

Effects of meso training cycles on cardiovascular and respiratory efficiency in soccer players from the UNAH-TEC Danlí Regional Centre

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ABSTRACT

The study consisted of the analysis of the effects of sports training planning through the combination of meso cycles that contribute to the improvement of physical preparation: Cardiovascular and Respiratory Efficacy of UNAH-TEC-Danlí footballers in the 2019 season of the Major League Pedro Nufio Category A. The effectiveness of the meso cycles with the specific load components for the treatment of physical preparation in the players was validated, belonging to a sample of 30 subjects, where in the pre-test moments and post-test, the QUERG tests were applied to assess the Cardiovascular Efficiency, Cooper for the maximum oxygen consumption where the correlation between the variables of Cardiac Efficiency and Respiration of the experiment was determined to generate probabilities and significance between them. Pearson's correlation, showing a moderate negative correlation index between the study variables, in this sense the conclusions and acceptance of the proposal were established and the objective of the research was met.

Keywords: Cardiovascular efficiency aerobic capacity; Oxygen volume.

Cite this article as:

Figueroa, R.O., Martínez-Saravia, N.D., & Gaitan-Amador, R.A. (2021). Effects of meso training cycles on cardiovascular and respiratory efficiency in soccer players from the UNAH-TEC Danlí Regional Centre. *Journal of Human Sport and Exercise*, 16(2proc), S811-S824. doi:<https://doi.org/10.14198/jhse.2021.16.Proc2.67>



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Abstract submitted to: Summer Conferences of Sports Science. [Costa Blanca Sports Science Events](#), 25-26 September 2020. Alicante, Spain.

JOURNAL OF HUMAN SPORT & EXERCISE ISSN 1988-5202

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doi:10.14198/jhse.2021.16.Proc2.67

INTRODUCTION

The research is of great relevance in its application, at least in this area of knowledge and in UNAH-TEC-Danlí. It consists of the elaboration of a set of meso cycles in order to assess the cardiovascular and respiratory efficiency of the UNAH-TEC-Danlí men's eleven soccer team. This study will be applied in students who belong to the UNAH-TEC-Danlí men's eleven soccer team and thus show what effects the combination of sports training meso cycles produces in the analysis variables (Cardiovascular and Respiratory Efficiency). In this way, to assess the effects of sports training planning through the combination of meso cycles that contribute to the improvement of physical preparation in UNAH-TEC-Danlí footballers in the 2018-2019 season of the Major League Pedro Nufio Category A.

The National Autonomous Technological University of Danlí, for being an academic unit of the innovative, dynamic superior level and committed to the training of professionals in the technological area with the highest global competencies, capable of generating and transferring quality knowledge, participating in the development social, economic, political and environmental of the country through organizational and participatory management; developing processes of social bonding and scientific research, based on new models of science and education, it is allowed to contribute to the area of knowledge of systematic physical activity, within the scope of the sports context of the UNAH soccer team- TEC-Danlí, participant in the Pedro Nufio Category A major league. In the preseason in 2018, a total of 6 friendly preparation games were observed where the players present deficiencies in regard to their physical preparation manifesting fatigue and problems of recovery to physical exercise, aspects that indicate an indication of the importance of carrying out the study, since the population investigated requires an intervention to improve these aspects; In this sense, in the incoming meso-cycle of the beginning of the general preparation stage, pedagogical tests are applied by the coaching staff to diagnose the physical-functional state of the players.

Of the three conditional capacities, strength, speed and endurance:

The resistance was the capacity that presented the most negative results, the Querg tests were applied for the evaluation of Cardiovascular Efficiency and the Cooper tests that allowed to determine the behaviour of Maximum Oxygen Consumption as a relative parameter of aerobic resistance which it is considered as the ability of the heart and vascular system to transport adequate amounts of oxygen to the working muscles, allowing activities that involve large muscle masses for prolonged periods of time. (Child, 2010).

Therefore, despite the fact that it is a capacity conceptualized by different authors, it is important to monitor their behaviour in the subjects in different contexts and thus evaluate the efficiency of the planning systems or methodology that are taken in this regard for their development.

METHODOLOGY AND INSTRUMENTS

The Cardiovascular and Respiratory Efficiency of the UNAH-TEC-Danlí men's eleven soccer team is a study that will have a (Quantitative) approach. Well, the inquiry merits it in attention to the use of instruments that generated quantification data. It is argued that the study is a symbiosis of theory and practice since applications of research methods, procedures and techniques are presented that will generate quantitative and qualitative data on the physical state to solve a perceived need regarding the object of study to research. Emphasizing that these data to be obtained are more quantitative.

The design to be applied is Experimental, an argument that is established in response to the literature investigated in this case, Sampieri and Collado in their work Research Methodology 2014 argue that a study of this magnitude compromises control situations in which they are manipulated, in a way intentional, one or more independent variables to analyse consequences of such manipulation on one or more dependent variables, making a relationship between cause and effect. Within the classification we use the Pre experiment, which is argued below:

A pre-experiment was carried out which allowed to know the effects of sports training planning through the combination of a set of meso cycles on the Cardiovascular and Respiratory Efficacy of the players of the UNAH-TEC-Danlí soccer team eleven in the year 2019 for its competitive stage.

Below is the outline of how the pre-experiment was carried out.

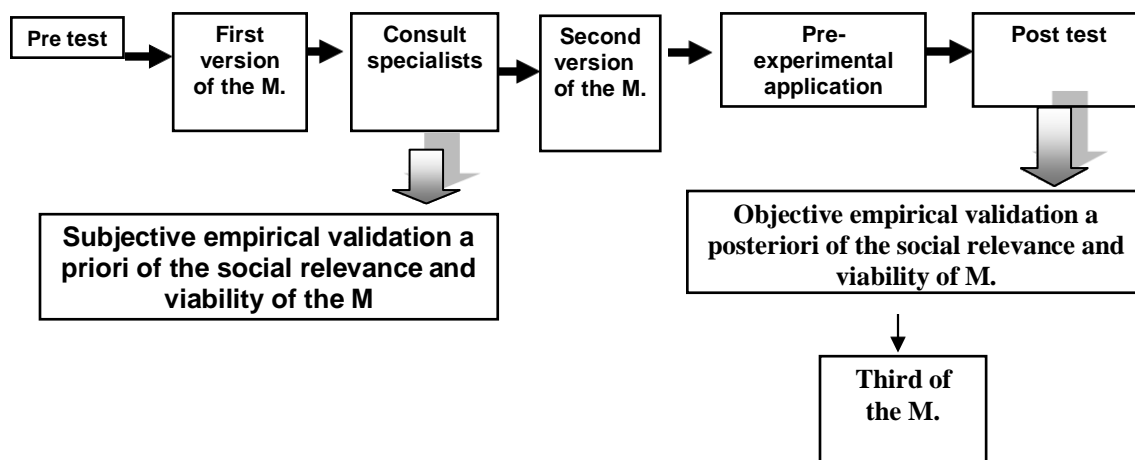


Figure 1. Experimentation application form.

Pre-Test (P1) to an experimental group, 2. Intervention (Stimulus), 3. Post-Test (P2) 4. Determine Difference if they existed with respect to the applied stimulus and determine conclusions.

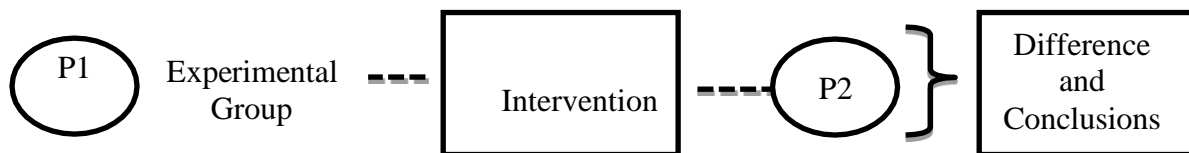


Figure 2. Pre-test intervention form.

The scope of the research is of an explanatory correlational nature since variables are associated through a predictable pattern for a group or population. In other words, it will be investigated using the following variables: (X) Set of Sports Training Mesocycles and the variable (Y) Cardiovascular Efficiency and Respiratory Efficiency.

Likewise, relevant statistical tests will be applied to this type of study (T test, Correlation of r Weights and Measures of central tendency - Mean, Standard Deviation of the two moments). In addition, it fulfils the goal

of providing a mathematical measurement system, descriptions and inferential, relationships and explanations, with the intention of consolidating the theory that supports the study.

Population and sample

The sample is of a non-probabilistic type directed, the selection procedure by quota intentionally, made up of 30 students who are part of the UNAH-TEC-Danlí men's soccer team.

Table 1. Work hypothesis.

Independent variable (X)	Y Dependent (Y)	Hypothesis
Meso sports training cycles (X).	Cardiovascular and Respiratory System (Y).	The application of sports training meso-cycles appropriate to the operation of the load (volume and intensity) will contribute to the improvement of aerobic resistance as relative parameters of this, the cardiac (Cardiovascular System) and respiratory (Maximum Oxygen Consumption, Respiratory System) efficiency) of the UNAH-TEC-Danlí players in the 2018-2019 season of Major League Pedro Nufio Category A.

Instruments

Chanlat Matrix

Typical of non-parametric statistics and referring to the demonstrable nature of the proposals that are established in the social sciences today, the well-known method of the Chanlat Matrix appears. Paulas. O, 2008 Cited by Paula. M, 2009, it enables the theoretical validation of the proposal with a significance level of 99.9 and a margin of error of 0.1. This makes it possible to identify the potentialities and insufficiencies of any proposal that is built, from a theoretical framework of science, therefore, it is applicable to the planned meso-cycles aimed at physical work that seeks to improve the Cardiovascular and Respiratory Efficiency of the men's soccer team of the UNAH-TEC-Danlí.

The objective: The application of this technique in research consists of:

Analyse the planned training meso-cycles could generate effects on the Cardiovascular and Respiratory Efficiency of the players of the UNAH-TEC-Danlí soccer team in the 2018-2019 season for their competitive stage.

To calculate the expected effectiveness of the set of Meso cycles (EECM), the following formula is used:
 $E.E.CM = I \times F \times O / 100$ (Impact, Functionality, Opportunity).

According to the referred authors, scholars and creators of the Chanlat matrix, the classification of the results of the EES in the following ranges are used:

If EECM is greater than 8, the proposal is considered strong. If EECM is between 5 and 7, the proposal is considered medium. If EECM is less than 5, the proposal is considered weak.

To achieve this application of the Chanlat Matrix method, 10 specialists from the area of Physical Culture and Health will be interviewed in what refers to sports training of Soccer in Honduras, their academic level, the functions they perform, the years as worker in the area and experience in its speciality.

The selection of specialists was made using the following criteria:

- Degree in the area of Physical Culture (Soccer Sports Training).
- Graduates or graduates of academic training processes in the area of Physical Culture (soccer coaches, soccer physical trainers).
- At least 5 years of experience as a soccer coach or coach.

The systematization of research associated with the direction of sports training and physical education, the elaboration of the proposal and the measurement of the results of these alternatives within Physical Culture and Sport, made it possible to identify the following variables and indicators submitted to the evaluation and suggestions requested by applying the Chanlat matrix.

Theoretical validation using the Chanlat Matrix.

Dear specialist:

We ask you to give a rating from 1 to 10 on the status of each of the indicators, by dimensions, with respect to each of the variables that will be shown below. We thank you in advance for your cooperation.

General data:

- *Names and surnames:*
- *Age:*
- *Degree in the area of Physical Culture:*
- *Degree in academic training processes:*
- *Years of experience as a soccer coach or fitness coach*

Table 2. Chanlat matrix.

Dimensions of the Physical Exercise Program variable	Indicators	Qualification
1.- Impact (I)	1.- Meso-cycles contribute to the achievement of goals in sports training.	
	2.- Satisfies the planning needs of meso-cycles for sports training.	
	3.- Covers the basic needs on the planning of sports training the meso-cycles presented.	
	4.- It contains an adequate organization of the meso-cycles planned for sports training.	
2.- Functionality (F)	1.- There is applicability of these meso-cycles by the coaches with respect to the load components.	
	2.- It has the necessary resources for the process of executing the planned training meso-cycles.	
	3.- There is official support from the authorities of the institution involved in the development of the meso-cycles in the planned training.	
	4.- It has the quality with respect to the distribution of the components of the load the meso-cycles of the planned sports training.	
	5.- Feasibility of developing the planned sports training meso-cycles.	

3.- Opportunity (O)	1.- The demands of the environment favour the meso-cycles of planned sports training.	
	2.- The meso-cycles of planned sports training are desirable.	
	3.- There is a need for the meso-cycles of planned sports training.	
	4.- There is general support for the development of the planned sports training meso-cycles.	

Querg test

Objective: Evaluate and determine cardiovascular efficiency.

Method: 1. Take the pulse while resting (Sitting).

1. Perform 30 squats in 20 seconds.
2. Perform a race at the top speed location in 30 seconds.
3. Run on site for 3 min. At a rate of 150 / min.
4. Jump with a rope for 1 min.
5. Then, immediately at the end of the jumps, the pulse is recorded, sitting, for 30 seconds P1, at the end of the minute after completing the exercise, the heart rate is taken again sitting in 30 seconds P2 and 4 min after having After the exercise, the heart rate is taken for the last time, sitting, for 30 seconds (P3).

Table 3. Assessment.

Indicators	Items
More of 105	Very well
99-104	All right
93-98	Regular
Less than 92	Weak

Cooper's test

Objective. Assess Respiratory Efficiency.

Methodical: Cover 2400 meters in the shortest time possible.

Table 4. Assessment.

Indicators	Items
More of 16.30	Bad
16.31-14.31	Poor
14.32-12.01	Medium
12.02-10.16	Good
Less than 10.15	Excellent

RESULTS

Tabulation and compilation of the data provided by the Chanlat Matrix.

Step 1: filling in the data table provided by each of the specialists in the research topic.

Step 2: each of the scores given by each specialist are added to each indicator that presents the three dimensions of the variable:

Example: Dimensions; Impact (I) (Indicators 1, 2, 3 and 4), Functionality (F) (Indicators 1, 2, 3, 4 and 5) and Opportunity (O) (Indicators 1, 2, 3 and 4)

Sum Weighting: Specialist 1 I = 10 + 9 + 8 + 10 = 37

F = 9 + 10 + 10 + 10 + 9 = 48

O = 8 + 9 + 10 + 10 = 37

Step 3: the Weighting is divided by the number of indicators that each dimension has:

Example: I = 37/4 = 9.25

F = 48/5 = 9.6 O = 37/4 = 9.25

Step 4

Validation results from consultations with specialists using the Chanlat matrix.

Formula: The Expected Effectiveness of Mesos-Cycles

$$(EEMC) \text{ EEMC} = \frac{I \times F \times O}{100} =$$

$$\text{Expert Example 1: EEMC} = \frac{9.25 \times 9.6 \times 9.25}{100} = 8.21$$

Table 5. Results of the application of the Chanlat matrix indicators.

Experts Number	Variable			Total
	Impact. (I) Weighting	Functionality (F) Weighting	Opportunity (O) Weighting	
1	9.25	9.6	9.25	8.21
2	8.75	9.2	9.25	7.44
3	9.5	9.4	9	8.03
4	9.25	9.6	9.5	8.43
5	9.75	9.4	9.25	8.47
6	10	9.6	9.5	9.12
7	9.75	9.6	9.5	8.89
8	9.25	9.4	9.5	8.26
9	9.25	9.4	9.5	8.26
10	9.75	9.6	9.25	8.65

Step 5: Sum of Average Weights.

Example: $\sum P$ number of specialists (10)

$$\frac{\sum P = 8.21 + 7.44 + 8.03 + 8.43 + 8.47 + 9.12 + 8.89 + 8.26 + 8.26 + 8.65}{10} =$$

Table 6. Cooper's tests at the time of the pre-test to determine the maximum oxygen consumption.

Nº	Size	Weight Kg	Time in minutes	Evaluation	Score	VO ₂ Max (mL/kg/min)	Evaluation Of VO ₂ Max	Score
1	1.7	69	15.2	Poor	2	37.23	Poor	2
2	1.83	73	11.3	Good	4	46.49	Good	4
3	1.7	71	16.48	Bad	1	35.14	Very poor	1
4	1.64	61	14.95	Poor	2	37.68	Poor	2
5	1.68	52	15.94	Poor	2	35.98	Very poor	1
6	1.83	78	11.7	Good	4	45.26	Regular	3
7	1.84	84	15.65	Poor	2	36.46	Poor	2
8	1.75	73	15.82	Poor	2	36.18	Very poor	1
9	1.88	94	13.8	Medium	3	39.95	Regular	3
10	1.65	66	16.6	Bad	1	34.96	Very poor	1
11	1.68	62	16.54	Bad	1	35.05	Very poor	1
12	1.69	70	11.95	Good	4	44.53	Regular	3
13	1.74	76	16.42	Bad	1	35.23	Very poor	1
14	1.68	66	15.76	Poor	2	36.27	Very poor	1
15	1.79	75	15.82	Poor	2	36.18	Very poor	1
16	1.83	86	12.87	Medium	3	42.09	Regular	3
17	1.74	68	16.54	Bad	1	35.05	Very poor	1
18	1.71	65	16.46	Bad	1	35.17	Very poor	1
19	1.76	79	16.35	Bad	1	35.34	Very poor	1
20	1.68	67	12	Good	4	44.38	Regular	3
21	1.69	68	14.87	Poor	2	37.82	Poor	2
22	1.86	89	14.6	Poor	2	38.33	Poor	2
23	1.75	72	16.4	Bad	1	35.26	Very poor	1
24	1.78	79	14.89	Poor	2	37.79	Poor	2
25	1.73	70	16.42	Bad	1	35.23	Very poor	1
26	1.79	78	16.34	Bad	1	35.35	Very poor	1
27	1.68	65	11.85	Good	4	44.82	Regular	3
28	1.8	82	16.45	Bad	1	35.19	Very poor	1
29	1.76	74	16.42	Bad	1	35.23	Very poor	1
30	1.72	70	15.65	Poor	2	36.46	Poor	2

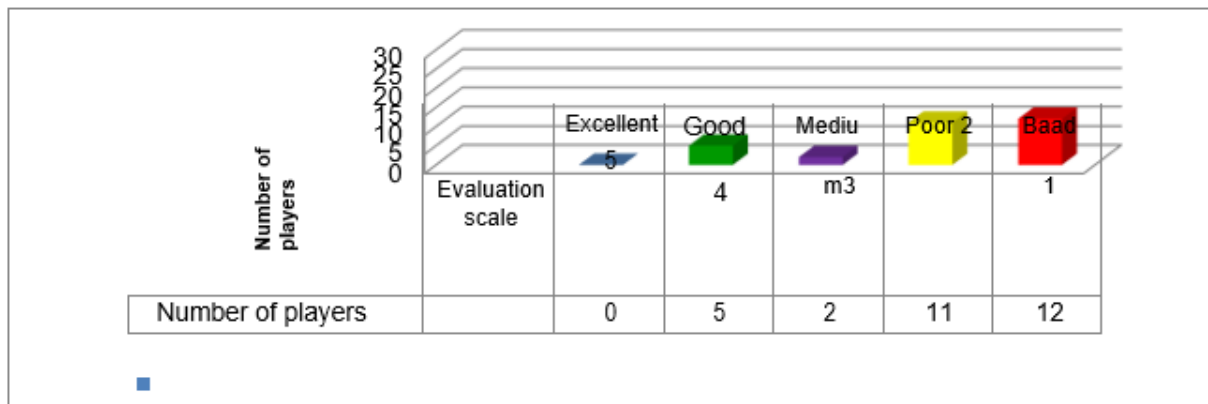


Figure 3. Graphical figure of Cooper test results.

Table 7. Evaluation scale to be used.

Evaluation scale		
Score		No. of Players
5	Excellent	0
4	Good	5
3	Medium	2
2	Poor	11
1	Bad	12

Table 8. Querg test results at the time of the pre - test, to assess cardiovascular efficiency.

N°	Size	Weight Kg	Evaluation	Score
1	1.7	69	Regular	3
2	1.83	73	Regular	3
3	1.7	71	Regular	3
4	1.64	61	Weak	2
5	1.68	52	Weak	2
6	1.83	78	All right	4
7	1.84	84	Weak	2
8	1.75	73	Weak	2
9	1.88	94	Regular	3
10	1.65	66	Regular	3
11	1.68	62	Weak	2
12	1.69	70	All right	4
13	1.74	76	Weak	2
14	1.68	66	Weak	2
15	1.79	75	Weak	2
16	1.83	86	Regular	3
17	1.74	68	Weak	2
18	1.71	65	Regular	3
19	1.76	79	Weak	2
20	1.68	67	All right	4
21	1.69	68	Weak	2
22	1.86	89	Weak	2
23	1.75	72	Regular	3
24	1.78	79	Weak	2
25	1.73	70	Weak	2
26	1.79	78	Regular	3
27	1.68	65	All right	4
28	1.8	82	Weak	2
29	1.76	74	Regular	3
30	1.72	70	Weak	2

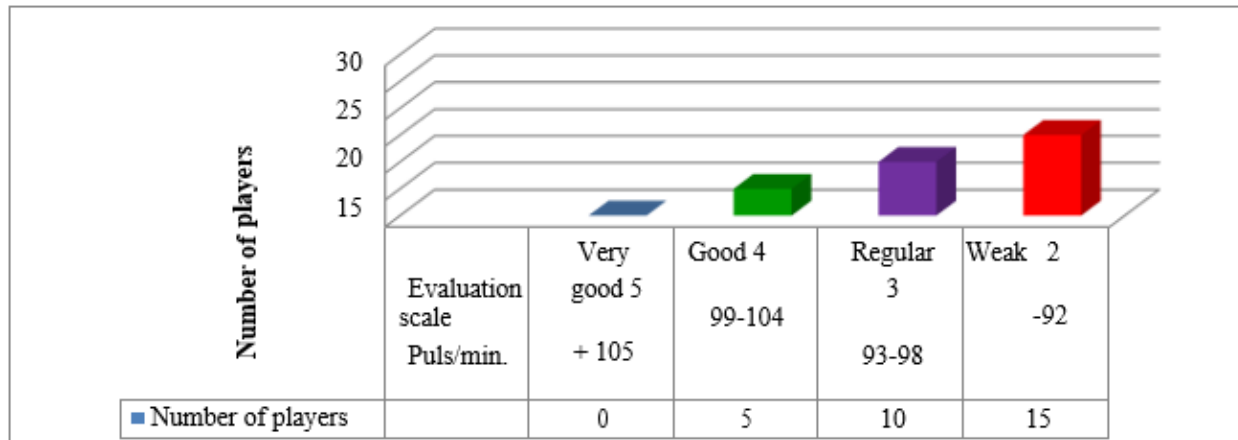


Figure 4. Querg test results at the time of the pre-test, to assess cardiovascular efficiency.

In the pre-tests carried out in the Cardiovascular Efficiency test, the following results were obtained:

- 5 athletes representing 17% are on a good scale of the Querg test.
- 10 athletes representing 33% meet is a regular scale of the Querg test.
- 15 athletes representing 50% are on the weak scale of the Querg test.
- Regarding the measurement of Respiratory Efficiency, the following marks were obtained:
- 5 athletes representing 17% are on a good scale of the Cooper test.
- 2 athletes representing 7% are on the middle scale of the Cooper test.
- 11 athletes representing 37% are on the poor scale of the Cooper test.
- 12 athletes representing 40% are on the poor scale of the Cooper test.

Table 9. Querg tests. Post-Tests.

Nº	Size	Weight Kg	Evaluation	Score
1	1.7	69	All right	4
2	1.83	73	very well	5
3	1.7	71	All right	4
4	1.64	61	Regular	3
5	1.68	52	Weak	2
6	1.83	78	Regular	3
7	1.84	84	Regular	3
8	1.75	73	All right	4
9	1.88	94	Regular	3
10	1.65	66	All right	4
11	1.68	62	Regular	3
12	1.69	70	Very well	5
13	1.74	76	All right	4
14	1.68	66	Weak	2
15	1.79	75	Regular	3
16	1.83	86	Regular	3
17	1.74	68	All right	4
18	1.71	65	All right	4
19	1.76	79	Weak	2

20	1.68	67	Regular	3
21	1.69	68	Regular	3
22	1.86	89	Weak	2
23	1.75	72	Regular	3
24	1.78	79	All right	4
25	1.73	70	Regular	3
26	1.79	78	very well	5
27	1.68	65	Regular	3
28	1.8	82	Regular	3
29	1.76	74	Regular	3
30	1.72	70	Weak	2

Table 10. Cooper Post-Tests Test.

Nº	Size	Weight Kg	Time in minutes	Evaluation	Score	VO ₂ Max (mL/kg/min)	Evaluation of VO ₂ Max	Score
1	1.7	69	13.5	Medium	3	40.61	Regular	3
2	1.83	73	11.3	Good	4	46.49	Good	4
3	1.7	71	14.85	Poor	2	37.86	Poor	2
4	1.64	61	11.83	Good	4	44.87	Regular	3
5	1.68	52	13.76	Medium	3	40.04	Regular	3
6	1.83	78	11.45	Good	4	46.02	Good	4
7	1.84	84	13.78	Medium	3	39.99	Regular	3
8	1.75	73	13.84	Medium	3	39.86	Regular	3
9	1.88	94	11.82	Good	4	44.9	Regular	3
10	1.65	66	14.9	Poor	2	37.77	Poor	2
11	1.68	62	14.87	Poor	2	37.82	Poor	2
12	1.69	70	11.65	Good	4	45.41	Regular	3
13	1.74	76	13.75	Medium	3	40.06	Regular	3
14	1.68	66	13.79	Medium	3	39.97	Regular	3
15	1.79	75	13.8	Medium	3	39.95	Regular	3
16	1.83	86	11.74	Good	4	45.14	Regular	3
17	1.74	68	14.78	Poor	2	37.99	Poor	2
18	1.71	65	14.84	Poor	2	37.88	Poor	2
19	1.76	79	13.82	Medium	3	39.91	Regular	3
20	1.68	67	11.65	Good	4	45.41	Regular	3
21	1.69	68	13.25	Medium	3	41.18	Regular	3
22	1.86	89	11.88	Good	4	44.73	Regular	3
23	1.75	72	13.87	Medium	3	39.8	Regular	3
24	1.78	79	11.92	Good	4	44.61	Regular	3
25	1.73	70	13.87	Medium	3	39.8	Regular	3
26	1.79	78	13.85	Medium	3	39.84	Regular	3
27	1.68	65	11.5	Good	4	45.86	Regular	3
28	1.8	82	13.84	Medium	3	39.86	Regular	3
29	1.76	74	13.85	Medium	3	39.84	Regular	3
30	1.72	70	13.44	Medium	3	40.74	Regular	3

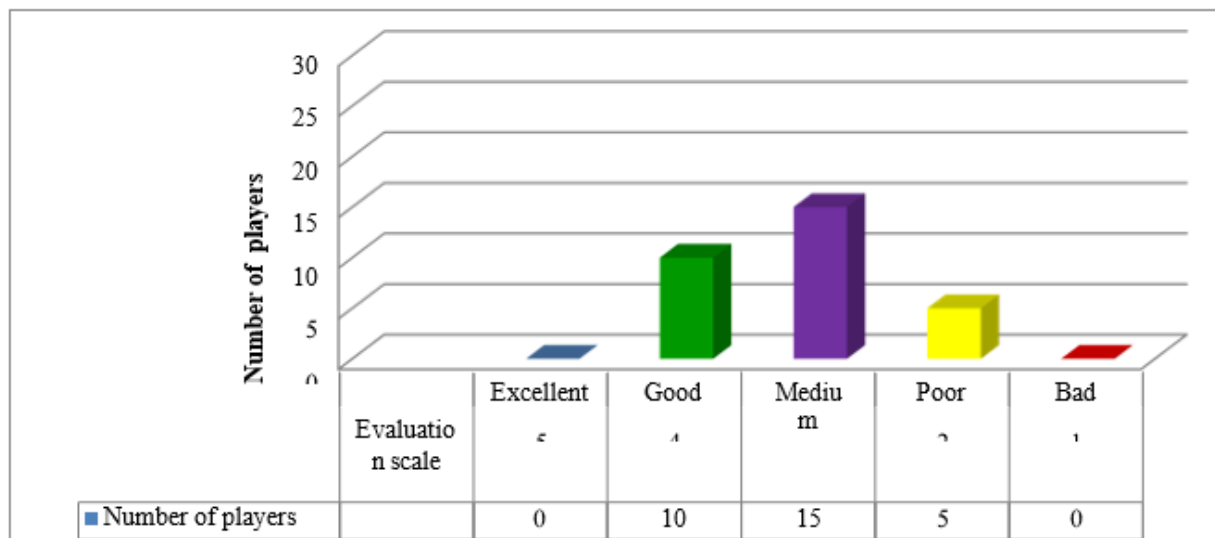


Figure 5. Cooper Post-Tests test.

In the post-tests carried out in the Cardiovascular Efficiency test, the following results were obtained:

- 12 athletes representing 49.67% are on a good scale of the Querg test.
- 13 athletes representing 43.33% are found on a regular scale of Querg's test.
- 5 athletes representing 7% are on the weak scale of the Querg test.

Regarding the measurement of Respiratory Efficiency, the following marks were obtained:

- 10 athletes representing 33.33% are on a good scale of the Cooper test.
- 15 athletes representing 50% are in the middle scale of the Cooper test.
- 5 athletes representing 16.67% are found on the poor scale of the Cooper test.
- 0 athletes representing 0% are found on the Cooper test bad scale.

Results of the correlation of the Research Variables

Considering the evaluated indicators, the correlation between the variables was determined by the Pearson coefficient; In this sense, based on the results obtained through the evaluation scales, we will take into account that the cardiovascular efficiency variable shows little significant improvement taking into account an index of 0.36, being valued as a low positive correlation.

Respiratory efficiency determined in working time in minutes was shown with high values in terms of respiratory efficiency with a correlation of 0.77 classified as high positive.

It is found that the shorter the work time, the better the maximum oxygen consumption, which gives it a moderate positive significance, obtaining results of 0.57 in the correlation index.

DISCUSSION

The relevant findings in the study are regarding the tolerance to the loads applied in the mesocycle by means of the Cooper tests to evaluate the maximum oxygen consumption and the Querg test for cardiovascular efficiency, as well as the acceptance by the patients. specialists by means of the Chanlat matrix at the end

of the post-test moment after the application of the mesocycles for the general preparation of the soccer team.

After completing 10 weeks of general preparation, significant improvements were observed in the maximum oxygen consumption, in that sense, the evaluations in the Cooper test weighted in the parameters of regulating by 76.6% with respect to the sample, something such that it was not observed in the pre-test results. However, we consider that other indicators such as VO_2 at the ventilatory threshold and MEV, the respiratory exchange ratio during maximal effort, and cardiac and metabolic reserves could be evaluated, as observed in the investigation by Niño (2010). However, with the results obtained, the objective of being able to assess the efficiency of the mesocycles corresponding to the evaluated stage has been met. It is also necessary to have informative aspects about the behaviour of the RF during the tests, that, although a constant effort is made and despite some variations in the work rhythm, it is important to monitor disproportionate increases in heart rate, which is an alert factor in the case of trained athletes and an indicator to be followed in the state of the soccer player in the conditions closest to the reality of the game. Limitations are also considered not to have contributed with results to the improvement of ventilatory demand and efficiency during the effort of the athletes at the end of the season of maintaining the optimal state of resistance capacity.

However, the study has shown interesting perspectives regarding the monitoring and observation of soccer team players in the process of preparing a season and the intention of complementing other tests with the training program that are usually carried out isolated from this, which would offer an awareness for the coaching staff relevant information that can contribute to the physical performance of the player.

CONCLUSIONS

The evaluative opinion of the criteria of specialists (Chanlat Matrix), confirmed a favourable prognosis of effectiveness and the theoretical validation of the meso training cycles in the cardiovascular and respiratory efficacy of the UNAH-TEC-Danlí soccer player, manifesting with an 8.38 per what is considered strong the opinion of the proposal from them.

The working hypothesis of the inquiry carried out is approved, based on the correlations carried out, where the Querg test in the pre-test and the post-test generates a Pearson coefficient of 0.36, with a direct relationship with a positive correlation between them. low, which determines an improvement in cardiovascular efficiency, but not a recovery capacity after the application of the physical load (The footballer recovers, but not quickly). With respect to the Cooper Test in the pre-test and the post-test it generates a Pearson coefficient of 0.77, having a direct relationship with a high positive correlation between them, which determines an improvement in Maximum Oxygen Consumption ($\text{VO}_{2\text{Max}}$), which means that the shorter the time, the greater the oxygen consumption capacity.

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