participant observations were made directly, in real training and competition conditions.

During the training sessions of the preparatory period in the special stage, uncoordinated movements (82 %), unbalanced or off-hook movements (73 %) could be seen, sometimes they stopped or did not reach the ball. Three athletes from the Under-18 category were tired in the evening training hours (it was difficult for them to recover and regain their strength after an increase in the assigned loads and they were slow at the beginning of their technical-tactical executions).

It was corroborated, by observing the games between the same team, limits and controls that the tennis players in the sample were affected by the lighting in training and competitions, since when reflected in the ball and racket, it cast a shadow on the table for different angles, which led to the inadequate calculation of distances and reading of the ball.

This was made explicit in the modeling carried out in the controls, where the 11 athletes (100 %) had difficulties moving and hitting because they could not correctly observe the contact of the ball on the racket and the impact of the ball on the table. In addition, it was observed in 73 % of those evaluated the negative attitude when losing points in the sets of

the games, due to the inadequate perception by calculations of distances or time; as well as dissatisfaction with their performance, since they were not able to anticipate efficiently either.

With the analysis of the observations made, it was evident that the difficulties in the perception of central and peripheral distance were present in practice and that error correction was insufficient for their eradication, since the cause prevailed and influenced the dynamics of the game. and therefore, in the individual performance of the players.

The set of problems detected related to the perception of distance generated lack of concentration, repetition of errors, self-doubt, difficulties in decision-making, in reaction, in the application of tactical schemes, the execution of the technique and the inadequate calculation of time and space; this demonstrated the relevance and demand of the adequate perception of the central and peripheral distance in this sport.

In the national table tennis team, regardless of the fact that conditions have been created that favor the sporting development of the tennis players in Cerro Pelado, the problem of lighting affects the development of the training itself, since the lights are inadequately located, a factor that, according to Sainz de la Torre (2007), affects the effectiveness of sports visual capacity and peripheral vision.

Analysis of the results of the interview. This technique was used indistinctly by athletes, coaches, psychologists, doctors and methodologists; from the interview with the athletes, it was observed that there is dissatisfaction in 100 % of the interviewees, regarding the internal conditions in the training area, specifically, regarding lighting and ventilation. Of the total athletes interviewed, 91 % expressed that this affected vision and observation, and influenced their sports performance. 82 % suggested lowering and leveling the lights, so the way in which its intensity reaches uniform, it was an aspect that was considered to improve the lighting of the room.

100 % of the athletes stated that they have not undergone ophthalmological tests in this period, the last time they did so was more than two years ago. The absence of vision control by specialists for their graduation influenced the perception of distance and affected the

precision, power and placement of the shots, since it is important to remember that perception varies with the placement of objects, the player and his adversary. Likewise, a perception can go from central to peripheral and vice versa.

In relation to the execution of the table tennis exercises, 100 % of the athletes expressed having difficulties when performing each of the techniques (serves and returns with and without effect), where they do not reach the ball, react slow or fast, according to be his assessment. These elements were associated with difficulties in central and peripheral vision.

In addition, they explained that the inadequate lighting caused shadows, making it difficult to anticipate the plays, make the opponent make mistakes, not reorganize and take advantage of time to hit back. 91 % considered that the perception was of great importance because it was known what plays the opponents tried to make and thus calculate the distances and make decisions even, in constant movement and with variation in their speed.

In the interview with the coaches, it was corroborated what was expressed by the athletes about not performing recent vision graduation measurements. 100 % of the coaches considered that the conditions of the training room are good, but there are problems with the location of the luminaires that make visualization difficult and hinder optical-motor calculations. Among the aspects that can be improved regarding the lighting in the room, the location of the luminaires, as well as the intensity of the light necessary to play, stood out, as did the athletes.

In the same way, 100 % stated that perception in table tennis is very important because from it, athletes can coordinate movements and make their decisions in less time, with speed and required rotations, which makes it possible to study the contrary. Each game situation requires a different context for the coach, so it is necessary to train perception, based on visual behavior and the reaction of individual athletes.

They reported that in their work as coaches, simple exercises are carried out to determine visual reaction time, hand-eye coordination (such as controlling the ball while walking) and with the intervention of the psychologist, they train visualization to build related mental

images. with the situations. They expressed that they perform continuous hitting exercises, at a point marked on the game table; which contributed to peripheral vision and they hit balls of different colors (white and orange) to identify the color of the ball; which contributed to attention and dynamic visual acuity.

The coaches further point out that, in order to achieve the optimal conditions of a table tennis hall for World Cups and Olympics, the light intensity should be at least 1000 lux evenly, on the playing surface and at least 500 lux in the rest of the area. In other lower-level competitions, the intensity is 600 lux uniformly and 400 lux in the playing area; these parameters must be met for efficient training.

In the interview with the team doctor and the psychologist, the information obtained in previous interviews was corroborated, in relation to the fact that the lighting in the training room is inappropriately placed, since the angle of the luminaires is reflected on the table; likewise, it is insufficient due to the height and shades the ball, the racket and the arm on the table, which makes it difficult to hit and to see.

In this case, the interviewees considered that the conditions of the training room have improved, but they are affected by the lack of adequate air conditioning and lighting, which causes an increase in flickering, because their distribution is not balanced. In the case of the team doctor and psychologist, they expressed that the quality of primary care for athletes and the follow-up of ophthalmological measurements carried out more than two years ago could be improved; they agree that the exercises performed to improve vision in the team are currently insufficient.

In the case of the methodologists, they considered that if the lights could be lowered and distributed properly, then their intensity would be uniform throughout the surface of the gaming table and throughout the room; explained that when the athlete speeds up the pace of his game, he needs better lighting. In their opinion, the placement of the lights in the room leads to reflection on the tables, limits the visibility of the ball and an inadequate reading.

They considered that perception in this sport is very important because it is necessary to take into account not only the movements of the ball, but also of the players, to decide in the shortest possible time how to obtain the point. They have the opinion that there are no exercises aimed at developing perception in the Comprehensive Preparation of the Athlete program that is currently being worked on.

Based on what was expressed, it was found that there are various factors that threaten perception in training, controls and limits as main psychological demands, as well as a fundamental indicator in table tennis tactics.

Results of the analysis of the test to determine the perception of central and peripheral distance. From the application of the test, it was obtained that towards the left side at 0.38 cm of 55 backhand hits, the total number of players reached 58 % effectiveness, 32 were positive and 23 negatives. On this same side at 0.76 cm, out of 55 backhand hits, the total number of players reached 69% effectiveness, 38 hits were positive and 17 negatives in the perception of distance.

Meanwhile, towards the right side at 0.38 cm, of 55 hits from the right, the total number of players reached 73 % effectiveness, 40 hits were positive and 15 negative and at 0.76 cm the total number of players reached 79 %, 43 hits were positive and 12 hits were negative. Through the center, out of 55 backhand or forehand hits, the total number of players reached 52 % effectiveness, 29 were positive and 26 negative hits. So, the total effectiveness between the right and left side and the center is 66 %.

It was shown that there are deficiencies in the perception of distance and that directly in the center and at the shortest distance from 0.38 cm perception is difficult, especially on the left side of the table with the backhand hit, this interfered in the reaction, the perception of the central and peripheral distance and the solution of the game situations, from the movement of the players and the trajectory of the ball, during basic solutions.

With the analysis of this test, the existence of less perception of distance on the left side in these athletes was demonstrated, as well as less range in the greater distance of the

backhand shot from the center of the table. The results of this technique are collected in table 1 shown below (Table 1)

Table 1. - Results obtained from the number of positive hits

Series			**1**		
Side	left		center	right	
distance	0.76cm	0.38cm	0	0.38cm	0.76cm
positive hits	38	32	29	40	43
%	69%	58%	52%	73%	79%

A general analysis of these results shows that the closer the athletes are to the 2.74 m long center line of the table, the more difficult the reaction in time is due to optical motor calculations, especially to the side. left. Diagonally, it is also made difficult by optical calculations, even though they have more time to react.

Hence, where there were more deficiencies was in the central distance or through the center of the table, which is a direct vision. However, when receiving the ball from the right, the hip had to be rotated to the right and back, as it was optional, some players did it from the right and on occasions, this hit threatened the speed of the ball, its effectiveness and adequacy, by not moving properly; which caused them to hit the ball unbalanced.

The deficiencies in the execution of the movement were conditioned by the inadequate reading of the ball in a short time, regardless of the fact that it was provided in a simple way and with predetermined exercises. The athletes with simple blows could even vary the speed; moreover, this deficiency in turn affected anticipation.

It is considered that inadequate reading could be determined by indicators such as visual problems, for which reason the measurement and graduation of vision is essential. There are other indicators such as acuity, visual amplitude and depth that require the use of a perimeter and give a reason for the current state of spatial vision.

Analysis of the results of participant observation. It was used during the training and controls of the 2021 special period; it was carried out directly in real training conditions through the use of a previously structured protocol.

During the perception determination test, unbalanced movements could be seen when moving, sometimes they stopped or twisted their bodies because they did not react in time to hit the ball, coordination, balance, and movement fluidity were limited. Three of the athletes were delayed in the coordination of the exercise, where the initial acceleration was affected and they did not anticipate efficiently. Deficiencies in perceptions of central and peripheral distance persisted in the test, influencing the individual dynamics of the players.

By triangulating the results, regarding the category of distance perception, from the analysis, it was possible to affirm that the optic-motor calculations and the central-peripheral vision had an inadequate level of development, which affected psychological processes. such as sensations, memory, attention, thought and motor representations that coincide with the results of research by Russell *et al.* (2008) and (Saínz de la Torre, 2003).

Exercise proposal to improve the perception of central and peripheral distance in athletes of the national table tennis team.

As part of the psycho-pedagogical foundation of these exercises, it is suggested that in order to capture at all times, both the situation of the game and the movement of the ball and the opponent, as well as the distance at which it is located and the delimitations of the table, without look directly in their direction, it is necessary for each player to have some development of peripheral vision, especially on the sides. This peripheral vision is nothing more than the ability to perceive visual stimuli between the limits of the visual field and its central area, that is, towards the point where the subject directs the vision.

This type of vision varies in each athlete and is essential for a successful anticipatory reaction such as finishing a ball after a service with downward and lateral effect. When peripheral vision is inadequately developed, it can form the basis of innumerable errors in tactical execution (Saínz de la Torre, 2003), hence the need to carry out exercises that contribute to its improvement. Russell *et al.* (2008) and Hernández et al. (2012) express that the exercises are not invasive and can be performed after completing a thorough evaluation to test perceptual-visual skills.

In this research, what was stated by Antón (1994) is taken into account: the improvement of central and peripheral vision and the visual field increase with training, and when movement perception is favored, there is a greater width of the recognition field (acuity peripheral vision), more conscious simultaneous vision and better kinetic visual amplitude.

There are exercises aimed at improving the perception of central and peripheral distance (Hernández, *et al.*, 2012; Molodzoff, 2008; Plou, 1994; Sainz de la Torre, 2010). These are characterized by the use of the eye muscle, to contribute to the reduction of deficiencies in athletes, in terms of central - peripheral vision and optic -motor calculations, essential indicators for to table tennis.

In this sport, the height, rotation, frequency, speed, change of rhythm and movement of the ball, as well as the perception of distance, direction and speed of the movements in a synchronized way they play a fundamental role in the correction of errors, the quality of technical action, perception and technical - tactical development.

Regarding the exercises that can be carried out to improve the perception of distance, Martin and Diéguez (2012) refer that authors such as Sainz de la Torre (2005) have proposed preparing tasks where the athlete uses simultaneous verbal indications to the action that is running and tell him when it is appropriate or not, in correspondence to the distance. These authors also explain that athletes can be guided to constantly use inner language, to evaluate the distance between them and other objects, teammates, opponents, and evaluate the result of their body movement in the event that have to do it.

In this regard, the work carried out by Martínez (2020) should be highlighted, who exposes exercises for the training of perception in tennis, with specific tasks according to the preparation and level of training of the athlete. In defining the exercises to be performed specifically for tennis players, it is necessary to take into consideration that the work aimed at perception must be adjusted at the time of preparation.

In the general stage, all the movements and components of the integral preparation of the athlete must be systematized, where the oculo-motor coordination starts and plays an important role if the game indicators mentioned above can be integrated. Hernández R.

(2012) concludes in his article that table tennis is based to a large extent on the success of visual and ocular skills, and refers to Plou (1995) giving it great importance in his classification, along with coordination in the racket sports, such as tennis, with great perceptive demand.

Hernández (2012) states that it is necessary to prepare the tennis player in exercises to strengthen their perception of distance and contribute to mastering the technical-tactical arsenal. If it is taken into account that it is a game in which visual skills are performed from top to bottom, circular from left to right and vice versa, the ball is followed at different distances, placements and rotations in place; Also, colors and objects are used for its development, depending on the difficulty.

These skills can be developed in the exercises selected by Molodzoff, (2008) that take into account these described aspects and are the individualized exercises that are proposed in this research, to improve the perception of central and peripheral distance in national team athletes.

They are described below:

Exercise 1. " Dynamic visual acuity"

Objective. Work on dynamic visual acuity in athletes.

Methodology. Front view, flexed in ready position, racket in front, both athletes located at each end of the table.

Method. Repetitions.

Dosage. Three times a week, for three minutes

The athlete receives balls thrown by the coach of different colors or a facilitating athlete located at the end of the table, he must discover the colors printed on the balls and say it aloud (Figure 2).

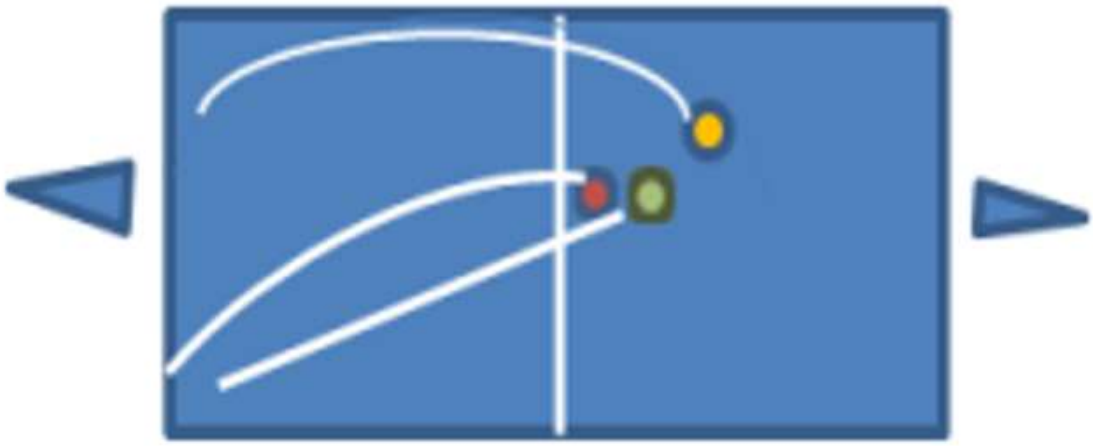

Fig. 2 *- Dynamic visual acuity*

Exercise 2. "Amplitude of vision"

Objective. Improve the breadth of vision in athletes.

Methodology. Front view, flexed in ready position, both athletes located at each end of the table.

Method. Repetitions.

Dosage. Twice a week, for three minutes.

The athlete located in the game position follows with his gaze without moving his head, the movement of the thumb of his opponent who is on the other side of the game table.

Exercise 3. "Peripheral vision"

Objective. Improve peripheral vision in athletes, starting from hitting the forehand with precision.

Methodology. Front view, flexed in ready position, both athletes located in a cross at each end of the table. The athlete spins on the spot.

Method. Repetitions.

Dosage. Five times a week, 40 repetitions, in three turns.

Continuous rallies are carried out from the right, with another athlete A; Athlete B keeps his gaze focused on a marked point on the game table (Figure 3).

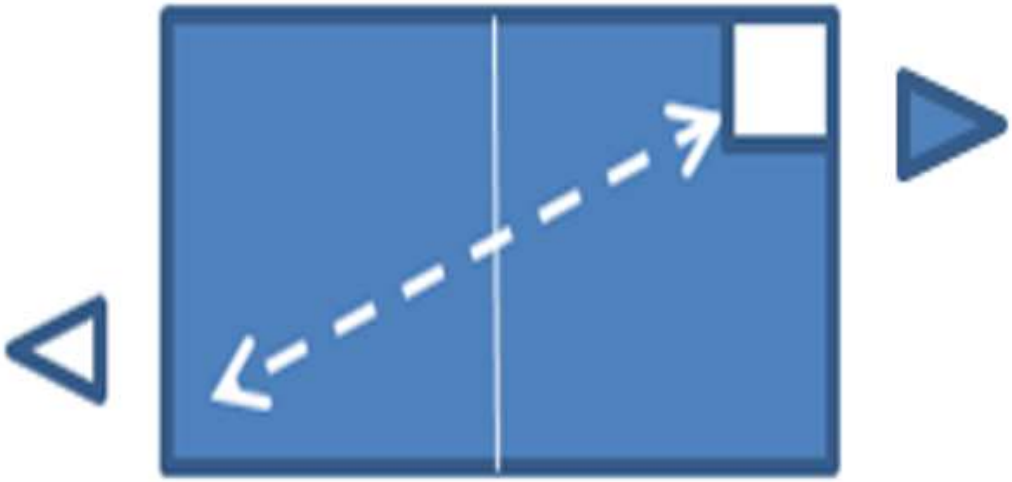

Fig. 3. - *Peripheric vision*

Exercise 4. " Optical calculations"

Objective. Improve optical calculations and visual reaction time in athletes.

Methodology. Front view, flexed in ready position, both athletes located at each end of the table, racket in front.

Method. Repetitions.

Dosage. Three times a week, for three minutes.

Athlete B located at the game table, the coach or athlete B located in the opponent's field, there he sends balls of different colors in a surprising way, the player must make a game intervention, depending on the color. (Red, topspin with rotation), (Green, topspin with speed), (Blue, topspin with power to the center of the table), the actions are performed in the shortest possible time. (The topspin can be forehand or reverse) (Figure 4).

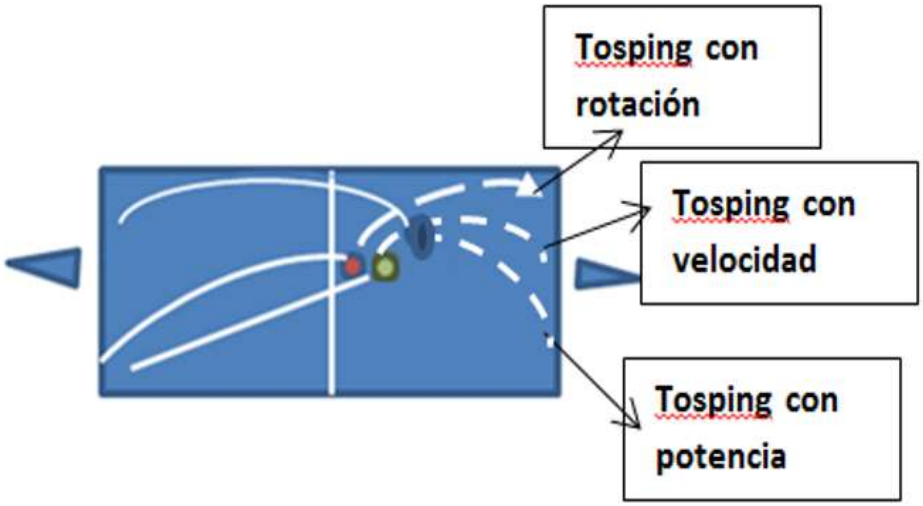

Fig. 4. *- Optical calculations s*

Exercise 5. " Central and peripheral vision"

Objective. Improve central and peripheral vision, through oculo - motor coordination in athletes.

Methodology. Vision forward, flexed in a ready position, racket to the side of the hand to play, walking, running or jumping, in six square meters.

Method. Repetitions.

Dosage. Twice a week, for three minutes.

The table tennis ball is thrown on a line and at the same time this athlete follows the trajectory of a partner who moves parallel, with displacements in ZT 8.

Exercise 6. " Optical calculations and amplitude of Vision"

Objective. Improve optical calculations and the range of vision, when hitting the ball in the right way, in the right way.

Methodology. Vision forward, flexed in ready position, racket in front.

Method. Repetitions.

Dosage. Twice a week, for four minutes.

Two athletes located on the game table, athlete A (supplier) sends white and orange balls, athlete B only responds to the action with the orange balls using the appropriate stroke, according to the characteristics of the ball sent (short, deep, with or without rotation) (Figure 5).

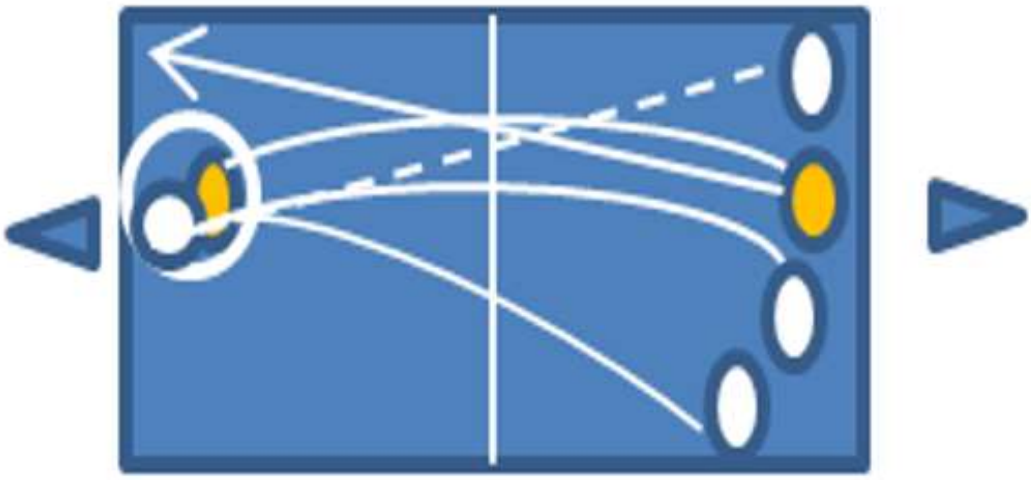

Fig. 5 *- Optical calculations and amplitude of vision*

The previously presented exercise proposal was subjected to evaluation by specialists as part of its theoretical validation. The result of this evaluation process carried out by the specialists is shown in Table 2 shown below (Table 2).

Table 2. - *General evaluation of the criteria of specialists*

Specialist	Very appropriate	Quite appropriate	Appropriate	Little Inappropriate	Inappropriate
1	x				
2	x				
3	x				
4		x			
5	x				
6			x		
7	x				
8	x				
9	x				
Total	7	1	1	0	0
%	77.7%	11.1%	11.1%	0%	0%

The table shows the criteria of the specialists that were issued on the basis of knowledge about this sport and the experiences of psychological intervention in sport. Of the nine specialists, seven evaluated the program as very adequate, which represented 77.7 %, since the structure of the intervention plan was adjusted to the requirements and needs of the team. One of the specialists considered it quite adequate, which represented 11.1 % of the total, and another specialist considered that it was adequate, which represented 11.1 % of the total.

In general, the specialists evaluated the exercise proposal carried out as very adequate, due to its applicability, viability and relevance. They stated that it is a relevant proposal for the team studied, with which it is expected that its implementation will be effective.

There is agreement with Russell *et al.* (2008) and Hernández *et al.* (2012) who express that non-invasive exercises can be performed after completing a thorough evaluation to test perceptual-visual skills. In this case, the work aimed at the perception that is proposed is adjusted to the moment of preparation for which it has been proposed, since it is considered that in the general stage all the movements and components of the integral preparation of

the athlete must be systematized, where oculo-motor and locomotor coordination play an important role if the game indicators mentioned above can be integrated.

This type of proposal is considered relevant, focused on improving the specific psychological demands of sports, agreeing in this case with Pérez and Fleitas (2020), Saínz de la Torre (2010) and Martínez (2020) that when preparing tennis player in exercises to strengthen his perception of distance, he contributes to mastering his technical-tactical arsenal.

CONCLUSIONS

From the determination of the theoretical foundations that supported this study, it was contributed to fill the theoretical gap found in the consulted bibliography, on the perception of central and peripheral distance in table tennis and it is necessary to continue with future studies for a greater scope, from the theoretical point of view.

The diagnosis made allowed to verify the level of perception of the central and peripheral distance existing in the athletes of the Under-18 and Under-21 category of the selected team, prior to the selection of perceptual-visual exercises to improve said perception, since it constitutes a fundamental psychological requirement in this sport and its training is essential.

The specialists stated that the proposed exercises, integrated into the training, contributed to the athletes learning how to perform them, to develop perceptual-visual skills and improve reaction time, decision and action, in each game situation.

THANKS

It is wished to thank the support of the research collaborators: Dr. C. Bárbara Concepción Oliva, national commissioner of this sport. To the national table tennis team, especially the athletes and coaches who were part of this study, for all the trust and support they provided. Finally, to all the people who contributed to this research. THANK YOU.

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Conflict of interests:

The authors declare not to have any interest conflicts.

Authors' contribution:

The authors have participated in the writing of the work and analysis of the documents