

ARTIGO ORIGINAL

Elaboração, aplicação e avaliação de um programa de ensino de adaptação ao meio aquático para idosos

Design, application and assessment of an educational pool-therapy adaptation program for the elderly

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RESUMO

Este artigo apresenta um programa de ensino, elaborado especificamente para este estudo, com quatro sessões, visando o aprendizado de habilidades que garantam independência motora (adaptação ao meio aquático) durante a imersão para pessoas idosas. A adaptação ao meio aquático é pré-requisito para o desenvolvimento da intervenção hidroterapêutica, devido ao receio apresentado por estas pessoas para a realização de atividades em meio aquático, comum nesta população, quando iniciam atividades de hidroterapia. Foram sujeitos deste estudo 18 mulheres, com idade entre 65 e 70 anos. Avaliou-se o desempenho na realização de dez atividades motoras treinadas com base em um roteiro previamente elaborado e pesquisou-se também a pressão arterial e a frequência cardíaca, como indicadores do estresse provocado pela realização de atividades na água. A avaliação foi realizada pelo pesquisador e por um observador independente, e foi atribuído as notas 1, 2, e 3 para cada atividade motora. Encontrou-se que, o grupo apresentou 89,7% do aproveitamento esperado, na realização das atividades motoras propostas ao final do programa, associado com diminuição da pressão arterial da primeira para a quarta sessão. Concluiu-se que o programa de ensino de adaptação ao meio aquático proposto foi suficiente para produzir alterações nas repostas motoras dos participantes que apresentaram independência no meio aquático e, para estabilizar os níveis de pressão arterial e frequência cardíaca.

PALAVRAS-CHAVE

hidroterapia, envelhecimento, educação especial, educação em saúde

ABSTRACT

The present report presents an educational pool-therapy adaptation program, especially designed for this study, consisting of four sessions, aiming at learning skills that warrant motor independence (adaptation to the aquatic environment) during immersion, for elderly people. The adaptation to the aquatic environment is a prerequisite for the development of hydrotherapy intervention, due to the natural fear presented by these people to perform aquatic environment activities, common in this population, when they start hydrotherapy activities. The subjects of the present study consisted of 18 women, aged 65 to 70 years. Their performance during ten trained motor activities based on a previously designed plan was assessed as well as blood pressure and heart rate, as indicative factors of stress caused by performing activities in the aquatic environment. The assessment was carried out by the researcher and by an independent observer and the scores 1, 2 and 3 were assigned to each motor activity. The results showed that the group presented 89.7% of the expected learning outcomes when performing the motor activities at the end of the program, associated with decreased blood pressure when the first session is compared with the fourth. We conclude that the educational pool-therapy adaptation program for the elderly was enough to produce alterations in the motor responses of the participants, who presented independence in the aquatic environment, as well as establishing blood pressure and heart rate levels.

KEYWORDS

hydrotherapy, aging, education special, health education

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INTRODUCTION

Many elderly individuals have never entered a pool, or, if they have, they did not venture far from the border. It is believed that this fact is related to the little incentive to the practice of swimming at the time these elderly individuals were children or adolescents and/or to the difficulty in having access to pools.

No studies in literature have reported on an educational pool-therapy adaptation program, for any type of population. When proposing a hydrotherapy program to acquire strength and mobility in elderly individuals, the necessity to create an adaptation program to the aquatic environment was observed, so that the elderly would obtain the maximum benefit from the hydrotherapy program with no effort-saving or without performing exercises that would involve simultaneously the upper and lower limbs in the supine position, for instance.

The aquatic environment is a new element for many individuals and thus, it becomes necessary to gradually adapt them to the water, from the teaching of the effects of immersing the body in the water to the elimination of factors that may trigger fear or anxiety.^{1,2,3} Hence, the elderly will learn that the body fluctuates naturally and, with the training of specific motor activities, they will not depend on physical or the physical therapist's support every time they enter a pool.

This study was developed from an educational program aiming at learning physical independence in the aquatic environment, for elderly that later participated in a hydrotherapy intervention that was planned for strength and mobility gain with a duration of 32 sessions (including the four adaptation sessions).

The use and assessment of this hydrotherapy program are justified by the necessity that these elderly present of maintaining or recovering strength,^{4,5} mobility^{6,7,8} and balance, commonly decreased due to the aging process. This type of intervention is associated to the enjoyable relaxation technique, with no joint overload.^{9,10,11}

Exercising in a warm pool is a good type of physical activity for the elderly, as it decreases the gravity action, allowing three-dimensional exercises; there is no risk of falls and possible injuries caused by the latter; it is possible to perform exercises with both upper and lower limbs at the same time; the environment is agreeable and has good social integration.^{9,12,13} All these factors together contribute to the improvement of the elderly's self-esteem and confidence.¹⁴

According to Kerbauy,¹⁵ we can teach whatever we want to attain the desired objectives, in different organism/environment situations. The teaching and the learning can take place in any place, in a formal or informal way.

This study used the formal approach, which involves intentional planning and is guided according to pre-established final and intermediate objectives.¹⁶

The aim of this study was to evaluate the efficacy of an adaptation program to the water environment, which arose from the specific necessities of the elderly and the final objective of teaching the adaptation program was to attain independence when performing motor activities in the water, with decreased anxiety during the performance of such activities.

METHODS

The educational program consisted of four sessions of hydrotherapy to learn adaptation to the water environment. All sessions were similar, regarding the motor activities, only differentiating by the increasing motor difficulty, as shown in Table 1.

SUBJECTS

A total of 18 sedentary, healthy volunteers, all females, aged 65 to 70 years old, participated in the study according to medical indication. All participants signed the free and informed consent form prior to the study.

STUDY SETTING

The study was carried out at the Pool Center Swimming School, located in Sao Paulo, Brazil, and the development of the project was carried out at LaFiC (Laboratory of Physical Therapy and Behavior of the Course of Physical Therapy of the School of Medicine of the University of Sao Paulo, FMUSP).

MATERIAL

A 4m x 2m pool, 1.3 m deep was used in the study, as well as a sphygmomanometer, chronometer, swimming goggles and evaluation sheet to assess motor performance in the aquatic environment.

PROCEDURES

Educational program design

The initial fear presented by most people inside a pool is to swallow water and suffocate, or to slip and fall backwards and not be able to get up. Therefore, it is common to see elderly people inside a pool stay near the border, making only a few movements nearby it. Considering that, it is necessary to propose motor activities for adaptation to the aquatic environment, where the elderly can learn to expel the water from the mouth, move through the water without support, use the fluctuation to support the body and recover the standing posture.

Based on the aforementioned specific difficulties presented by the elderly in general, a program was created, which consisted of 4 sessions with 10 motor activities with up to 4 increasing degrees of difficulty to perform them, as shown in Table 1.

The acquisition of the ability to expel the water from the mouth is added to the feeling of safety. In order to overcome this fear, respiratory motor activities were proposed: bubbles in the water and bubbles in the water with immersion.

In the water, the body depends on the learning of new balance strategies, due to the effect of fluctuation. When the elderly lose their balance inside the pool, they imagine that they will drown, causing anxiety and fear, which has great importance in the mental

adaptation of the individuals attending the aquatic activities, regarding their safety and willingness to cooperate with the physical therapist. Thus, three motor activities were proposed to learn the use of fluctuation to support your own body: immersion of the body (without support), observation of the aquatic environment and cube posture.

To learn how to move in the aquatic environment without support, two motor activities were proposed: to walk forwards/backwards and to walk sideways.

Finally, to learn how to recover the standing posture (fluctuate on your back and return to the original position), two motor activities were proposed: free vertical rotation and vertical rotation on the bar.

Assessment Criteria Design and Use

At the first session, all subjects presented difficulties in all proposed motor activities. At the 4th session, the participants were assessed, regarding their performance, in ten motor activities trained at their maximum degree of difficulty. The assessment was carried out by the researcher and an independent observer, following the criteria developed for this study.

This assessment used a score criterion, which varied from 1 to 3, with score “1” being attributed to the non-performance of the exercise, phobia or panic during the exercise or performing the exercise with full support; score “2” was attributed when the motor activity was performed with difficulty or support given by the physical therapist and score “3” was attributed when the subject performed the motor activities adequately with no reference of fear or any type of support.

The evaluation of the arterial blood pressure (BP) measurement was used as a physiological indicator of adaptation to the aquatic environment. Guyton,¹⁷ described that emotional factors, such as fear and anxiety, stimulate the hypothalamus and increase the BP and/or the heart rate (HR) and the inverse is also true, i.e., the feeling of safety and tranquility decreases BP and/or HR.

Arterial blood pressure and heart rate were measured three minutes after resting outside the water (A); after three minutes of immersion in rest (B); at the end of the training of the motor activities in immersion (C) and finally, three minutes after leaving the pool at rest (D).

Use of the Educational Program

Four sessions were carried out to teach adaptation to the aquatic environment, during two consecutive weeks. They were double-sessions and lasted one hour, with 15 minutes being reserved for the measurement of vital signs and 45 minutes for the training of the motor activities, from 1 to 10, in up to 4 degrees of difficulty, divided in warming-up (motor activities that introduced independence of mobility in the aquatic environment), followed by movements without changing the body position, but with segment mobility, and later, specific motor activities of adaptation to the aquatic environment (Table 1).

Data Analysis

It was considered, specifically for this study, the scale for the

Table 1
Results regarding the motor activities, obtained through descriptive statistical analysis.

Motor activity	Mean of the group performance na when performing the predicted motor activity	SD	Minimum and maximum
1. Walk forwards/backwards	100%	0,0%	100% ; 100%
2. Walk sideways	100%	0,0%	100% ; 100%
3. Make bubbles in the water	91,7%	19,2%	50% ; 100%
4. Make bubbles with immersion	88,9%	21,4%	50% ; 100%
5. Submerge without support	83,3%	34,3%	0% ; 100%
6. Observe the aquatic environment	97,2%	11,8%	50% ; 100%
7. Positioning in cube posture	97,2%	11,8%	50% ; 100%
8. Perform free vertical rotation	66,7%	34,3%	0% ; 100%
9. Perform vertical rotation on bar	77,8%	35,2%	0% ; 100%
10. Behavior in the water	94,4%	23,6%	0% ; 100%
General mean of the motor activities	89,7%	12,9%	70% ; 100%

scores so that score “1” would be 0% of the expected behavior; score “2” would be 50% of the attained behavior and score “3” would be 100% of the behavior. We can interpret the degree of adaptation as a percentage of the acquired behavior in relation to the maximum predicted score. The data regarding the performance of the motor activities were assessed by a descriptive analysis, fitted to emphasize the patients’ mean degree of adaptation attained at each proposed motor activity, as well as the general performance mean in the 10 proposed and assessed motor activities.

It was understood that, in the present study, the data regarding the studied adaptation variables must not be analyzed through the focus of classical statistics (stochastic), but through that of epistemics, which seeks to numerically express the tendency of events and not their probability.

The variables, diastolic arterial pressure variation (DAPV), systolic arterial pressure variation (SAPV) and heart rate variation (HRV) were analyzed at two dimensions: 1. During each session, comparing the results at moment A (basal) with those of moments B, C and D at each session; 2. Between sessions, comparing the results of session 1 with those of sessions 2, 3 and 4, at each moment A, B, C and D. In both cases, the comparisons were analyzed by a parametric test, a paired mean test that compares whether a population in different related situations, presents or not the same behavior. All the comparisons considered as significant the probabilities associated to tests < 0.05, that is, with a maximum 5% chance of rejecting the hypothesis of equality of means when it is true. The definition of pressure variation, considering the measurement of pressure 1 at moment A as basal, was: pressure at session I at moment j minus pressure at session 1 at moment A, divided by pressure at session 1 at moment A, multiplied by 100, with i= 1, 2, 3, 4 and j= A, B, C, D.

The definition of heart rate variation used (%), considering the measurement of rate 1 at moment A as basal, was similar to the

definition of arterial pressure variation.^{18,19}

RESULTS AND DISCUSSION

Responses to motor activities

As shown in Table 2, the motor activities 1 (walk forwards/backwards) and 2 (walk sideways) that aimed the independence of mobility in the aquatic environment obtained 100% of success (SD=0%). This task was considered to have been attained, as the participants obtained the maximum score in these activities.

As for the two motor activities that were proposed for breathing control, it was observed that during motor activity 3 (making bubbles in the water), three subjects presented a minimum score of 50% and 15 presented a maximum score of 100%. This motor activity attained 91.7% of success (SD=19.2%).

Regarding the motor activity 4 (making bubbles with immersion), the success rate was 88.9% (SD=21.4%). Four subjects presented a minimum score of 50% and the remaining participants presented a maximum score of 100%. These data indicate that most participants were able to efficiently perform the motor activities for breathing control, although Koury¹⁰ is against submerging the head at the first sessions for participants who are afraid of water.

As for the three motor activities that were proposed for the use of fluctuation to support the subject's body, the motor activity 5 (submerging the body without support) presented a success rate of 83.3% (SD=34.3%), which shows a slight difficulty when the participants had to submerge the body without any type of support (fluctuation). Two subjects had a minimum score of 0%, two subjects had a minimum score of 50% and the remaining participants had a maximum score of 100%.

The motor activity 6 (observing the aquatic environment) had a 97.2% success rate (SD=11.8%); despite being an immersion activity without support, the individuals remained with their feet on the pool floor, which showed a better performance than in motor activity 5, as only one individual presented a minimum score of 50%.

The motor activity 7 (cube position) showed a success rate of 97.2% (SD=11.8%) and only one subject presented a minimum score of 50%.

At the two motor activities used to recover the standing posture, the motor activity 8 (perform free vertical rotation) had 66.7% of success (SD=34.3%), which showed this was the most difficult motor activity, perhaps due to the fact that it is a complex and higher-risk activity. Two individuals obtained a minimum score of 0%, 8 individuals obtained a score of 50% and 8 a maximum score of 100%.

At the motor activity 9 (perform vertical rotation on bar) showed that it was more successfully learned than the free vertical rotation, with 77.8% (SD=35.2%) as expected, as the physical support provided by the bar offers further safety. Two individuals obtained a minimum score of 0%, 4 obtained 50% and 12 individuals obtained a maximum score of 100%, which shows some difficulty in performing this activity.

The last score used as a criterion of adaptation to the aquatic environment was to assess the voluntary behavior in the water,

by observing the initiative of each participant for having fun with activities in the water, interacting with the aquatic environment and demonstrating enjoyment of being in an environment that provides little weight support. A success rate of 94.4% was observed (SD=23.6%), with only one minimum score of 0%.

The general mean of the 10 proposed motor activities was 89.7% (SD=12.9%), with a minimum and a maximum score of 70% and 100%, respectively. Some participants needed longer training time for the motor activities or the addition of other types of ludic activities to attain better results.

INDICATORS OF FEAR AND/OR ANXIETY

Arterial Pressure

The knowledge of the BP levels at rest (moments A and B) in the absence of anxiety was impaired as, on the first day, the patients did not know what they were undergoing and perhaps the anxiety caused by having to enter the pool or discovering what they were going to perform might have increased BP levels at moments A and B. But one can affirm that BP levels at moments C and D are related to the adaptation to the environment, as after performing the exercises, the latter were no longer unknown and the BP levels presented important decreases.

Behavior of the diastolic arterial pressure variation (DAPV)

The diastolic arterial pressure (DAP), from session 1 (S1) to session 4 (S4), at moment A, presented a decrease of 18.4% (p=0.0; significant); at moment B, it presented a decrease of 16.7% (p=0.0; significant); at moment C, a decrease of 15.6% (p=0.002; significant) and at moment D, a decrease of 24.3% (p=0.0; significant). When comparing session 1 with session 4, a decrease in DAVP was observed, although the individuals were developing the maximum degree of difficulty for each proposed motor activity at the 4th session.

A decrease in DAVP was observed from moment A to moment B, related to the physical principle of the water - hydrostatic pressure - which increases the blood displacement and decreases blood pressure,^{12,20} as well as an increase in DAVP from moment B to moment C, as expected after the motor activities, caused by the physiology of the exercise, in addition to an increase in DAVP from moment C to moment D, reaching values above the basal DAP (A). In this situation (D), there is no action of the hydrostatic pressure and there is the gravity force action, which eliminates the venous return facilitation²⁰ and explains the increase in DAVP (Chart 1).

Behavior of the systolic arterial pressure variation (SAPV)

The variation of the SAP from session 1 to session 4 at moment A showed a decrease of 9.9% (p=0.03; significant); at moment B, 9.6% (p=0.078; non-significant); at moment C, 9.5% (p=0.036; significant) and at moment D, 17% (p=0.0; significant). When comparing session 1 with session 4, a decrease in SAP was observed.

It was observed that both DAP and SAP presented a decrease

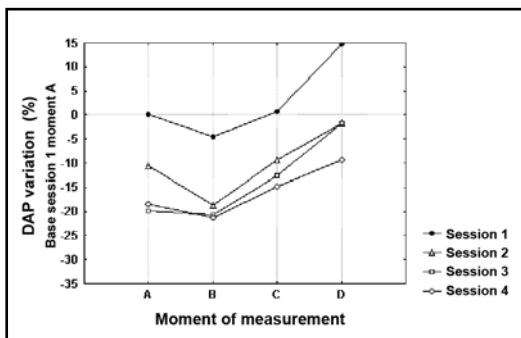


Chart 1
Diastolic arterial pressure (DAP) response to the practice of motor activity in the adaptation program.

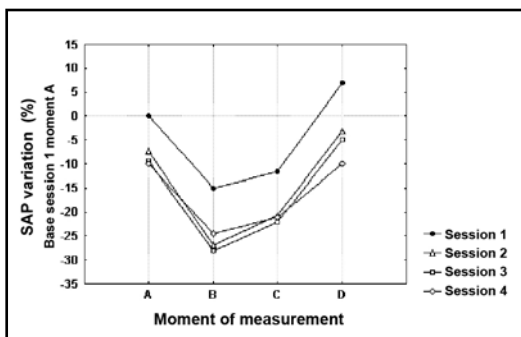


Chart 2
Systolic arterial pressure (SAP) response to the practice of motor activity in the adaptation program.

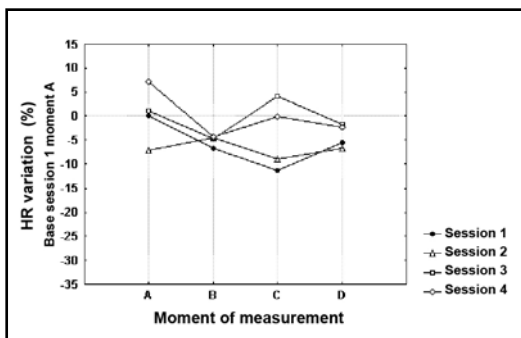


Chart 3
Heart rate (HR) response to the practice of motor activity in the adaptation program.

from moment A to moment B, an increase at moment C, after the motor activities, followed by an increase from moment C to moment D, which was higher than basal (A), after the end of the session (Chart 2), which indicates adaptation to the aquatic environment with the performance of the motor activities at their maximum degree of difficulty with stable arterial pressure.

Heart Rate Variation (HRV) Behavior

The heart rate presented variation, as there was a gradual increase of the HR at all moments A, B, C and D. From the first

(S1) to the fourth (S4) session at moment A there was an increase of 7.1% ($p=0.098$; non-significant); at moment B, an increase of 2.3% ($p=0.618$, non-significant); at moment C, an increase of 11.1% ($p=0.01$, significant) and at moment D, an increase of 3.3% ($p=0.427$, non-significant).

It was observed that the HR decreases during immersion, as shown at the moment B in the four sessions, which is also related to the hydrostatic pressure.²⁰ At moment C, the sessions 1 and 2 showed lower heart rate in comparison to sessions 3 and 4, which is justified by the knowledge of the existence of challenging situations created by the insertion of the increasing degree of difficulty of the activities, thus increasing HR, although the mammalian diving reflex in humans decreases HR.¹⁷ In spite of that, there was a normalization of heart rate at moment D, which suggests the control of anxiety (Chart 3).

CONCLUSION

The designed motor activity training for the acquisition of independence in the aquatic environment and for learning how to expel the water from the mouth were adequate for the proposed teaching objective.

It was observed that some individuals presented difficulty when performing a motor activity for the use of fluctuation as support of their own body and two participants needed complementary training for the activities of immersion without support. Higher difficulties were observed in the motor activities of standing posture recovery: ten participants had difficulty in the free rotation activity and six in the vertical rotation on bar.

Not all participants could perform the motor activities as predicted, at the same period. Group teaching usually needs complementary teaching periods, so that all participants attain 100% of the expected response.

As for the behavior of the arterial pressure and heart rate, used as indicators of fear and/or anxiety, there was an agreement between the physiological responses analyzed and the degree of difficulty in the requested motor activities.

This educational program showed to be effective, as the general mean of the motor activities assessed in the group 89.7% - enough for all the participants to continue with their hydrotherapy intervention, with no effort-saving in strength or velocity, no difficulties to perform motor activities in different decubitus positions with fear or anxiety and no interruption of activities of the hydrotherapy program of strength and mobility – although some participants needed complementary training to attain the maximum success rate at the program.

This program offers indications to create and apply other programs of adaptation to the aquatic environment for other age ranges or other pathological populations or not, maintaining the objective of providing independence in the aquatic environment, in order to benefit the most from hydrotherapy programs.

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