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Impact of swimming initiation on the physical fitness and mental health of elderly women

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ABSTRACT. This quasi-experimental study aimed to analyze the impact of swimming initiation on the physical fitness and mental health of 10 elderly women. It used the Senior Fitness Test, the Rosenberg Self-esteem Scale, the Geriatric Anxiety Inventory, the Perceived Stress Scale, the WHOQOL-BREF and the WHOQOL-OLD. The program involved 12 weeks of swimming initiation lessons, twice a week. There was significant difference between pre- and post-test in 'sit-to-stand' ($p = 0.005$), 'elbow flexion' ($p = 0.007$), 'walk 2.44 m and sit' ($p = .005$), 'walk 6 min.' ($p = 0.005$), as well as in anxiety ($p = 0.005$), stress ($p = 0.005$), self-esteem ($p = 0.007$) and quality of life ($p < 0.05$). Swimming was effective in improving the physical fitness and mental health of the elderly women.

Keywords: motor activity; aging; gerontology; quality of life.

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Introduction

Aging is associated with changes in mobility, loss of physical function, decreased exercise tolerance, risk of cardiovascular and metabolic diseases, and risk of falls and fractures. Reduced physical fitness from the age of sixty is clearly perceived, not only in sport performance, but in everyday activities (Matsudo, 2013). Changes during this process are related to performance of movements and daily tasks, as well as with psychological diseases and disorders affecting an individual's emotional state (Ascencio & Pujals, 2015).

Aging-related changes such as loss of physical fitness or emotional and psychological disorders can be managed in order to keep the elderly functional until the end of their lives (Fechine & Trompieri, 2015). Physical exercises and sport modalities are important in maintaining one's physical fitness as well as emotional and psychological aspects (Cordeiro, Del Castillho, Freitas, & Gonçalves, 2014). Some sport modalities, such as running, fights, collective and individual sports, or mind sports are great physical and neural stimulators (Daolio, 2008).

Among so many options, swimming is being drawing special attention for preventing respiratory problems and promoting benefits in this regard, besides helping to correct and maintain posture and physical conditioning (Huang et al., 2018). In addition to physical benefits, swimming enables social interaction for those who engage in it, allowing individuals to be part of a group (Cavalcanti, Barbosa, Souza, Góis, & Lima, 2011). It has been evidenced that swimming lessons create a friendly environment composed of play and communication, in addition to providing swimmers with the sensation of being part of a group, helping them to understand and accept their fellows (Candeloro & Coromano, 2016).

Since 2006, the Brazilian National Health Promotion Policy has been driving the creation of bodily practices and physical activities that promote health in different spaces and contexts, having the elderly as a major target of this political initiative. This places as emergent the need for producing interventions that contribute to spreading knowledge about these actions all over the country (Brasil, 2015).

Currently, experimental studies approaching swimming as a practice that can improve the health of seniors are scarce. The hypothesis of this investigation is that swimming improves the physical fitness of elderly women for promoting stimuli that favor it, in addition to providing socialization moments that contribute to their psychological and emotional health. Thus, the objective of this research was to analyze the impact of swimming initiation on the physical fitness and mental health of elderly women.

Material and methods

Participants

This research had the participation of 10 elderly women users of two Third Age Gyms [*Academias da Terceira Idade*]´(ATI) in the municipality of Sarandi, Paraná, Brazil, and were chosen intentionally and by convenience. Elderly women who did not know how to swim (as informed by means of self-report) were included. The exclusion criteria were: elderly women with perceptible hearing and cognitive impairment that made data collection impracticable, as well as those who used accessories for walking, and who had heart diseases, neurological diseases and/or dementia, such as Alzheimer's disease, Parkinson's disease and Cerebrovascular Accident (CVA).

Instruments

First, a semi-structured questionnaire was applied by the authors themselves, with questions concerning age, ethnicity (white, black, Asian, native), education (did not study, incomplete elementary education, complete elementary education, higher education), retirement (no, yes), occupational status (active, inactive), monthly income (1 minimum wage, 1-2 minimum wages, 2-3 minimum wages, over 3 minimum wages), marital status (with partner, without partner), presence of diseases (none, one, two, or more), and number of medications (none, one two, or more).

The physical fitness evaluation used the Senior Fitness Test (SFT), developed by Rikli and Jones (2008). It is composed of the following tests: stand up and sit on a chair; forearm flexion; sit and reach; reach behind the back; sit, stand up, walk 2.44 meters and sit again; and a 6 min. walking test.

Self-esteem was evaluated by means of the Rosenberg Self-Esteem Scale, which was created by Rosenberg (1989), translated and adapted by Hutz and Zanon (2011). The scale aims to analyze an individual's overall self-esteem, being a unidimensional scale composed of 10 statements that cover a set of self-esteem and self-acceptance feelings. The statements are answered on a 4-point Likert-type scale (1 = completely disagree to 4 = completely agree). Negative connotation items (3, 5, 8, 9, 10) score inversely, that is, the higher the indexes the higher the individual's self-esteem perception, which may range from 10 to 40.

Anxiety levels were assessed through the Geriatric Anxiety Inventory (GAI), developed by Pachana et al. (2007), and translated and validated for the Brazilian context by Martiny, Silva, Nardo, and Pachana (2011). The inventory aims to assess anxiety in the elderly population and is composed of 20 statements. There are two types of possible answers, yes and no, and each answer is worth 1 point; the higher the score the higher the senior's anxiety level.

Perceived stress was assessed by means of the Perceived Stress Scale designed by Cohen, Kamarck, and Mermelstein (1983), which was adapted for Brazilian senior citizens by Luft, Sanches, Mazo, and Andrade (2007). It is made up of 14 questions referring to feelings and thoughts one had during the last month, and answers range from 0 to 4, with 0 = never, and 4 = always.

Finally, quality of life was assessed by means of questionnaires WHOQOL-BREF (Fleck et al., 2000) and WHOQOL-OLD (Fleck, Chachamovich, & Trentini, 2006). The WHOQOL-BREF (Fleck et al., 2000) is a shortened version of the WHOQOL-100 (Fleck et al., 1999) and composed of 26 questions, of which two refer to individual perception about quality of life and health; the other ones (24) are subdivided into four domains: physical, psychological, social relations and environment. The closer to 20 the better the quality of life in the assessed domain.

The WHOQOL-OLD (Fleck et al., 2006) is an additional tool and, along with the WHOQOL-BREF, is a useful alternative to investigate quality of life in older adults, including relevant aspects that are not covered by instruments originally designed for non-senior populations. Thus, the quality of life evaluation was complemented with the application of the WHQOL-OLD as well. The latter consists of 24 aspects assigned to six domains: functioning of senses; autonomy; past, present and future activities; social participation; death and dying; and intimacy. Each item is composed of four questions.

Procedures

This is a quasi-experimental study conducted between March and July 2017, with approval from the Ethics Committee of *Faculdade Metropolitana Unifamma* by means of legal opinion number 2.410.419/2017. Data collection for the present research was carried out respectively to the processes: contact with elderly

women at the ATI, where there was an informal presentation about the research, objectives, duration, and intervention place and time. Right after the 10 participating women were selected, a meeting was held at the place where the intervention occurred to explain the entire learning process, group division, class schedule and respective objectives.

The lessons took place from Monday to Thursday: Monday and Wednesday for a group of five women, and Tuesday and Thursday for another group of five women, starting at 14h00 and ending at 14h45. Pre-evaluation was performed at the company where the lessons happened, one week before the start of the intervention, at the same time when the lessons were carried out, just as post-evaluation, which was performed one week after the end of the lessons. The sessions were led by a physical education professional with vast swimming experience and practice. He adopted as didactics for his classes motivational and encouraging phrases. The intervention took place in an indoor space equipped with a pool measuring 25 meters in length, 20 m in width and 1 m and 30 cm in depth.

The intervention program lasted 12 weeks; the first three were dedicated to exercises for familiarization with the liquid medium (walk and run in the water in many directions and positions; hops; object stabilization and manipulation in liquid medium). The fourth and fifth weeks were dedicated to exercises for respiratory control in liquid medium (wet the face with the hands; breath in and immerse the face holding the breath; breath in and immerse the face breathing out from the nose, still immersed; grab objects at the bottom of the pool). The sixth, seventh and eighth weeks were dedicated to floating exercises (floating in prone and supine position with and without the aid of floats; survival strokes – 'dog paddle', support and displacement towards the edge). The ninth and tenth weeks focused on the crawl stroke – freestyle (elementary crawl strokes; leg movement with float; arm movement with float; crawl stroke with technique; simple push-off; simple turn; platform jump in the water; platform jump out of the water). And, finally, in the last two weeks, backstroke was taught and practiced (elementary backstroke; leg movement with float; arm movement with float; simple push-off; simple turn).

Data analysis

Data were analyzed by means of software SPSS 22.0. The analysis was run through a descriptive and inferential statistics approach. Initially, data normality was verified by the Shapiro-Wilk test. Because data did not show normal distribution, Median (Md) and Quartiles (Q1; Q3) were used for result characterization. To compare the moments (pre- and post-intervention), Wilcoxon's test was applied. The level of significance was set at $p < 0.05$.

Results

The elderly women (n = 10) participated in all sessions of the 12-week intervention program. They had mean age of 67.2 ± 3.5 years.

Comparting the impact of 12 weeks of intervention with swimming on the subjects' physical fitness (Table 1), significant difference was found between pre- and post-test moments for the following tests: sit-to-stand ($p = 0.005$); elbow flexion ($p = 0.007$); walk 2.44 m and sit ($p = 0.005$); walk 6 min. ($p = 0.005$). Such findings indicate that the swimming intervention was effective in improving the women's physical fitness, since after 12 weeks of training they performed more repetitions in the sit-to-stand and the elbow flexion tests, walked a greater distance in the 6 min. walking test, and executed the 2.44 m walk and sit test in a shorter time. The intervention had no effect only in flexibility improvement, that is, in the sit and reach ($p = 0.705$) and the reach behind the back ($p = 0.157$) tests.

Table 1. Comparting the impact of 12 weeks of swimming intervention on the elderly women's physical fitness.

Variables	Moments		p
	Pre-Test Md (Q1; Q3)	Post-Test Md (Q1; Q3)	
Sit-to-Stand (rep.)	14.5 (13.0; 16.3)	17.0 (15.0; 18.5)	0.005*
Elbow Flexion (rep.)	18.0 (17.0; 21.5)	21.0 (18.8; 23.8)	0.007*
Sit and Reach (cm)	1.5 (1.0; 1.6)	1.5 (1.0; 1.7)	0.705
Walk 2.44 m and sit (s)	8.0 (7.4; 9.3)	7.0 (6.2; 8.0)	0.005*
Reach behind the back (cm)	-4.0 (-6.3; 1.0)	-4.0 (-6.2; 1.0)	0.157
Walk 6 min. (m)	500.0 (452.3; 543.8)	541.5 (500.0; 612.5)	0.005*

*Significant difference ($p < 0,05$) – Wilcoxon's Test. rep.: repetition; cm.: centimeter; Md: median; Q1-Q3: quartiles.

Comparing the impact of 12 weeks of swimming intervention on the elderly women's psychological attributes and quality of life (Table 2), significant difference was found ($p < 0.05$) between pre- and post-test moments on symptoms of anxiety ($p = 0.005$), stress ($p = 0.005$), and self-esteem ($p = 0.007$), as well as on all quality of life domains and aspects ($p < 0.05$), evidencing that the swimming intervention increased self-esteem and all quality of life domains and aspects, in addition to reducing stress and anxiety levels.

Discussion

The main findings of this study indicate improvements in all evaluated physical fitness aspects, except for flexibility, as well as improvements in stress and anxiety levels, self-esteem and quality of life after 12 weeks of swimming initiation, showing that the insertion of seniors in physical exercise programs promotes benefits to both physical and psychological aspects (Ascencio & Pujals, 2015). In addition, it is worth highlighting swimming as a health-promoting tool in the elderly that contributes to experimental investigations on the modality for this population.

Prado, Schmidt, Masiero, Raguse, and Kruel (2017) believe that swimming training can have positive effects on the muscle strength of those who practice it, because factors such as the physical properties of water, physiological responses to immersion, and bioenergetic aspects are determinant to these responses and should be understood by the professional involved. This justifies the improvement in the sit-to-stand and the elbow flexion tests in this study. The author also mentions that swimming training uses metabolic systems (phosphocreatine, anaerobic and aerobic glycolysis, and oxidative metabolism), which justifies the improvement in the 6 min. walking test.

The results found corroborate with recent researches that stress the benefits of physical exercise for the elderly (Matsudo, Matsudo, & Barros Neto, 2012; Cordeiro et al., 2014). In a study conducted by Etchepare, Zinn, Pereira, and Graup (2003), which aimed to verify the effect of water activities on physical fitness variables in elderly women, concluded that there were improvements in all tested physical qualities (balance, agility, strength and flexibility). Unlike what was shown by Etchepare et al. (2003), when it comes to flexibility, the present research found no significant improvements in this regard for the sample.

According to Zago and Gobbi (2003), flexibility is crucial for elementary movement and functional fitness in the elderly. For rapidly decreasing with the aging process, this physical capacity needs to be worked on in a specific way (Vale, Novaes, & Dantas, 2005). In light of the foregoing, it can be inferred that the findings of the present study as to the elderly women's flexibility might have been a result of the absence of an exercise aimed specifically at this capacity in the swimming training program.

Table 2. Comparing the impact of 12 weeks of swimming intervention on the elderly women's psychological attributes and quality of life.

Variables	Moments		p
	Pre-Test Md (Q1; Q3)	Post-Test Md (Q1; Q3)	
Anxiety (score)	9.0 (6.5; 12.8)	4.5 (3.0; 6.5)	0.005*
Stress (score)	37.5 (33.8; 39.3)	17.0 (11.8; 21.0)	0.005*
Self-Esteem (score)	25.0 (23.0; 28.3)	34.5 (32.8; 36.3)	0.007*
Quality of Life Domains (WHOQOL *Bref*)			0.005*
Domain 1 – Physical	9.7 (8.4; 11.2)	14.6 (14.1; 17.4)	0.004*
Domain 2 – Psychological	11.3 (10.7; 12.0)	16.3 (16.0; 17.5)	0.007*
Domain 3 – Social Relations	12.0 (10.7; 13.7)	16.0 (14.7; 17.0)	0.005*
Domain 4 – Environment	9.8 (8.9; 11.1)	14.0 (12.6; 15.1)	0.004*
Domain 5 – Self-Evaluation	10.0 (8.0; 12.0)	16.0 (14.0; 18.0)	0.008*
Quality of Life Aspects (WHOQOL *Old*)			
Aspect 1 – Func. of Senses	10.5 (7.8; 11.0)	13.0 (12.0; 14.0)	0.008*
Aspect 2 – Autonomy	10.0 (8.8; 11.5)	14.5 (14.0; 15.8)	0.004*
Aspect 3 – Activities	12.0 (8.8; 12.3)	15.5 (14.0; 18.0)	0.005*
Aspect 4 – Personal Participation	7.5 (6.8; 9.3)	16.0 (15.0; 17.3)	0.005*
Aspect 5 – Death and Dying	8.5 (6.8; 10.8)	13.5 (11.8; 20.0)	0.008*
Aspect 6 – Intimacy	8.5 (7.8; 12.8)	16.0 (12.8; 20.0)	0.012*

*Significant difference ($p < 0.05$) – Wilcoxon's test. Md: median; Q1-Q3: quartiles.

In a research carried out by Simons (2006), which assessed strength, resistance, motor coordinator, agility and flexibility in a group of elderly subjects, mostly women, who were subjected to cardiovascular exercises for a period of 12 (twelve) weeks, improvements were found in all physical fitness components. Just as the mentioned research, the present study, with identical intervention time, found improvements in strength, coordination and balance, except for flexibility, despite involving different types of exercise. The hypothesis for these findings is that swimming regularly can meet elderly women's stimulus needs, thus improving their physical capacities.

Rabelo, Bottaro, Oliveira, and Gomes (2004) investigated the effects of a swimming learning program on the physical fitness of elderly women and found significant improvements in many movements used in their daily tasks. The study found improved aerobic capacity, walking speed, lower limb muscle strength, abdominal strength, motor coordinator, dynamic balance, flexibility, and agility, corroborating with the findings of the present study.

The results found also showed that swimming decreased anxiety levels in the group of elderly women in relation to the pre-intervention period. A study conducted by Minghelli, Tomé, Nunes, Neves, and Simões (2013), with a group of seniors, verified an inversely proportional relationship between physical activity and prevalence of mental disorders, that is, when physical activity was performed, anxiety and/or depression levels were lower.

The women in this study also presented lower stress levels after the intervention. Bavoso, Galeote, Montiel, and Cecato (2017) reinforce the importance of physical exercise for both biological and psychological aspects. They point out positive psychological changes related to improved self-esteem, self-image, decreased stress levels, and others. Stress control may be one of the causes that most motivate the elderly to exercise

Meurer, Benedetti, and Mazo (2011) found that senior individuals that had been exercising for more than a year presented better self-esteem for this practice compared to those who had been exercising for less than a year, which may be related to the benefits of physical exercise to one's health, physical and social aspects, with self-esteem being a result from practice rather than a motivating behavior. Less active elderly women are prone to diseases. A study developed by Fonseca et al. (2014) observed that elderly women who did not engage in systematic physical activities presented lower self-esteem level values compared to active ones. Thus, senior women inserted in a regular exercise program present better self-esteem indexes, as shown by data in this study.

Better quality of life may be justified by the sensation of autonomy that those women felt during the swimming lessons; thus, with improved physical fitness, they improved their daily activities and socialization, increasing their satisfaction with life. Corroborating with the abovementioned author, the present study was based on the same criteria for the approaches during the lessons, which might be the reasons for the women's better self-perception.

Even with the positive results found, this study has its limitations. First, the short intervention time and lack of specific exercises for each physical competence may have prevented even better results. Second, the study design is also a limitation, since it did not use a control group, and other confusion variables were not controlled. Thus, future researches should replicate this study by means of a randomized clinical trial, in addition to a longer intervention program.

As practical implications, regular group exercises are recommended for the elderly as a way to promote social insertion and improve their physical fitness, which allows them to have a greater autonomy and reduces isolation, having a positive effect on the impacts derived from the aging process and improving psychological aspects, since the benefits of exercising improves self-perception and one's ability to perform tasks, which interferes with the elderly's self-esteem. Improvements in this aspects and decreased stress and anxiety raise their quality of life. As for swimming as regular physical exercise to positively affect these aspects, practical intervention should be thought of according to this population's demands.

Conclusion

The results obtained allow concluding that the 12-week swimming intervention program was effective in improving the elderly women's physical fitness, psychological and emotional aspects, and quality of life.

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