Articles

Extracurricular aquatic activities program to promote the physical fitness of university students

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Abstract: Introduction. Swimming, as a means of improving quality of life and promoting healthy lifestyles, is one of the most widespread activities today. Objective: To improve the physical fitness of university students who participate in the swimming program during their free time. Methodology. This causal-explanatory study employed a pre-experimental design (single group) with a cross-sectional quantitative approach. A total of 21 (n=21) young university students from various majors at the State University of Milagro participated. They were administered a strength endurance test, a Cooper test, a speed test, and a 100-meter freestyle swimming technique test. Results. A three-phase program is proposed: a diagnostic phase, a development and implementation phase, and an evaluation and validation phase of the empirical results of the instruments administered during the pre-test and post-test. The conclusions confirm that the extracurricular aquatic activities program was effective for the participants, demonstrating significant changes in their physical condition after its implementation. This was verified through a student's t-test, which yielded a p-value of 0.00 ($p < 0.05$), thus supporting the researcher's hypothesis (Hi).

Keywords: Swimming, physical condition, university students.

Introduction

Swimming as a means for quality of life and healthy lifestyles is one of the most prolific activities today. Authors such as Rojas Bajaña, R. A., Criollo, L. P., Guerrero, M. C., & Cantos, A. M. (2024), Brito Mancheno, F. D. (2025) address aspects related to improving the functional conditions of practitioners; however, other authors, such as Villafuerte Cedeño, M. E., & Chávez, E. A. C. (2025), delve into contributions to mental health and the psychological well-being of practitioners.

Regarding aspects related to physical fitness for health, the works of Apolo Illescas, J. U., (2024), Delgado Tenesaca, C. E., & Pilleo Guapisaca, L. F. (2022) are oriented towards promoting cardiovascular capacity and aerobic endurance, the development of strength and joint mobility in age groups such as older adults, adult women, young adults, adolescents, and children from different contexts. In these cases, program and activity proposals are made, ranging from playful activities to traditional and specific exercises using specialized means and materials for their practical implementation.

Swimming activities and exercises have been used very naturally to promote certain conditional physical capacities, including endurance, aerobic capacity, muscle tone, strength, and aspects related to obesity and sedentary lifestyles in different age groups. In this sense, the works of Cruz Gutiérrez, O. C., et al., (2021), Juárez Flores, J., et al., (2024) stand out; they propose improvements in lipid profiles, glucose metabolism, and blood pressure in adults of different ages.

There are other works that guide the application of proposals aimed at cognitive well-being, mental state, mood, and psychological aspects related to stress and improvements in sleep quality, among which are those of Correa Pérez, G. A. (2023), Loja, E. T., et al., (2025), which aim to reduce anxiety states and promote social relationships and social skills in certain age groups.

In the case of children, a group of options with playful activities in the aquatic environment and low-intensity exercises with a frequency of three to four weekly sessions conducive to learning flotation and safety skills have been proposed; therapeutic swimming and adaptations for disability open opportunities for inclusion and rehabilitation; in this case, the studies of García, J. L., & Doncel, M. L. R. (2022) stand out.

In the case of university students, similar to the sample of the present study, works aimed at physical performance, mental health, promoting leisure time occupation, obesity and sedentary lifestyles, and others aimed at addressing some cognitive and motor problems due to some disability or other causes stand out; in this case, the works of Romero-Ibarra, O. P., et al., (2024) stand out. The previous theoretical assumptions, combined with the observation of limitations in some conditional capacities of university students at the State University of Milagro (UNEMI), led to this study, whose objective focuses on verifying the effectiveness of an extracurricular swimming program in improving the physical condition of university students who attend the swimming program during their free time.

Materials and Methods

The study is of a causal explanatory type with an experimental design in the mode of a pre-pedagogical experiment (single group) with a cross-sectional quantitative approach, in which a total of (n=21) young university students from different majors at the State University of Milagro who attend the swimming program for the promotion of health and physical condition participated. The study began its diagnostic phase in April of Cycle I of the 2025 academic year and concluded with the application of the actions and their results in July 2025. As empirical methods, measurement with functional physical tests and the physical activity questionnaire were used. The research was developed in three phases: diagnosis, development and implementation of the program, and validation of the program's effectiveness. As data collection techniques, the Arm Strength Endurance Test, Cooper Test, 60-Meter Speed Test, and 100-Meter Freestyle Test were used.

Participants

The population consisted of sixty-two university students (N=62) who attended the double session of the swimming program at UNEMI. As a sample, (n=21) were used, chosen by certain inclusion criteria at the researcher's convenience, such as female gender, students with more than 90% attendance at the sessions, and voluntary willingness to participate in the research. The sample consisted of 21 female students with an average age of 21.4 years with a standard deviation (SD) of 3.52 and an average Body Mass Index (BMI) of 27.15 and an (SD) of 2.65.

Procedures

The recommendations provided by the National Council of Measurement in Education (2018) regarding standards for the application of instruments were followed, which included the following actions: a) approval for the application of the instruments was requested; b) references from authors whose studies used the tests to be applied were taken; c) the instrumentation was submitted for validation by specialists; d) informed consent regarding participation in the study was assessed with the students; e) data collection and tabulation proceeded. The study was approved by the Research Commission of the Faculty of Education Sciences of UNEMI in 2025.

Instruments

For information collection, quantitative and qualitative techniques were used, detailed below:

Arm Strength Endurance Test: This test was applied to evaluate the state of upper body strength endurance of the university students in 30 seconds. The 60-meter speed or sprint test to evaluate speed of movement, the Cooper test to evaluate the state of aerobic endurance, and the 100-meter freestyle test to evaluate the times taken to complete the distance.

Results

As part of the diagnostic phase in April of Cycle I of the 2025 academic year, the established instruments and tests were applied to the declared sample, which yielded the following results in each of the tests as pretest:

The arm strength endurance test was applied to evaluate the number of repetitions in 30 seconds, for which criteria from other studies for evaluation in young people of this age were taken, the evaluation categories being: >30 Excellent, 24-30 Very Good, 19-23 Good, 13-18 Fair, and <13 Poor. For the 60-meter speed test, the following scales were used: <8".50 Excellent, 8".50-8".89 Very Good, 8".90 - 9".10 Good, , 9".11-9".60 Fair, and >9".60 Poor. For the Cooper test, standardized criteria for subjects who are not high-performance athletes were taken, so the following evaluation categories were assigned: >2350m Excellent, 2349-2150m Very Good, 2149-1950m Fair, and <1950m Poor.

For the 100-meter freestyle test, considerations for university students of these ages were taken into account and subjected to criteria from swimming specialists, so the times considered for grading were: <1:10".00 Excellent, 1:10".00-1:18".00 Very Good, 1:18".01-1:25".00 Good, 1:25".01-1:30".00 Fair, and >1:30"00 Poor.

Table 1
Results of the tests during the diagnostic phase (pretest)

Physical Condition Test (Pre-Test)								
No.	**Reps/30"**	**Eval.**	**Cooper Dist.**	**Eval.**	**60m Time**	**Eval.**	**100m Crowl**	**Eval.**
1	18	Fair	1530	Poor	11.93	Poor	1:32"10	Poor
2	15	Fair	1810	Poor	13.74	Poor	1:35"20	Poor
3	10	Poor	1750	Poor	12.25	Poor	1:35"25	Poor
4	20	Good	1750	Poor	10.12	Poor	1:30"00	Poor
5	12	Poor	1190	Poor	10.75	Poor	1:30"00	Poor
6	23	Good	1920	Poor	10.80	Poor	1:28"16	Fair
7	25	V. Good	2015	Fair	9.50	Fair	1:27"12	Fair
8	26	V. Good	2150	Fair	9.25	Fair	1:26"24	Fair
9	18	Fair	1850	Poor	11.26	Poor	1:45"30	Poor
10	22	Good	1730	Poor	11.30	Poor	1:55"30	Poor
11	20	Good	1600	Poor	10.15	Poor	1:56"24	Poor
12	18	Fair	1750	Poor	11.23	Poor	1:36"00	Poor
13	14	Fair	1800	Poor	10.34	Poor	1:37"25	Poor
14	22	Good	1950	Fair	11.32	Poor	1:25"87	Fair
15	21	Good	1840	Poor	10.27	Poor	1:32"23	Poor
16	16	Fair	1780	Poor	9.58	Fair	1:31"60	Poor
17	15	Fair	1750	Poor	11.26	Poor	1:33"30	Poor
18	13	Fair	1820	Poor	12.45	Poor	1:30"00	Poor
19	17	Fair	1620	Poor	10.05	Poor	1:34"13	Poor
20	16	Fair	1980	Fair	11.10	Poor	1:37"60	Poor
21	21	Good	2010	Fair	9.55	Fair	1:45"34	Poor
X	18.19	Fair	1790	Poor	10.86	Poor	1:38"26	Poor

Note: Reps/30". Arm Strength Endurance Test, Cooper Dist.: Aerobic Endurance Test, 60m Time: Speed Test, 100m Freestyle: Speed Endurance Test in Swimming.

The results of the tests showed general difficulties in the sampled university students entering the swimming program, revealing results in the arm strength endurance test where only two students are rated as Very Good for 9.5%, 7 are rated as Good for 33.3%, 11 are rated as Fair for 52.4%, and two are rated as Poor for 9.5%. This shows that more than 50% of the participants are rated between the Fair and Poor categories. Regarding the Cooper Test, many more difficulties are shown, as 16 of the 21 students are rated as Poor for 72.2% and the rest, 17.8%, are rated as Fair, so none of the students are rated as Good.

Regarding the 60-meter speed test and the 100-meter freestyle test, generally unfavorable results were obtained, as 17 of the 21 students are rated as Poor by 80.9% and the rest, 19.1%, are rated as Fair; none of the students are rated in another category.

Based on this result during the Program Development and Implementation Phase, the following actions were determined: development of the general and specific objectives, planning of the exercise system and methods of the program, and its application over 12 weeks. These actions are presented below:

Action 1. Development of objectives. In this phase, the General Objective was determined: To improve the physical conditions of university students at the State University of Milagro.

Specific objectives:

a) Develop exercises for the development of the physical capacities of rapid strength, strength endurance, speed endurance, pure speed, aerobic endurance.

b) Develop technical exercises for learning the technical phases of the freestyle in swimming.

c) Improve the capacities of strength endurance, speed, anaerobic and aerobic endurance.

d) Improve times in the speed tests and speed endurance test in swimming.

Action 2. Exercises and methods for training basic and specific conditional capacities.

Table 2

Schedule of exercises, methods, procedures, and components of the training load of the program

Physical Work Dosage Mesocycle 1

Physical Capacity	Sessions/Wk.	Method	Procedure	Intensity	Volume
Strength Endurance	2	Intensive Interval	Frontal	High 80-85% HRmax	2 sets x12-15 reps/70%1RM
Explosive Strength	1	Standard Repetition	Circuit	Very High >90% HRmax	4 sets x6-8 reps 30-35% 1RM
Speed	2	Standard Repetition	Wave	Very High >90% HRmax	3 sets x4 reps of 30-35 m
Speed Endurance	2	Extensive Short Interval	Wave	Medium 75% HRmax	3 sets x4 reps of 50-60 m
Aerobic Endurance	1	Standard Continuous	Frontal	Low 60% HRmax	Continuous run 8-10 minutes
Maximal Strength	1	Ascending	Circuit	Very	4 sets x6-8 reps

Physical Work Dosage Mesocycle 2					
Physical Capacity	**Sessions/Wk.**	**Method**	**Procedure**	**Intensity**	**Volume**
Strength Endurance	2	Intensive Interval	Circuit	High 85-89% HRmax	3 sets x12-15 reps/75%1RM
Explosive Strength	1	Standard Repetition	Frontal	Very High >90% HRmax	4 sets x8-10 reps 35% 1RM
Speed	2	Standard Repetition	Wave	Very High >90% HRmax	3 sets x4 reps of 35-40 m
Speed Endurance	2	Extensive Medium Interval	Wave	Medium 75% HRmax	3 sets x4 reps of 70-200m
Aerobic Endurance	1	Standard Continuous	Frontal	Low 60% HRmax	Continuous run 10-15 minutes
Maximal Strength	1	Ascending Repetition	Circuit	Very High >90% HRmax	4 sets x 4-6 reps 75-80% 1RM
Flexibility	1	Standard & Variable Exercise	Circuit	Low 50-60% HRmax	3 sets x reps 20 sec.
Freestyle Technical Work	4	Repetitions	Waves	Low-Medium	20-25 min.
Physical Work Dosage Mesocycle 3					
Physical Capacity	**Sessions/Wk.**	**Method**	**Procedure**	**Intensity**	**Volume**
Strength Endurance	2	Intensive Interval	Circuit	High 85-89% HRmax	3 sets x10-15 reps/80%1RM
Explosive Strength	1	Standard Repetition	Wave	Very High >90% HRmax	4 sets x 8-10 reps 40% 1RM
Speed	2	Standard Repetition	Wave	Very High >90% HRmax	3 sets x4 reps of 35-40 m
Speed Endurance	2	Extensive Medium Interval	Wave	Medium 75% HRmax	3 sets x4 reps of 200-400m
Aerobic Endurance	1	Standard Continuous	Frontal	Low 60% HRmax	Continuous run 15-20 minutes
Maximal Strength	1	Ascending Repetition	Circuit	Very High >90% HRmax	4 sets x 4-6 reps 85-90% 1RM
Flexibility	1	Standard & Variable Exercise	Circuit	Low 50-60% HRmax	3 sets x reps 30 sec.
Freestyle Technical Work	4	Repetitions	Waves	Low-Medium	20-25 min.

Source: Own elaboration

The program effectiveness validation phase allowed the evaluation of the changes obtained in the physical condition of the university students. This phase was carried out in weeks 14 and 15 of the declared academic period, where the same tests were applied in a standardized manner to the selected sample. The results of this second measurement are presented below:

Table 3

Results of the physical condition tests during the program validation phase (posttest)

Physical Condition Test Post-test								
No.	**Reps/30"**	**Eval.**	**Cooper Dist.**	**Eval.**	**60m Time**	**Eval.**	**100m Freestyle**	**Eval.**
1	20	Good	1920	Fair	9.6	Fair	1:29”20	Fair
2	18	Fair	1970	Good	10.68	Poor	1:30”20	Poor
3	14	Fair	1925	Fair	10.2	Poor	1:31”25	Poor
4	24	V. Good	1950	Good	8.7	V. Good	1:25”00	Fair
5	18	Fair	1380	Poor	9.5	Fair	1:24”00	Good
6	23	Good	2150	V. Good	9.50	Fair	1:24”16	Good
7	27	V. Good	2250	V. Good	9.00	Good	1:23”12	Good
8	29	V. Good	2320	V. Good	9.05	Good	1:22”24	Good
9	22	Good	2000	Good	9.50	Fair	1:36”30	Poor
10	26	V. Good	1820	Fair	9.60	Poor	1:45”30	Poor
11	20	Good	1740	Poor	9.20	Fair	1:36”24	Poor
12	23	Good	1890	Fair	9.45	Fair	1:29”00	Fair
13	14	Fair	1970	Good	9.00	Good	1:32”00	Poor
14	24	V. Good	2350	Excellent	10.20	Poor	1:21”87	V. Good
15	20	Good	1930	Fair	9.30	Fair	1:27”23	Fair
16	20	Good	1950	Good	9.20	Fair	1:28”60	Fair
17	17	Fair	1750	Poor	9.50	Fair	1:28”30	Fair
18	17	Fair	1880	Fair	10.50	Poor	1:27”00	Fair
19	22	Good	1850	Fair	9.05	Good	1:29”13	Fair
20	19	Good	2200	V. Good	9.70	Poor	1:32”60	Poor
21	24	V. Good	2150	V. Good	8.85	V. Good	1:35”34	Poor
X	18.19		1790	Poor	9.76	Poor	1:31”26	Poor

Source: Own elaboration

The results of the tests performed show slight progress in most of the physical tests performed. In the arm strength endurance test, 6 students are rated as Very Good for 28.6%, 9 are rated as Good for 42.8%, 6 are rated as Fair for 28.57%, and none are rated as Poor. This shows significant progress after applying the program. Regarding the Cooper Test, progress is shown, as only 6 of the 21 students are rated as Poor for 28.57%. Progress is shown in students rated between Good and Excellent with 38.1%, and 7 are rated as Fair for 33.3%.

Regarding the 60-meter speed test, although no praiseworthy progress is shown in the assigned categories, there are 6 students rated between Good and Very Good for 28.6%. In the Fair category, 9 students are diagnosed for 42.8%, and only 6 are rated as Poor for 28.6%.

In the 100-meter freestyle test, very favorable results were obtained in the times, as 100% improved their results; however, the Very Good and Excellent categories were poor. Only five out of 21 students, 23.8%, were in these categories, 8 students were rated as Fair for 38.09%, and 9 students were rated as Poor for 42.8%.

These results were subjected to hypothesis testing, so a normality test was applied to corroborate if the data have a normal distribution and consequently apply a statistical test to corroborate the following Researcher's Hypothesis Hi:

The application of the program caused changes in the physical condition of the university students and H0: The application of the extracurricular program did not cause changes in the physical condition of the university students.

Table 4

Student's T-test for Paired Samples						
	Diferencias emparejadas			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
Arm Strength Endurance Pretest - Posttest	-2.81	1.861	0.406	-6.92	20	0.00
Aerobic Endurance Pretest - Aerobic Endurance Posttest	-178.571	92.738	20.237	-8.82	20	0.00
60m Speed Pretest - 60m Speed Posttest	1.37714	0.68084	0.14857	9.269	20	0.00
100m Freestyle Pretest - 100m Freestyle Posttest	6.00714	3.82212	0.83405	7.202	20	0.00

Source: Own Elaboration

The results show that in all four tests the Significance level is 0.00 <0.05, therefore the null hypothesis is rejected and the researcher's hypothesis Hi is accepted, demonstrating that the differences are highly significant in the posttest after applying the extracurricular swimming activities program.

Discussion

The study coincides with the female gender used by Cruz Gutiérrez, O., et al., (2021), but with adult women to whom an aquatic activities program was applied that had an impact on their mood and quality of life; however, this study does not apply physical or functional tests that would show the physical impacts of the sample under study. Nevertheless, the present research shows, in a process of test standardization, exact control of the evaluated physical condition indicators.

The study conducted by Juárez Flores, J., Carrillo, C. C. R., Serna, H. V., & Martínez, J. Á. F. (2024) addresses the incidence of aerobic exercise on blood pressure in Mexican older adults, corroborating changes in interesting indicators such as BMI and Abdominal Perimeter with significant changes in these anthropometric indicators. However, no changes in the physical condition of the older adults were offered, and no physical tests or trials were applied. As a limitation of the present study, there is the low generalizability of the study results due to the sample size. It is recommended to extend the number of subjects with the application of the program and include subjects of the male sex.

Conclusions

The development of an extracurricular program with its phases of diagnosis, development and implementation, evaluation and validation of the results, and its subsequent application included physical preparation exercises and the development of specific skills in the freestyle stroke in swimming over three mesocycles in university students at UNEMI. Its effectiveness was statistically demonstrated with the application of the student's t-test for hypothesis, which showed that the significance levels in the four tests were highly significant with a P value result of 0.00 <0.05, therefore the changes after applying the program were highly significant in the subjects under study.

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Carlos Rosendo Álvarez Rojas: Participated in the application of the research methods and instruments, the development of the activity program and its application and implementation. Developed the research methodology.
Manuel Rondan Elizalde: Developed the theoretical framework, constructed the bibliographic references, and the search and systematization of theoretical information. Developed the discussion and conclusions of the study.