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Training In Aquatic Rescue As A Social Responsibility In A University Institution In Medellín

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Summary
Within the framework of the Sustainable Development Goals (SDGs), this research addresses the need to strengthen training in aquatic rescue as a preventive and educational strategy. The study focused on the design and implementation of a comprehensive program aimed at the development of technical, physical and emotional competencies for emergency care in aquatic spaces, with the purpose of promoting an institutional culture of self-care and social responsibility.

The methodology adopted was mixed, incorporating quantitative and qualitative tools. Theoretical, physical and psychological tests were applied before and after the training process, structured in 40% theoretical content and 60% practical. The sample was made up of people with little previous experience, which allowed us to assess the impact of the program from a training perspective.

The results revealed a mean theoretical performance (average: 2.69/5), with strengths in protocols such as PRICE (93.75% of correct answers), but weaknesses in resuscitation techniques (93.75% of errors in chest compressions). In physical condition, 56.25% were between "low" and "acceptable" levels in cardiorespiratory tests, and only 25% showed optimal aptitude in the aquatic environment. In the psychological component, 62.5% had a medium level in the state of anxiety, and 37.5% at a high level.

It is concluded that the training had a positive impact on the comprehensive preparation of the participants, highlighting its value as a transformative pedagogical practice, with the potential to be integrated into educational contexts that seek to promote safe environments and citizens committed to collective well-being.

Keywords: training, aquatic rescue, social responsibility.

1. Introduction

In the current context, the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda establish priority targets aimed at ensuring human well-being, including health promotion (SDG 3) and access to quality education (SDG 4). In this framework, the need arises to promote university initiatives that respond effectively to these commitments. Training in aquatic rescue, beyond constituting a technical competence, is proposed as a concrete manifestation of social responsibility in a university institution in Medellín, aimed mainly at its student and academic community. This proposal seeks to articulate knowledge with action, highlighting the role of higher education as an agent of social transformation in the prevention of accidents and the promotion of healthy lifestyles.

The approach to the problem is based on an alarming situation: despite the international recognition of aquatic rescue as a key discipline in the prevention of drowning endorsed by organizations such as the World Health Organization (WHO) and the International Lifesaving Federation (ILS), at the Jaime Isaza Cadavid Polytechnic there is a significant lack of systematic training programs in this area. This

omission not only contravenes legal regulations such as Law 1209 of 2008, which establishes the obligation to have trained personnel in aquatic spaces, but also increases the vulnerability of the university community to risk situations.

From a pedagogical and preventive approach, this research proposes to design and implement a training plan in aquatic rescue, adapted to the particularities of the Jaime Isaza Cadavid Polytechnic. The theoretical framework considers aquatic rescue as a comprehensive discipline, which encompasses rescue techniques, first aid, risk prevention and emotional management in aquatic contexts. Likewise, the value of training as an essential strategy to reduce morbidity and mortality rates due to drowning, considered one of the main causes of accidental death worldwide, particularly among children and young people, is emphasized (WHO, 2023).

The justification for this study lies in the pressing need to generate knowledge and develop intervention strategies that strengthen the preparedness of the university community for aquatic emergencies. By integrating theoretical and practical knowledge, it is intended not only to train specific competencies, but also to consolidate an institutional culture oriented towards prevention, self-care and solidarity. In the same way, it responds to the international call for a transformative, relevant education committed to collective well-being.

The general objective of this research is to promote training in aquatic rescue as an expression of social responsibility among students and academic staff of the Colombian Polytechnic Jaime Isaza Cadavid Medellín, in order to develop competencies and skills that contribute to the prevention of accidents in aquatic spaces and the construction of safer university environments.

Likewise, a significant impact is projected both at the community and academic level. In a direct way, the proposal will improve safety in aquatic spaces near the university, reducing the risks of accidents thanks to the training of staff and students. Indirectly, through educational campaigns, seedbed activities and extension programs, it will seek to bring this awareness and training to rural communities, other universities and vulnerable sectors. In the curricular field, the inclusion of this topic will enrich various areas of the Bachelor's Degree in Physical Education, such as pedagogical foundations, first aid, research, teaching practice and aquatic activities. This approach will allow not only technical training, but also a pedagogical transformation aligned with the current demands of safety, prevention and social responsibility.

2. Methodology

This study adopted a mixed approach, integrating quantitative and qualitative methods to evaluate the impact of a training program in aquatic rescue in the university community of the Colombian Polytechnic Jaime Isaza Cadavid Medellín. The design was experimental and focused on students and academic staff related to the didactics of aquatic activities.

Study design and participant selection

The intervention group was made up of students of the Bachelor's Degree in Physical Education, Recreation and Sports, professionals in Sports and a teacher of Aquatic Activities. The participants, mostly beginner students, were taking subjects related to Water Activities at the time of the study, so their experience in aquatic environments was initial and limited. This characteristic was relevant to structure a progressive training program, aimed at the acquisition of basic skills in aquatic rescue.

The inclusion criteria included: being currently enrolled in aquatic activities subjects within the Bachelor's Degree in Physical Education, Recreation and Sports; having basic training in physical activities; being between 18 and 55 years of age; belonging to the Jaime Isaza Cadavid Polytechnic as a student, graduate or related personnel; having a current affiliation to EPS and ARL; and having signed the informed consent for participation.

The exclusion criteria included: suffering from medical conditions incompatible with physical or aquatic activity (heart disease, respiratory disease, or musculoskeletal injuries); having severe phobias

of water; consumption of substances that alter judgment or physical performance; and lack of time availability to complete the training process.

Initial assessment

The diagnostic phase was oriented from a quantitative approach, applying the following activities:
Personal interview: aimed at identifying the motivation, previous experience and possible physical or psychological restrictions of the participants.
Physical tests:
On the ground: Assessment of physical endurance, aerobic endurance, cardiac recovery capacity, cardiorespiratory fitness, and strength.
In the water: assessment of aquatic skills such as flotation, swimming styles and endurance in the aquatic environment.
Psychological test: measurement of anxiety levels and stress management capacity in aquatic environments.
Theoretical test: evaluation of previous knowledge in first aid and emergency care in aquatic environments.

Procedure Executed in Physical Tests

The present research was structured under a mixed methodological approach, descriptive, with an intervention phase that included the application of psychological and physical tests, aimed at evaluating conditions associated with training in aquatic rescue as university social responsibility. The tests were applied to students and university staff of the Colombian Polytechnic Jaime Isaza Cadavid, Medellín campus.

2.1. Initial psychological test

The procedure began with the application of Ch. Spielberger's State-Trait Anxiety Inventory (IDARE), a standardized and internationally validated instrument to measure the levels of transient (state) and trait anxiety in contexts of physical or emotional demand. The call was made in a previously arranged room, where the purpose of the test, the mode of application and the confidential nature of the data were explained in detail.
Participants filled out the inventory using their personal mobile devices, accessing a digital form shared in real time. They were assigned an estimated time of 20 minutes for their completion. Subsequently, each participant sent their answers directly to the institutional email of the principal investigator. The review and validation of the content was carried out by a professional psychologist, an expert in psychological evaluation in sports and educational contexts.

2.2. First Aid Knowledge Test

Following the psychological test, a theoretical knowledge test focused on basic principles of first aid was applied, in order to evaluate the level of conceptual preparation of the participants in emergency situations in aquatic or everyday contexts.

This test was structured in a mixed format composed of 10 questions, distributed as follows:

- Single-choice items (multiple choice with only one correct answer),
- Items of false or true,
- Items to complete short text.

The application was also made through personal mobile devices, using a digital form shared in real time, accessible from a secure platform. An estimated time of 20 minutes was granted for its development. Once finished, each participant sent their answers to the institutional email of the principal investigator, verifying in real time the correct delivery and receipt of the data.

2.3. Physical Tests on the Ground

Once the knowledge test was completed, the physical tests on land were carried out, developed in pairs with a collaborative accompaniment system. Each pair was in charge of recording their partner's results using technological means (mobile devices). Through a digital form shared in real time, distributed through the WhatsApp application, the participants registered their data immediately.

Once the tests were completed, each pair sent the form to the institutional email of the principal investigator, who verified in real time the receipt and quality of the record, ensuring the validity of the data collection.

The physical tests on the ground were carried out on an outdoor basketball court, under controlled conditions and with the technical accompaniment of the principal investigator. It is important to note that these tests were specifically adapted for a population that does not belong to high-performance or elite sports, that is, people with general physical fitness levels typical of university students and/or teachers. This adaptation made it possible to guarantee the safety, accessibility and relevance of the evaluations carried out.

The following tests were developed:

- Ruffier test: evaluation of cardiovascular recovery after physical exertion.
- Course Navette Test (Léger test): evaluation of maximum aerobic capacity through progressive intermittent running, starting at low levels of demand.
- Elbow flexion-extension test: measurement of the strength-resistance of the upper body.
- Abdominal strength-endurance test: evaluation of the abdominal muscles using a timed time of 1 minute, with clear instructions and prior demonstration.

Each test was technically explained and demonstrated by the principal investigator, in order to standardize the execution, minimize the risk of injury and ensure the reliability of the data obtained.

2.4. Aquatic Physical Tests

The final phase consisted of the execution of aquatic physical tests, carried out in the pool of the Colombian Polytechnic Jaime Isaza Cadavid Medellín. These tests were also carried out under the modality of pairs, maintaining the same registration procedure through mobile devices.

For this stage, a digital form shared in real time was also used, which was filled out by each couple from their devices, and sent to the institutional email of the principal investigator immediately after completing the battery of tests. The delivery was verified in real time to ensure the integrity of the process.

The aquatic tests included the following components:

- Entry into the water: jumping into the water from the edge (step forward or feet together).
- Static buoyancy in dorsal position (star).
- Static buoyancy in the ventral (star) position.
- Static support in the water, including variations with:
  - Movement of the upper body (arms, forearms and hands).
  - Movement of the lower body (crawl style kick,, mixer or piston).
- Freestyle swimming technique (crawl) 50 meters, without goggles.
- Horizontal displacement in immersion (apnea) 25 meters, without equipment, using crawl, chest or butterfly (undulation) type kicks. Displacement is a specific technical practice of aquatic rescue, whose purpose is the development of functional and operational skills in rescue contexts. Unlike sports freediving in its static and dynamic modalities, where the objective is to achieve personal or competitive bests under specific regulations, freediving in rescue does not seek to overcome record times or distances, but to strengthen body control, efficiency in the aquatic environment and the ability to react in simulated emergency situations. In this sense, although both disciplines share the physiological principle of voluntary suspension of breathing, their approaches, objectives and evaluation criteria are fundamentally different.
- Drag a person 25 meters, simulating a basic water rescue.

The freestyle swimming (crawl) with clothing (jeans and t-shirt) over a distance of 100 meters was additionally contemplated; however, this was canceled by institutional administrative decision, in order to preserve the safety of the participants and guarantee the logistical viability of the process.
Throughout the aquatic phase, compliance with safety protocols, first aid and aquatic rescue accompaniment, and continuous supervision of the technical development of each event were guaranteed.
Development of the intervention plan
Based on the results obtained in the initial evaluation, a training program was designed structured in 40% theoretical content and 60% practical, developed in terrestrial and aquatic environments. The thematic contents addressed were:

Initial orientation: objectives and context of the program.
Fundamentals of aquatic safety and risk prevention.
Analysis of the causes, mechanisms and signs of drowning.
Identification of victim types and safe rescue strategies.
Risk assessment and preparation of aquatic emergency plans.
CPR techniques adapted to the context of drowning.
Basic use of the Automated External Defibrillator (AED).
Introduction to oxygen therapy in aquatic first aid.
Primary care of common injuries in aquatic environments.

Implementation of the training
The implementation was developed in face-to-face sessions supervised by the certified aquatic rescue instructor (principal investigator). Hands-on activities included:
Controlled simulations of aquatic rescue.
First aid exercises adapted to aquatic situations.
Utility swimming training focused on self-rescue and victim rescue.

Compliance with safety measures was guaranteed and periodic feedback allowed the continuous adjustment of the training process based on the performance of the participants.

Final Evaluation
The final evaluation adopted a qualitative approach, aimed at exploring the subjective experience of the participants. Semi-structured interviews were conducted where perceptions were collected about the learning acquired, the main challenges faced and the relevance of the program in their personal and

professional development. This information made it possible to assess the training impact beyond the technical achievements observed.

3. Results

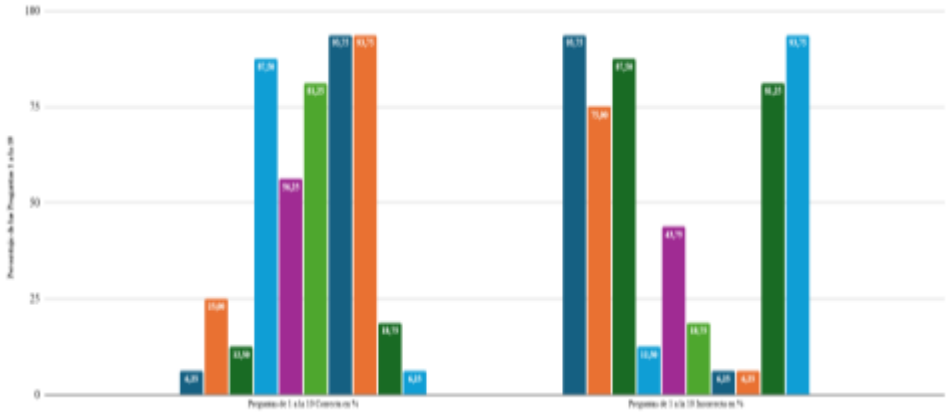
3.1. Written Test of First Aid Knowledge

As part of the evaluation process of this research, a written test of knowledge in first aid was applied, composed of ten mixed items (single selection, true or false, and complete short text), designed to assess the level of understanding of the participants regarding fundamental concepts and procedures in emergency situations.

The analysis of the results allowed us to identify both conceptual strengths and weaknesses in the evaluated group. The following are the most representative percentages of correct and incorrect answers, which show the level of mastery in specific aspects of the topic:

93.75% of the participants correctly answered question 7, related to the PRICE protocol (Protection, Rest, Ice, Compression and Elevation) applied to musculoskeletal injuries, which demonstrates an adequate understanding of the immediate basic actions against this type of injury.
87.5% correctly answered question 3, corresponding to the level of consciousness assessment scale (probably the AVPU or Glasgow scale), evidencing an appropriate identification of tools for rapid assessment of neurological status.
81.25% correctly answered question 6, referring to the recognition of cardiorespiratory arrest, which indicates a general knowledge of the clinical signs associated with this critical condition.

However, significant conceptual difficulties were also noted in some key issues:
93.75% of the participants answered question 1 incorrectly, which inquired about the difference between first responder and first responder, evidencing a confusion between these roles, despite their operational relevance in emergency situations.
81.25% answered question 9 incorrectly, referring to the use of the bag-valve-mask (BVM) type valve, which suggests a significant lack of knowledge in basic or advanced life support techniques.
Similarly, 93.75% failed in question 10, related to the appropriate chest compressions technique, a critical aspect in cardiopulmonary resuscitation (CPR) maneuvers.



Graph 1 analysis first aid knowledge test. In original Spanish language

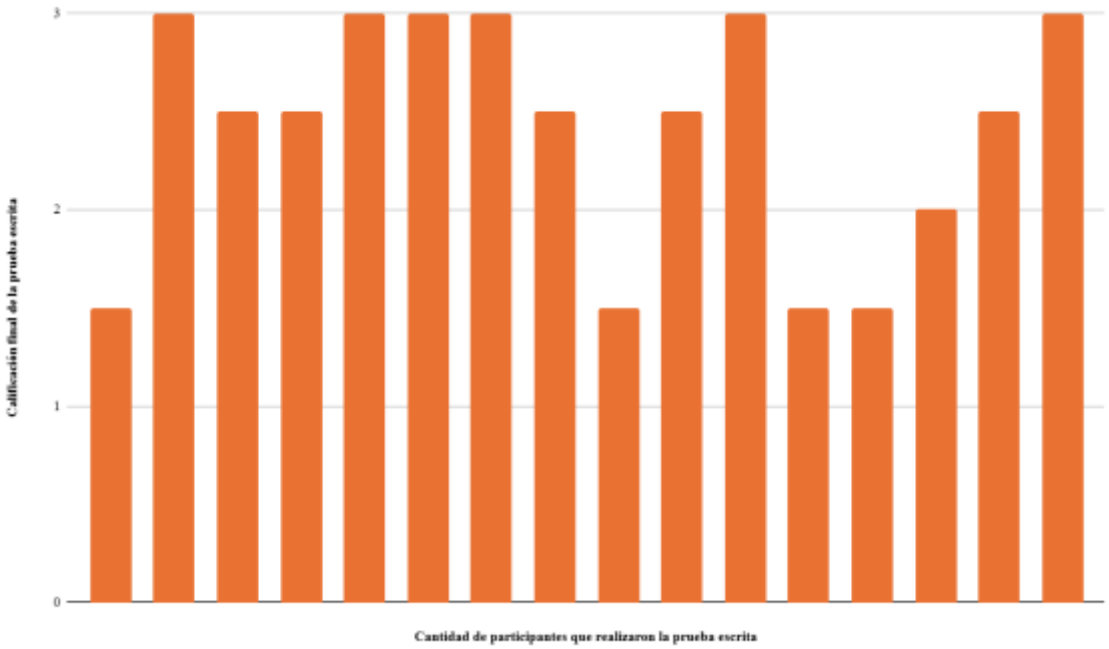
First Aid Written Test Final Grade

The written test of knowledge in first aid consisted of 10 questions with a mixed format, where each correct item was valued with 0.5 points and incorrect answers with 0 points, for a possible maximum of 5 points. The final grade of each participant was obtained by adding the scores accumulated by the correct answers.

The analysis of the quantitative results made it possible to determine the following statistical indicators:

The average score obtained by the group was 2.69 points out of 5, which corresponds to a moderate overall performance in terms of theoretical knowledge in first aid.
The highest score achieved was 3 points, lower than the maximum expected of 3.5 points previously recorded as a reference.
The lowest score obtained was 1.5 points.

Regarding the distribution of grades, the following ranges and frequencies were identified:
1.5 points: 4 participants (25%)
2 points: 1 participant (6.25%)
2.5 points: 6 participants (37.5%)
3 points: 5 participants (31.25%)

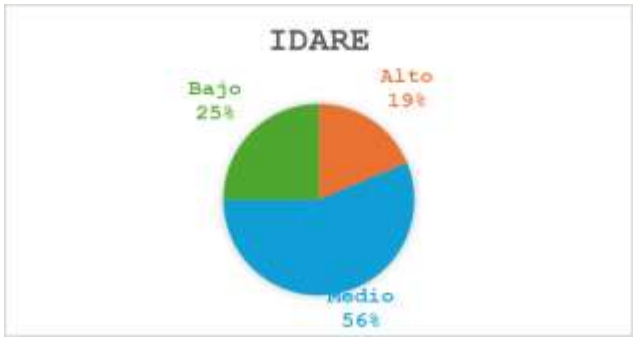


Graph 2 Analysis of the first aid knowledge test. In original Spanish language

3.2. Psychological Testing

The test was applied during a day on March 13, 2025 to 16 people (4 women, 12 men) adults, with a post-secondary education degree and linked to the JIC polytechnic Medellín headquarters, the participants self-applied the questionnaire under the indications of the researchers. The answers were analyzed in Excel according to the parameters of the test booklet. The results are as follows:

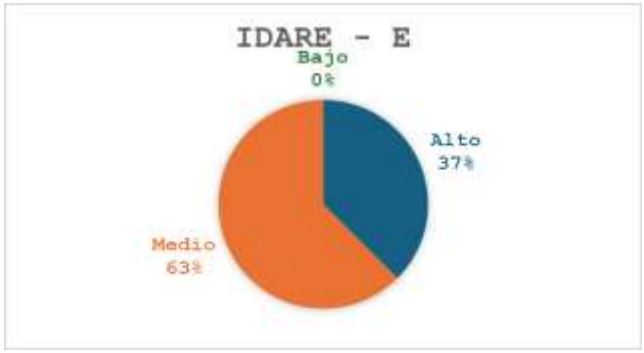
In the IDARE State:
Three people (men) scored high on the scale.
Nine people (3 women/6 men) obtained a mean score.
Four people (1 woman/3 men) had a low score.



Graph 3 IDARE Status. In original Spanish language

In the IDARE Trait:

- Six people (1 woman/5 men) scored high on the scale
- Ten people (3 women/ 7 men) scored average
- None had a low level score



Graph 4 IDARE Trait. In original Spanish language

In conclusion, adequate levels of anxiety are identified in the research participants, this could indicate the probable existence of tools, skills or strategies to cope with stressful situations associated with the situations that are the subject of this study.

In the face of the four people with low results in the State test, the implementation of accompaniment plans is suggested to strengthen their response capacity to the situation raised, these plans can include strengthening self-schemes, training in the required skill and supervision in the first exercises to provide a greater perception of security.

3.3. Physical test on the ground

3.3.1. Ruffier Test Results

The Ruffier Test is a submaximal test used to assess cardiovascular recovery capacity after brief physical exertion, being an indirect indicator of the general state of cardiorespiratory fitness. In this research, the results obtained were classified according to commonly accepted qualitative categories: Very Low, Low, Acceptable, Good and Excellent.

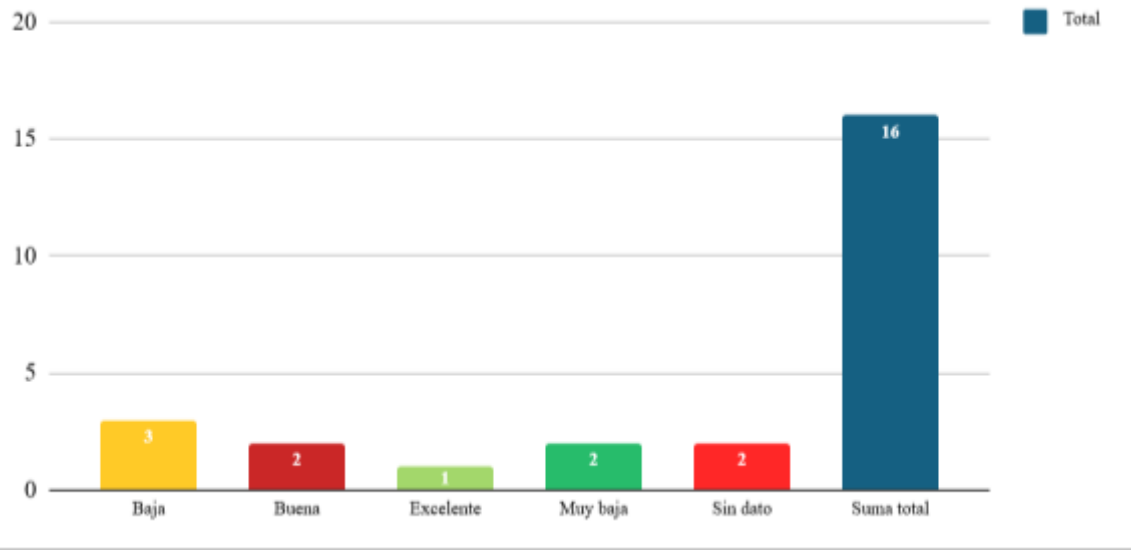
The data obtained reflect a general trend towards moderate physical fitness, with a higher concentration of participants in the "Acceptable" category. However, a significant proportion of individuals classified

in the "Low" and "Very Low" levels are also observed, suggesting a need to improve their cardiovascular physical capacity.

The percentage distribution of the results was as follows:

- Acceptable: 6 participants (37.5%)
- Low: 3 participants (18.75%)
- Good: 2 participants (12.5%)
- Excellent: 1 participant (6.25%)
- Very low: 2 participants (12.5%)
- No data: 2 participants (12.5%)

The analysis shows that more than half of the participants (56.25%) are in categories ranging from "Low" to "Acceptable", which indicates an adequate, but not optimal, functional level of physical condition. Only a small percentage achieved the "Good" or "Excellent" levels, while 12.5% were classified in the lowest category, which represents a potential risk if they are faced with situations of intense physical exertion, such as those that can occur in water rescue or emergency contexts.



Graph 5 Ruffier test results. In original Spanish language

3.3.2. Results of the Léger Test (Course Navette)

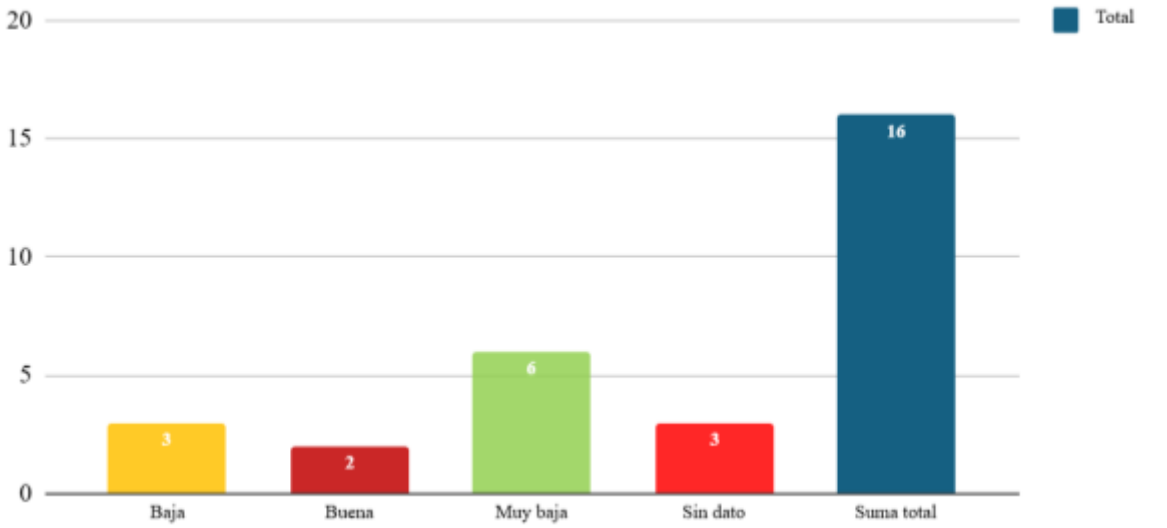
The Léger Test, also known as the Course Navette or the 20-meter round-trip Course Test, is an internationally validated test for the estimation of maximum oxygen consumption (VO_2 max.), and therefore, the aerobic capacity of individuals. This test is widely used to assess cardiorespiratory performance in different populations.

The results obtained in the present research reflect that a significant proportion of the participants have a very low level of aerobic fitness, which implies a limited capacity to sustain prolonged or high-intensity physical efforts.

The distribution of the participants according to the level of physical condition, expressed as a percentage, was as follows:

- Very low: 6 participants (37.5%)
- Low: 3 participants (18.75%)
- Acceptable: 2 participants (12.5%)
- Good: 2 participants (12.5%)
- No data: 3 participants (18.75 %)

The data show that 56.25% of the total participants are in the "Very low" or "Low" categories, which is indicative of low cardiorespiratory performance. This situation represents an alert in the context of water rescue training, since low aerobic capacity can limit efficiency and safety in scenarios that require sustained physical endurance.
Likewise, only a small group (25%) was classified as "Acceptable" or "Good", indicating that most participants do not meet minimum recommended aerobic fitness standards for physically demanding activities.



Graph 6 Grading of the Leger test. In original Spanish language

3.3.3. Elbow Flexo-Extension Test Results

The purpose of the elbow flexion-extension test is to evaluate the functional flexibility of the upper body, specifically in the elbow joint, a key aspect for mobility, coordination and efficiency in physical activities that involve pushing, pulling or support, such as those of aquatic rescue.

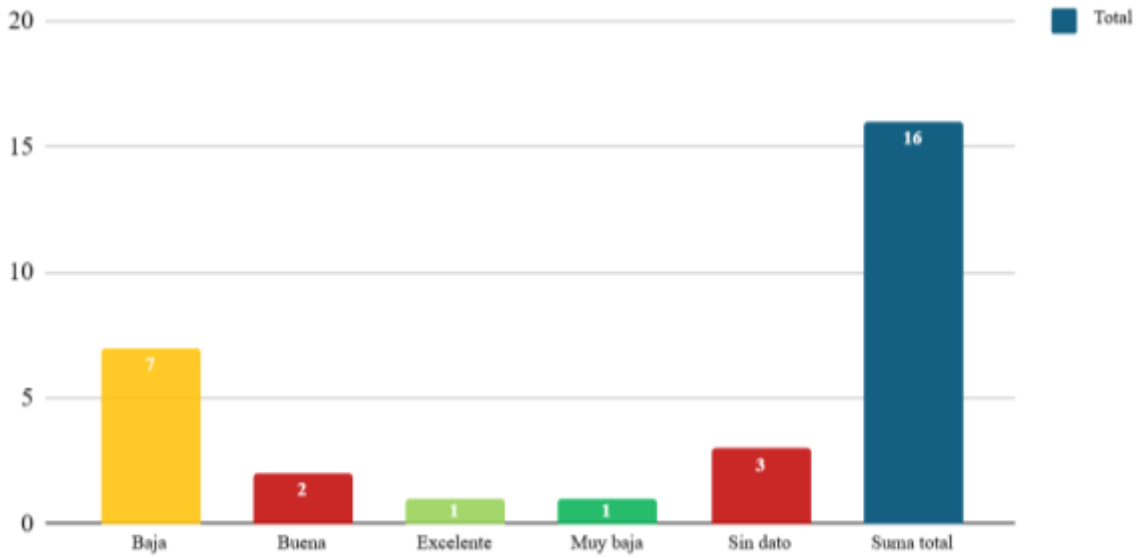
The results obtained indicate that a majority of the participants have low levels of flexibility in this joint, which could limit their general physical performance and increase the risk of musculoskeletal injuries during the execution of technical maneuvers.

The percentage distribution of participants in the different evaluation categories was as follows:

- Low: 7 participants (43.75%)
- Acceptable: 2 participants (12.5%)
- Good: 2 participants (12.5%)
- Excellent: 1 participant (6.25%)
- Very low: 1 participant (6.25%)
- No data: 3 participants (18.75 %)

It is observed that more than half of the group (50%) is in the "Low" or "Very Low" ranges, which shows limited joint flexibility in the upper body. On the contrary, only 6.25% reached the "Excellent"

level, and another 12.5% were classified as "Good", indicating that only a minority presents optimal conditions in this dimension.



Graph 7 Elbow flexion and extension test score. In original Spanish language

3.3.4. Results of the Abdominal Strength-Endurance Test

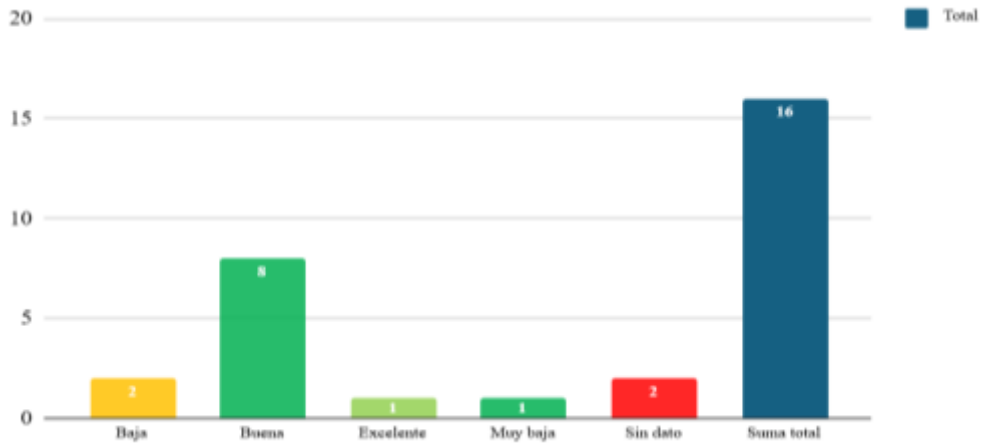
The abdominal strength-endurance test was applied with the purpose of assessing the participant's ability to maintain repeated or sustained muscle contractions in the abdominal region, which is essential for trunk stability, postural control and performance in activities that involve physical effort, such as those of aquatic rescue.

The results indicate that most of the participants have a level of abdominal strength classified as "Good", which is a positive indicator in terms of functional condition of the core. However, cases were also identified at the extremes of performance, including one participant rated "Excellent" and another in the "Very Low" category.

The percentage distribution by performance level was as follows:

- Good: 8 participants (50%)
- Acceptable: 2 participants (12.5%)
- Low: 2 participants (12.5%)
- Excellent: 1 participant (6.25%)
- Very low: 1 participant (6.25%)
- No data: 2 participants (12.5%)

The analysis shows that more than half of the group (56.25%) obtained results from "Good" to "Excellent", suggesting an adequate functional capacity of the group in this area. However, the remaining 25% are at "Low" or "Very Low" levels, which indicates specific deficits that could affect body stability and general physical performance.



Graph 8 Abs test rating. In original Spanish language

Integrated Analysis of Physical Results

The global analysis of the physical tests applied to the participants allows us to evidence a heterogeneity in the levels of physical fitness, where both individual strengths and significant weaknesses are identified in the group evaluated as a whole.

Overall, positive results were observed in the abdominal strength-endurance test, with the majority of participants placed in the "Good" and "Acceptable" categories, suggesting a favorable functional basis for trunk stabilization and overall physical performance. However, the results obtained in the aerobic capacity (Léger test) and cardiovascular recovery (Ruffier test) tests show a low performance in a high percentage of participants, reflecting a limited cardiorespiratory condition, a critical aspect in the context of aquatic rescue and physical preparation to face emergency situations.

Similarly, reduced levels of flexibility were evidenced in the elbow flexion-extension test, which could compromise range of motion, execution technique in functional activities and increase the risk of musculoskeletal injuries. These limitations highlight the need for specific interventions aimed at improving joint mobility, cardiovascular endurance, and overall functional efficiency.

The final results of the physical tests confirm that no participant exceeded 15 points as the estimated maximum overall score, implying that none reached a level of physical fitness considered optimal within the framework of this research. This finding reinforces the importance of implementing systematic physical preparation strategies, adapted to the profile of the group, considering that these are people who are not trained or belong to high-performance sport.

3.4. Results of the Aquatic Physical Test

The aquatic physical test was composed of seven standardized exercises that evaluate different technical skills and functional capacities in the aquatic environment, essential for performance in rescue, safety and survival contexts in the water. The tests included aspects such as safe entry into the water, buoyancy

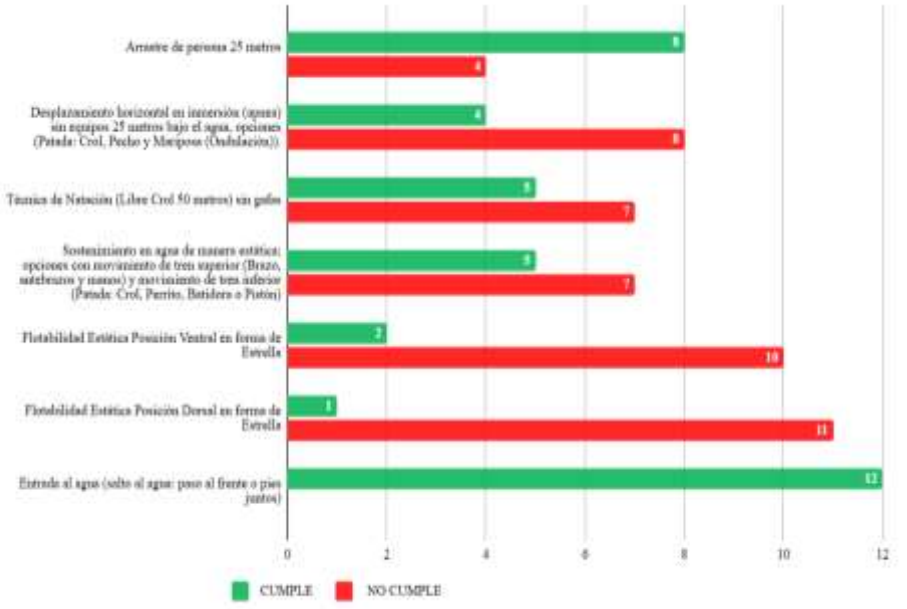
control in different positions, static resistance, swimming technique, freediving and dragging people, these being key skills in training processes aimed at aquatic rescue.

The results obtained reveal that the participants present a heterogeneous level of aquatic competence, with some tests passed by the majority, while others represented greater technical and physical difficulty.

The detailed description of compliance by test was as follows:

- Entry into the water (jump into the water): 12 participants complied.
- Static Buoyancy – Dorsal Star-Shaped Position: 1 participant did not comply.
- Static Buoyancy – Star-shaped Ventral Position: 2 participants did not comply.
- Static water support: 5 participants complied.
- Swimming Technique (Crawl Free – 50 meters): 5 participants complied.
- Horizontal displacement in immersion (freediving – 25 meters): 4 participants complied.
- Person drag (25 meters): 8 participants complied.

It is noteworthy that the tests with the highest compliance rate were the Entry into the water and the Dorsal Static Buoyancy, which suggests an appropriate basic familiarity with the aquatic environment and postural skills in floating conditions. On the other hand, the tests with the lowest level of compliance were horizontal immersion displacement (apnea) and static support, showing limitations in lung capacity, static endurance and prolonged body control under conditions of exertion.



Graph 9 Aquatic Test Qualification. In original Spanish language

Final result of the Qualitative Evaluation

Participation in research on water rescue training allowed students to gain a deeper and more structured understanding of rescue techniques, first aid in aquatic environments, risk assessment and incident prevention. In addition to the development of technical knowledge, the training experience fostered soft skills such as teamwork, effective communication, decision-making under pressure and empathy, all of which are key elements in emergency contexts.

Among the main challenges identified by the participants, the limitations in previous aquatic skills, the physical demands of realistic drills and the need to integrate theory with practice stand out. This process required adaptability, resistance to stress and commitment to continuous improvement.

From a personal and professional perspective, the training had a positive impact on the development of greater social awareness, a sense of responsibility and preparation to act in situations of risk. Many of the participants said they now feel safer, more responsible and motivated to contribute in community spaces where aquatic environments represent a latent risk.
The relevance of the training was widely recognized by the students, since the contents addressed real scenarios and common situations in vulnerable communities. In this sense, a high degree of applicability was evidenced, especially in contexts where access to knowledge on rescue and prevention is limited.
Among the most significant aspects of the experience are:

- The solidity of the training team and its appropriation of the theme.
- The use of practical methodologies in teaching.
- The comprehensive approach that combined technical training with social responsibility.

Faced with the possibility of institutionalizing this training as part of the curriculum, most of the participants agreed that it would be highly pertinent to implement it as a formal subject. This course, by combining theoretical, practical and ethical aspects, would contribute significantly to the comprehensive training of students, strengthening not only their professional profile, but also their commitment to society.

Finally, the need for this training to be structured and certified was highlighted, which would ensure quality standards, greater academic recognition and better professional projection. It would also consolidate the role of the university as an active agent in the training of citizens prepared and committed to community safety and well-being in aquatic contexts.

4. Analysis and discussion

The present research allowed to evidence multiple relevant aspects about the current state of the preparation of university personnel, in relation to the approach to emergencies, physical performance and competencies in the aquatic environment. Through the application of cognitive, psychological, physical and technical tests, specific strengths were identified in some participants, but also important weaknesses that affect the comprehensive response to critical situations.

In terms of theoretical knowledge, the results show an acceptable, although not optimal, level of understanding in basic first aid topics. Difficulties were particularly evident in the technical and practical aspects of basic life support. This situation is directly linked to the fact that most of the participants have not yet taken the corresponding subject, which limits their preparation to intervene appropriately in real emergency situations. In this sense, the need to review the curricular location of the subject of First Aid is highlighted, suggesting its inclusion as a prerequisite for subjects such as morphology, so that students can acquire this fundamental knowledge from the early stages of their training. Likewise, it is recommended to expand its content to explicitly include aquatic first aid, considering its direct applicability to the professional profile of the graduate in Physical Education, Recreation and Sports.

As for the physical component, the global analysis of the tests revealed a heterogeneous level of physical condition, with poor results in the tests of cardiovascular endurance (Léger's test and Ruffier's test), joint mobility (elbow flexion) and resistance in the aquatic environment. Although adequate performance was observed in abdominal strength tests, none of the people evaluated reached the maximum overall score, which suggests that none of the participants currently has an optimal physical condition to effectively face demanding or emergency scenarios.

The situation is especially worrying in the aquatic component, where the participants showed a basic technical mastery, with difficulties in apnea, flotation and efficient movement. These findings also directly affect the implementation of the subject of Aquatic Activities, which, although it contemplates a solid pedagogical and methodological training, is limited in its development due to the low level of updating with which students enter. As a consequence, a significant part of the time of this subject is

dedicated to teaching basic swimming skills, to the detriment of the approach to its didactic contents. Therefore, it is proposed that the subject of Aquatic Rescue be incorporated as a mandatory requirement after Didactics of Aquatic Activities, thus guaranteeing a coherent pedagogical sequence: first the consolidation of essential aquatic skills, and then the technical deepening in rescue.

In accordance with the diagnostic results obtained, a training intervention plan was designed and developed, structured in 40% theoretical content and 60% practical, executed in both terrestrial and aquatic environments. Although the final structure partially differed from the initial proposal, it remained consistent with the general objectives of the project, strengthening its quality through articulation with the international lifeguard course level 1 endorsed by the International Life Saving Federation (ILS). The contents addressed included orientation to the program, aquatic safety fundamentals, analysis of mechanisms and signs of drowning, rescue strategies, risk assessment, CPR techniques, use of the AED and oxygen therapy, among others. This approach allowed for a greater appropriation of practical knowledge in real contexts, increasing the relevance of the training process. Likewise, the pedagogical, technical and operational skills necessary for future professionals to respond with greater preparation to risk situations in aquatic environments were reinforced, aligning the proposal with international and national standards.

In this context, the research "Training in aquatic rescue as a social responsibility of university staff" highlights the importance of this subject being integrated in a structural and compulsory way within the curriculum of the programs in Physical Education, Recreation and Sport. This inclusion would allow the institution not only to respond to the real needs of the environment, but also to comply with the guidelines established by Colombian regulations, such as Law 1209 of 2008, Decree 554 of 2015, Decree 780 of 2016 and Law 1523 of 2012, which establish the obligation to have personnel trained in rescue and risk prevention in aquatic spaces. Therefore, professionals who graduate certified in this area will be better prepared, with a more comprehensive profile, and will respond effectively to social, legal and labor demands.

An additional aspect that should be highlighted is the absence of participation of the members of the university emergency brigades. Although they were formally invited to be part of the evaluation process, their non-participation prevented their results from being included in the analysis. This situation should be the subject of institutional reflection, given that the brigades are conceived as a strategic component of risk management within the university, and their involvement in training, evaluation and updating processes in aquatic rescue is essential. The active participation of this group is not only a duty, but a manifestation of their commitment to the safety of the university environment and to the social responsibility that their role entails.

In this way, the research highlights an urgent and concrete training need: the mandatory integration of aquatic rescue into the university curriculum, progressively and articulated with other components such as first aid and aquatic didactics. This measure would not only address the shortcomings detected, but also consolidate a more solid professional profile, expand the field of action of future graduates and respond more effectively to the legal and social demands that fall on professionals in physical education, sports and recreation. Ultimately, this strategy reaffirms the institutional commitment to the training of citizens prepared to safeguard life and act responsibly in contexts of risk.

5. Conclusions

The results obtained in this research show a partial and heterogeneous preparation of the participants in key aspects for care in emergency situations, both theoretically and practically. In the field of knowledge, an acceptable but insufficient general understanding was identified in critical technical areas such as basic life support. On a psychological level, adequate levels of anxiety were observed in most of the participants, suggesting the presence of effective coping strategies, although some particular cases require specific intervention. Regarding physical condition, specific strengths were identified, such as abdominal strength, but also significant weaknesses in aerobic capacity, cardiovascular recovery, and joint mobility, crucial factors for functional performance in real scenarios. Finally, aquatic tests showed that while there is a basic mastery, substantial improvements in technique,

freediving and endurance are required to ensure a minimum level of operational competence in aquatic rescue contexts.

6. Recommendations

Based on the findings of the study, it is suggested that a comprehensive training plan be implemented to address the deficiencies identified in three fundamental dimensions: technical, physical and psychological. On the technical side, it is recommended that first aid and life support training be strengthened through supervised practices, personalized feedback and periodic evaluations. Physically, it is necessary to incorporate aerobic conditioning, joint mobility and functional strengthening programs adapted to the profile of the participants, with individualized monitoring and progressive objectives. In the psychological component, the development of support plans for individuals with less capacity for emotional regulation is proposed, integrating tools that increase the perception of security and resilience. Finally, it is urged to include specific aquatic training that reinforces swimming, controlled apnea and functional endurance skills, in order to achieve comprehensive and safe performance in interventions in aquatic environments.

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