

**THE PHYSIOLOGICAL AND PSYCHOSOCIAL EFFECTS
OF A 13 WEEK HYDROGYMNASTICS PROGRAM
ON HEALTHY BRAZILIAN WOMEN**

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Abstract. *A systematic and oriented physical activity program was carried out as a hydrogymnastics experimental study. Participation in the program was selected as the independent variable and weight, height, body mass index, flexibility, body image and quality of life index as the dependent variables; cardiac frequency monitoring in a group of 30 sedentary women aged 25 to 55, with controlled intensity. Intervention was composed of three hydrogymnastic sessions per week, each with a duration of 60 min for 13 weeks. Pre- and post-intervention measures were compared using the Wilcoxon and paired t-test. A statistically significant difference was observed only for flexibility. Possible explanations for this are clear, particularly the initiation of sedentary individuals into regular programs of physical exercises. The psychosocial results of the program were also recorded, regarding social inclusion, generating individual and collective actions that provided achievements in respective standards of acting and doing.*

Key words: *physical activity, aquatic environment, evaluation*

1. INTRODUCTION

Present theories suggest that sedentariness is an important risk factor for several non-transmissible chronic diseases (Powell & Blair, 1994). A sedentary lifestyle is thus seen as a public health matter in both developed and under-developed countries (WHO, 2002). In this context, in 1998, the American College of Sports Medicine (The American College of Sports Medicine, 1998) published guidelines with regards to the quantity and quality of exercises for the attainment and maintenance of health. The American College

of Sports Medicine (ACMS) suggests that adults exercise at least 3-5 times a week with 20-60 minutes of continuous or intermittent aerobic activity (a minimum of 10 min) and with an intensity of 55-90% of the maximum heart rate for cardio-respiratory fitness and body composition.

In this context, aquatic activities are considered, since an aquatic environment provides decreased gravitational action, less impact and increased support for body weight. Moreover, training in the water provides several other benefits, such as symmetric muscular work, circulatory stimulus, social contact and the sensation of welfare caused by the water temperature. Other positive aspects are that the body is not necessarily exposed and the absence of sweat sensation (Galdi et al., 2004, 131).

Studies which gave a detailed evaluation of AF and which did not consider only the biological aspects, demonstrated that group involvement in exercise practices improves the quality of life. Research carried out by Lustyk et al. (2004) showed a relation among quality of life and exercises frequency, volume and intensity, and the evidence showed that most frequently active people report a better quality of life. These facts have also been reported by Pasetti (2005), who after remarking significant Quality of Life (measured by WHOQOL) improvements for obese women, suggested that being part of a group would help start their physical exercise and bring about a change in the way they feel and their way of life.

Along with these facts, official documents from the World Health Organization (WHO) communicate concepts to make Health Promotion viable from social mobilization. Empowerment, that is, the communities' power to increase concern about and control of their own destiny, constitutes the core of such a project. It comprises, among other initiatives, education for citizenship, information socialization, involvement in decision-making, planning, and the execution of projects related to them (World Health Organization, 2003).

The objective of the present study was to measure changes in bio-physiological and psychosocial aspects resulting from a systematized hydrogymnastics program for healthy Brazilian women aged 25–55.

2. METHODS

Location and population

Sixty women volunteered to participate in the experiment and provided informed consent in accordance with the procedures approved by the university ethics committee prior to beginning their participation. Participants were then screened based on information about their previous physical activities, frequency of medical attendance and the presence of any pathological disorders. Eleven volunteers were excluded for not receiving medical attention at the referred institution and nine for presenting clinical contraindications for being involved in regular physical activity. The group consisted of 40 healthy sedentary women with a mean age of 43.4 (s.d. = ± 7.84 years). Ten dropped out during the execution of program, for different personal reasons.

The study was performed in association with the Health Center in the Santa Monica district, in Campinas City, Brazil. This is part of the applied facilities of the local university, specializing in Health, Education and Culture (Campos et al., 2000). The population of this region is featured by social and economic exclusion, which began due to urbanization and was reinforced by the constant migration process it is subject to. Actually,

salary average discrepancy from different city regions and social exclusion are responsible for the high violence index installed in the quarter (Martins, 2004), since the monthly salary average of the head of the family is approximately 50 dollars. Nevertheless, a series of agreements and conventions between universities and non-governmental organizations tries to contribute to the development of active citizenship and projects, which positively interfere with the inhabitants' day to day life.

Tests protocols

To evaluate the impact of the exercise program, we collected measures of each of the dependent variables before and after the intervention. Weight and height were measured with a conventional scale (Filizola[®]) with 0.1 kg and 0.5 cm accuracy. Body mass index (BMI) was then calculated according to McGee et al. (2005). We used the sit-and-reach test (AAHPERD, 1984) to assess flexibility. We evaluated psychosocial parameters with the body image test, adapted from Sorensen & Stunkard (1993). Data on the quality of life questionnaire developed by the World Health Organization (1998) were collected and published elsewhere (Vicentini et al., 2006).

Exercise program

The hydrogymnastics program was performed during a period of 13 weeks according to the recommendations of the ACSM (American College of Sports Medicine, 1995). The group first underwent an adaptation period of one week, during which elements such as self-confidence, body domain and balance were worked on. The initial conditioning phase of three weeks was characterized by a minimum of 55% and a maximum of 60% of maximal cardiac frequency (MCF). The development phase of five weeks was carried out with intensities between 60% and 80% of MCF. The maintenance phase also lasted five weeks and aimed at stabilizing the gains (intensities from 70% to 80% of the MCF).

The training involved three weekly sessions of 60 min. The water level was maintained between the umbilical scar and subaxillary line (Baum, 1998). The training session was composed of warm-up exercises and stretching (10 min), resistance training (30 min) and cool down with relaxation (10 min). The warm-up was performed in the swimming pool with exercises for large muscular groups followed by wide and slow movements. Resistance exercises were applied using accessories (aquatubes, boards, gloves, balls) and several movement possibilities such as knee and elbow flexion and extension, supine, adduction and leg abduction. Due to the physical characteristics of the liquid environment, submersing movements and increases in speed were used as a form of increasing the load. Cardiac frequency was monitored continuously during the training sessions (ECG, Vantage NV, Polar[®], Electro, Finland) as a measure of exercise intensity. At the beginning of each training session five participants were randomly chosen for monitoring. Cooling down was performed with massage and self-massage and sliding, respiration and fluctuation exercises.

In the statistical analysis, the presentation of anthropometric variables and a BMI was performed by position and variability indices. Pre and post-measurements were compared using the Wilcoxon non-parametric test for the flexibility variable and paired t-tests (Norman & Streiner, 1994) for the weight and BMI variables. Alfa was set at 0,05 for all statistical tests (Gonçalves, 1982).

3. RESULTS

Table 1 presents the descriptive measures and the results of the statistical test on comparison of pre and post measurements. Flexibility was the only measure that showed significant differences between pre- and post-intervention measures. Further items can be included in the results related to several individual and collective actions done, which turned out to improve social acting and activity standards of the group. Some of them are:

- Participation in associative activities: an innovative program for a social group of strongly mobilized participants for which the community could generate resources for transport financing, through craftsmanship activities, articles sales and lotteries. Besides, group insertion in a university environment is allowed.
- Dialogue with the authorities: questions emerging during the running of the project led to a dialogue between the organizers and participants and non-governmental organizations, members of parliament, private companies and government authorities.
- Democratization of physical activity: through a sports activity not normally accessible to such social groups, due to the costs of installation and maintenance of the necessary facilities.
- Deployment of a physical education professional in the Health Basic Unit: considering resolution # 218 of March 6th 1996 from the Health National Council, physical education professionals are recognized as belonging to the health staff, enabling them to act in a field still not much studied; in this case, the multidisciplinary staff involved colleagues such as local physicians and nurses.

4. DISCUSSION

Flexibility was the only variable which displayed statistical difference in the two successive measures. This seems surprising considering that all the activities were carried out in an aquatic environment, where the performance of exercises for developing flexibility is difficult, especially for the muscles of the posterior region of the thigh and column due to the difficulty of trunk flexion without head immersion (Takeshima et al., 2002). In contrast, considering that decrease in flexibility is natural in the aging process along with the low levels of physical activity, we may conclude that adherence to physical activity may be sufficient to promote increase in this variable (Heyward & Stolarczyk, 1996).

Case (1998) reports higher movement amplitude and facility of execution as the possible causes of increased flexibility. In addition, Silva, & Moreira (2001) verified the positive effect of such a motor ability in the physical conditioning programs without the presence of oriented exercises. Interventions performed by sedentary individuals of both genders for nine months, four sessions per week, indicated significant improvement, especially when compared to the initial indexes of the re-test applied during the third month. This demonstrates gains with relatively short practice time, even if this practice is not composed of specific exercises.

Another possibility is the fact that intense reactions to exercise, such as increases in body temperature, blood irrigation, muscular viscosity and stimuli to tendinous and Golgi organs, as time passes, promote higher elasticity, especially of the muscular components. In short, in addition to observations of McArdle et al. (2000), it has been found that, at any age, men and women may gain between 20% and 50% flexibility with regular physical activities.

Table 1. Descriptive measures and the results of a statistical test
comparing pre and post-measurements

Variable	Descriptive Measure	Initial measurement	Final measurement	Result of the statistical test
Weight	Minimum Value	47.00	47.00	$t = 2.03, p > .05$
	1 st Quartile	58.75	57.00	
	Median	66.00	65.00	
	3 rd Quartile	82.25	83.75	
	Maximum Value	116.00	116.00	
	Average	71.80	70.40	
	Standard Deviation	16.96	16.95	
Height	Minimum Value	1.48	1.48	$t = 0.00, p > .05$
	1 st Quartile	1.52	1.52	
	Median	1.58	1.58	
	3 rd Quartile	1.62	1.62	
	Maximum Value	1.67	1.67	
	Average	1.57	1.57	
	Standard Deviation	0.06	0.06	
BMI	Minimum Value	20.00	20.00	$t = 0.19, p > .05$
	1 st Quartile	24.75	24.00	
	Median	27.00	26.00	
	3 rd Quartile	35.00	34.00	
	Maximum Value	50.00	50.00	
	Average	29.03	28.43	
	Standard Deviation	7.07	7.06	
1 th corporal image	Minimum Value	2.00	2.00	$t=1.06, p>.05$
	1 st Quartile	3.00	3.00	
	Median	4.50	4.00	
	3 rd Quartile	6.00	5.00	
	Maximum Value	7.00	8.00	
	Average	4.60	4.37	
	Standard Deviation	1.54	1.56	
2 nd corporal image	Minimum Value	1.00	2.00	$t = 0.70, p > .05$
	1 st Quartile	3.00	4.00	
	Median	5.00	5.00	
	3 rd Quartile	6.00	6.00	
	Maximum Value	8.00	8.00	
	Average	4.57	4.90	
	Standard Deviation	1.70	1.69	
3 th corporal image	Minimum Value	2.00	2.00	$t = 0.91, p > .05$
	1 st Quartile	3.00	3.00	
	Median	3.50	3.00	
	3 rd Quartile	4.00	4.00	
	Maximum Value	6.00	6.00	
	Average	3.60	3.47	
	Standard Deviation	0.81	1.01	
Flexibility	Minimum Value	5.00	4.00	$t = 2.72, p < .01$
	1 st Quartile	16.00	19.00	
	Median	25.50	27.50	
	3 rd Quartile	29.00	30.00	
	Maximum Value	40.00	42.00	
	Average	23.10	24.67	
	Standard Deviation	9.07	8.80	

Finally, it is also important to emphasize the psychosocial results (social inclusion, generating individual and collective actions) that promoted achievements in the respective standards of acting and doing. As a matter of fact, subjective aspects are also considered as determinants of the continuity of physical practice.

Therefore, as quality of life is recognized as a complex reality constituted at least by two main components, lifestyle and life conditions – the first one corresponding to the habits and personal subjective decisions and the second ones to objective elements such as income, educational background, social welfare and health (Gonçalves, 2005), this project could contribute to overcoming the mistake stating that Physical Education comprises and deals with Quality of Life, only changing sedentary people into active ones, without any interference on the material dimensions of social groups where such facts occur. In other words, what was attained here, is to have physical activity somehow act as a renewing resource of life conditions, as it influenced the action of the social segments involved, allowing them to perceive and re-elaborate daily practices, as effective actors. It is, therefore, sensible for the managements of the women considered to organize, for example, and make resources available to allow them to get from their houses to the practice locations.

In conclusion, it was observed that systematic and oriented physical activity programs may give rise to additional psychosocial benefits.

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FIZIOLOŠKI I PSIHOSOCIJALNI EFEKTI 13 NEDELJNOG PROGRAMA HIDROGIMNASTIKE NA ZDRAVE BRAZILKE

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Sistematski i ciljni program fizičke aktivnosti je sproveden u okviru eksperimentalnog istraživanja hidrogimnastičkog programa. Učešće u programu je selektovano kao nezavisna varijabla, a težina, visina, indeks mase tela, fleksibilnost, izgled tela i kvalitet života su uzete kao zavisne varijable, frekvencija srčanog rada je kontrolisana u grupi od 30 sedećih žena u starosnoj dobi od 25 do 55 godina. Program se sastojao od tri hidrogimnastičke sesije od 60 minuta nedeljno u trajanju od 13 nedelja. Uporedljivani su rezultati merenja pre i posle intervencije putem Wilcoxon testa t. Statistički značajna razlika je uočena samo u prostoru fleksibilnosti. Moguća objašnjenja za ovo su jasna naročito kada je u pitanju inicijacija sedećih ispitanika i njihovo uvođenje u regularni program fizičkih vežbi. Zabeleženi su i rezultati u psihosocijalnoj sferi uključujući tu i socijalno uključenje koje uzrokuje individualno i kolektivno delovanje i angažovanje, a što je rezultiralo postizanjem odgovarajućih standarda u zadanim vežbanjima.

Ključne reči: fizička aktivnost, voda i vežbanje u vodi, procena