

## AQUA ZUMBA VERSUS AQUA JOGGING: COMPARATIVE EFFECTS ON HEALTH PARAMETERS AMONG OBESE MIDDLE AGED WOMEN

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### Abstract

**Background:** Obesity is major contributor to diseases and mortality. Constant weight loss significantly reverses diseases related to obesity and helps prolong human life expectancy. To date, there has been limited scientific evidence comparing the effectiveness of the Aqua Zumba® Fitness program and conventional aqua jog among obese women. Thus, the purpose of this study is to compare the effects between 12 weeks of Aqua Zumba® Fitness and aqua jog on health parameters among middle-age women. **Methods:** A total of sixty sedentary obese women (BMI >30 kg/m<sup>2</sup>), aged 40-59 years old were randomized to either Aqua Zumba® Fitness (AZ, n=20), aqua jog (AJ, n=20) or control group (C, n=20). Exercise groups were involved in different 12-week aqua exercise programs, 3 times per week, 60 minutes per session, with an intensity of 50-75% of maximum heart rate. Body mass (BM), skeletal muscle mass (SMM), body fat percentage (BF%), waist circumference (WC), upper and lower body strength (UBS and LBS), cardiorespiratory fitness (CRF), and flexibility were measured at baseline (week-0) and post-exercise intervention (week-13). **Result:** The AZ group demonstrated significant changes (p<0.05) in all selected health parameters following 12 weeks of exercise programs. AJ group also demonstrated significant differences (p<0.05) in most of the health parameters except for WC and UBS post-intervention. However, this study found that the AZ group produced significant superior changes in the improvement of SMM, WC, UBS and LBS (P<0.05) when compared to the AJ group. **Conclusion:** The

Aqua Zumba Fitness program elicits better improvement in all health parameters among obese middle-aged women as compared to aqua jog.

*Keywords:* Aqua exercise, obesity, health related fitness

## **Introduction**

According to the World Health Organization (WHO), obesity, identified as body mass index (BMI) of  $\geq 30$  kg/m<sup>2</sup>, has become a worldwide issue. Global prevalence has almost tripled in the last four decades (WHO, 2018). Worldwide in 2016, WHO reported that rates of overweight and obesity among adults aged 18 years and older were 39% (40% women) and 13% (15% women), respectively. Similar trends have been observed in the Malaysian population, with the statistics showing that over 51% Malaysian adults were overweight and obese (Ying Yi Chan et al., 2017). From these categories, the number of obese females outnumbered the males, placing them at greater risk for lower health related quality of life, higher risk in metabolic disease, and difficulties in performing daily living activities, and resulting in shorter life expectancy compared to males (Bhale, Patil, & Mahat, 2014; Thomas, & Kreamer, 2013; Akdur, 2011; Letchuman et al., 2010; Cakmakci, 2010; Jackson et al., 2010; Sower, 2003).

It is well known that obesity leads to the development of cardiovascular and metabolic disorders and has become a serious public health concern. Therefore, there is a need to identify the optimal method to maintain bodyweight. Various studies have been conducted to find ways to combat obesity issues. Most previous studies have found that exercise is an optimal method to overcome the issue because it helps to improve body composition, physical parameters, physical function, lipid profiles and offers many additional benefits (Johnson, 2009; Okura et al., 2007; Sarsan et al., 2006; Thong et al., 2000; Kreamer 1999).

Previous studies have indicated that water exercise in the form of aqua jogging has become an optimal type of exercise for the obese population due to its reduced to a non-weight-bearing stress on skeletal joints (Saavedra et al., 2007; Raffaelli et al., 2010; Luksevicius Rica et al., 2013). Aqua Zumba Fitness has become the most popular type of water exercise, as it involves upper and lower body movements and has been generally rated as a more fun exercise than aqua jogging by female obese population (Fisken, Waters, Hing, Steele, & Keogh, 2014). Since both of the aqua exercises reported significant contribution to improved cardiovascular fitness, reduced body fat percentage, increased muscular strength, and increased flexibility (Fisken, Waters, Hing, Steele, & Keogh, 2014; Nuttamonwarakul, Amatyakul, & Suksom, 2012; Pasetti, Goncalves, & Padovani, 2012; Saavedra et al., 2007; Takeshima, 2004) among obese population, it is interesting to identify which of these two aqua exercises (Aqua Zumba Fitness or aqua jogging) elicit greater changes in selected health parameters among obese middle aged women. Therefore, the purpose of the present study was to compare the effects of two different aqua workout programs, one known to be the most commonly conducted in past studies (aqua jogging) and the other known to be new and latest aqua fitness program (Aqua Zumba Fitness) on health parameters among obese women. The study was approved by the UiTM Research Ethics Committee.

## **Methods**

### *Subjects*

In this prospective experimental study design, sixty (N=60) sedentary female volunteers aged between 40 to 55 years participated in this study. Sample size was estimated based on previous studies, with an expected effect size of 0.7, and taking into consideration a 10% dropout, n=20 per group will be adequate to obtain 80% power, for a two-tailed test. All were randomly selected with the following inclusion criteria: 1) obese, with BMI of 30 to 40 kg/m<sup>2</sup> and body fat percentage between 35 to 45%; and 2). sedentary, defined as not involved in any structured physical activities for the past six months. Participants with history of myocardial infarction, taking medication which will alter heart rate response during exercise, pregnant, having musculoskeletal injuries or physical disabilities were excluded. Participants' physical characteristics are presented in Table 1. Prior to participation, participants were informed of the study's purpose and testing procedures. Each participant gave her written informed consent. This study was approved by Universiti Teknologi MARA Research Ethics Committee. Participants were screened with a physical activity readiness questionnaire (PAR-Q) and resting ECG.

### *Exercise protocol*

The participants were randomly assigned into 12-weeks of Aqua Zumba (n = 20), aqua jog (n = 20), and control (n = 20). Participants in Aqua Zumba® Fitness group performed four core rhythms of Aqua Zumba fitness program (Merengue, Salsa, Cumbia, Reggaeton) that involved various combinations of total body movements for 3 days/week, 60 minutes per session (10-min warm-up, 45-min conditioning, 5-min cool down), led by a qualified Aqua Zumba instructor. The exercise tempo gradually progressed from 60-80 bpm (the first 4 weeks), 70-100 bpm (from week 5 to week 8), and 90-110 bpm (in the last 4 weeks). Participants were assigned a target heart rate that represented 50 to 75% of their age predicted maximum heart rate. Participants in the aqua jog group were instructed to perform shallow jogging exercise (both feet in contact with swimming pool bottom) with similar exercise frequency and duration, 3 days/week, 60 minutes per session (10-min warm-up, 45-min conditioning, 5-min cool down) maintaining similar heart rate as in the other intervention groups. Both the aqua exercise groups performed their routines in standing head-out immersion in 1.2 depth swimming pool with water fixed near to chest level, with water temperature ranging from 24 to 27°C, and were supervised by two certified lifeguards for safety purposes. Missed workouts were made up by attending an additional session in the same or subsequent week. Participants in the control group were instructed to maintain their normal activity. Participants were asked to keep to their normal diet and 3-days food record for 12 weeks were taken and analysed using Diet Four Plus Software version 10 and were advised not to be involved in any other regimented exercise during the intervention period.

## **Outcome measures**

Body composition was determined using Bioelectrical Impedance Analysis (BIA) InBody 720 (Biospace, Korea) machine. Prior to the measurement of body mass (kg), lean mass (kg), and body fat percentage (%), height, age, and gender were input into the software. Participant height was measured using body meter (SECA, Germany) of which the value was recorded nearest to 0.1 cm. Waist circumference (WC) was measured to the nearest 0.1 cm horizontally at the narrowest point of the distance between xiphoid prominence and umbilicus. The 6-minute walk test (6MWT) (Capodaglio, De Souza, Parisio, Precilios, Vismara, Cimolin, & Brunani, 2012) was conducted to measure cardiovascular fitness. Participants were instructed to walk at their maximum speed at a 30 meter track for 6-minutes. The total distance covered within six minutes was used to predict VO<sub>2</sub>peak via a formula suggested by ACSM (2010). Upper and lower body strength tests were measured via multiple repetition strength tests (8-RM) (Pereira & Gomes, 2003, Strohacker, Fazzino, Breslin, & Xu, 2015). Participant performed chest press (upper body strength) and leg press (lower body strength) (Tomlinson et al., 2016) exercise using a standard 22-kg (45-lb) barbell and a nonadjustable Cybex weight bench and a nonadjustable Cybex plate-loaded leg press machine (Cybex International, Inc., Medway, MA). Prior to testing, participants attended two familiarization sessions at the Strength and Conditioning Lab, Faculty of Sports Science, UiTM. Participants lifted a certain weight until they experienced muscular failure at eight repetitions maximum (8-RM) and the score was recorded in kilograms (kg). Participant trunk and hamstring flexibility were determined using the sit and reach test (Benetti et. al., 2016). Participants were instructed to flex their trunk and moved the scale marker with their fingertips as far as possible while maintaining the legs and knees flat on the floor. Participants were given two trials and the mean score was recorded in cm.

## **Statistical analyses**

All values are expressed as the mean  $\pm$  SD. The changes within (pre-post) and between groups (Aqua Zumba vs. aqua jog vs. control) on body composition, cardiovascular fitness, muscles strength, and flexibility were determined using a mixed within-between subjects' ANOVA. The level of statistical significance was set at  $p < 0.05$ .

## **Results**

Table 1 shows the participants' physical characteristics between groups. At baseline, we confirmed that all three groups demonstrated similar physical characteristic with Levene's test for homogeneity of variances at  $p > 0.05$ . Additionally, one-way between-groups ANOVA analyses showed no significant difference on the mean scores for all variables between three groups with  $p > 0.05$ . Therefore, we can conclude that all groups were equally distributed.

**Table 1:** Baseline physical characteristics of participants by group.

Variables	Aqua Zumba group	Aqua jog group	Control group	P-value
Age (years)	44.89 ± 4.37	45.20 ± 4.21	45.36 ± 5.97	.614*
Height (cm)	157.91 ± 9.89	156.28 ± 6.02	158.63 ± 8.51	.698*
Weight (kg)	83.21 ± 8.85	84.08 ± 8.00	83.23 ± 10.24	.741*
BMI (kg/m <sup>2</sup> )	33.27 ± 5.36	32.34 ± 3.56	32.98 ± 5.43	.921*
BF% (%)	44.94 ± 5.69	45.68 ± 5.83	45.48 ± 4.49	.861*

\* p>0.05 in Levene's test for homogeneity

Significant differences were observed within and between groups for all health parameters across 12-weeks interventions with partial eta squared ranged from 0.43 to 90 (moderate to high effect size). Both interventions showed significant improvement compared to the control group on all selected parameters. However, Tukey Post Hoc indicated Aqua Zumba demonstrated significant changes compared to aqua jog (p<0.05) on skeletal muscle mass (AZ = 14.65%, AJ = 7.42%) waist circumference (AZ = -5.74%, AJ = -4.56%), upper body strength (AZ = 32.48%, AJ = 12.64%), and lower body strength (AZ = 16.40%, AJ = 11.75%) parameters. Hence, it can be concluded that the Aqua Zumba Fitness program elicited favorable changes in improving most of the health parameters compared to aqua jog exercise.

**Table 2:** Changes on health parameters across groups following 12-weeks intervention.

Variables/pre-post scores	Aqua Zumba group	Aqua jog group	Control group	Time effect, P-value	Group effect, P-value
Body mass (kg)					
Pre	83.21 ± 8.85	84.08 ± 8.00	83.23 ± 10.24	0.01	0.040
Post	77.16 ± 10.93 <sup>c</sup>	77.27 ± 8.51 <sup>c</sup>	85.16 ± 11.79 <sup>ab</sup>		
Body Fat (%)					
Pre	44.94 ± 5.69	45.68 ± 5.83	45.48 ± 4.49	0.01	0.031
Post	32.35 ± 7.60 <sup>c</sup>	35.14 ± 6.28 <sup>c</sup>	47.30 ± 4.51 <sup>ab</sup>		
Skeletal muscle mass (kg)					
Pre	20.54 ± 5.16	21.17 ± 4.60	21.85 ± 5.82	0.01	0.025
Post	23.55 ± 6.32 <sup>bc</sup>	22.74 ± 3.73 <sup>ac</sup>	20.67 ± 5.90 <sup>ab</sup>		
Waist circumference (cm)					
Pre	105.83 ± 10.92	104.44 ± 8.99	105.85 ± 10.79	0.01	0.037
Post	99.76 ± 11.48 <sup>bc</sup>	99.68 ± 8.36 <sup>ac</sup>	107.28 ± 9.89 <sup>ab</sup>		
Upper body strength (kg)					
Pre	26.32 ± 4.99	26.58 ± 5.37	27.10 ± 6.58	0.05	0.019
Post	34.87 ± 4.11 <sup>bc</sup>	29.94 ± 4.81 <sup>ac</sup>	26.77 ± 6.01 <sup>ab</sup>		
Lower body strength (kg)					
Pre	78.01 ± 6.91	78.41 ± 7.55	80.10 ± 7.90	0.01	0.029
Post	90.80 ± 7.33 <sup>bc</sup>	87.62 ± 7.94 <sup>ac</sup>	78.31 ± 6.48 <sup>ab</sup>		
Cardiorespiratory fitness (ml/kg/min)					
Pre	21.71 ± 2.99	22.09 ± 4.45	22.12 ± 3.55	0.05	0.035
Post	23.69 ± 3.93 <sup>c</sup>	23.93 ± 3.27 <sup>c</sup>	21.03 ± 2.66 <sup>ab</sup>		
Flexibility (cm)					
Pre	20.70 ± 4.91	20.54 ± 3.92	19.70 ± 4.60	0.01	0.039
Post	22.97 ± 5.10 <sup>c</sup>	22.60 ± 4.90 <sup>c</sup>	19.81 ± 4.31 <sup>ab</sup>		

*a* = sig. different to aqua zumba

*b* = sig. different to aqua jog

*c* = sig. different to control

## **Discussion**

Current findings showed significant changes in all variables for Aqua Zumba and aqua jogging except for waist circumference and upper body strength in aqua jogging group. Based on the findings, it is interesting to note that any form of upright exercise performed in shallow water does bring significant improvement in overall health related fitness among obese middle aged women.

Overall, both Aqua Zumba or shallow aqua jogging program managed to elicit significant changes in body composition including body weight, body fat percentage, and lean mass. These results are in agreement with other previous studies which also found significant changes in body composition, and cardiorespiratory fitness following shallow water walking and Zumba (Gappmaier, Lake, Nelson, & Fisher, 2006; Saavedra, De La Cruz, Escalante, & Rodriguez, 2007; Krishnan, Tokar, Boylan, Griffin, McMurry, Esperat, & Cooper, 2015). However, only Aqua Zumba program improved waist circumference in the present study. The potential mechanism which lies behind the improvement in waist circumference following Aqua Zumba fitness program may be due to the total body movement because Zumba involves Salsa and Reggaeton exercise routine which targeted on core muscle (Perez, & Adami, 2011). Salsa and Reggaeton require the movement of the ribcage, arms apart from the gluteus, quadriceps, hamstring and gastrocnemius (Bosse, 2008). The current study supported the previous study which also found significant changes in waist circumference following Zumba program (Krishnan, Tokar, Boylan, Griffin, McMurry, Esperat, & Cooper, 2015).

Upper and lower body strength were significantly improved in Aqua Zumba group, but shallow aqua jogging group improved only in lower body strength. Jogging movement involved mostly gluteus, quadriceps, hamstring and gastrocnemius (Thorpe, Yu Li, Crompton, & Alexander, 1998). There had been past studies which analyzed locomotion during water immersion in determining whether the exercise involved static, horizontal or vertical movement (Alberton, Cadore, Pinto, Tartaruga, Da Silva, & Krueel, 2011; Killgore, 2012). They found that exercise which involved horizontal movements in shallow water at submaximal speed produced greater muscle activity than the same exercise performed on land. Meanwhile, vertical movement performed in water at submaximal speed produced less muscular activity compared to the same exercise performed on land, due to a reduction in the force of gravity resulting from the increased buoyancy effects of water (Reilly, Dowzer, & Cable, 2003; Barbosa et al., 2009). However, when exercise (static, horizontal or vertical movement) performed at high speed in the water, greater neuromuscular activity was seen when compared to performing on land (Meredith-Jones, Waters, Legge, & Jones, 2011). Since Aqua Zumba movement involved combination of static, horizontal and vertical movements, therefore, this can be the concrete reason why Aqua Zumba program demonstrated superior changes in improving muscular strength (upper and lower body) compared to shallow aqua jogging.

The results above have illustrated that both aqua exercise groups demonstrated significant improvements in trunk and hamstring flexibility compared to the control group. The mechanism behind these changes was due to the buoyancy effect, which enabled movements to be performed at full range of motion (ROM), improving participants'

flexibility. The results from the present study are aligned with those of previous studies that also obtained significant improvements in hamstring and back flexibility after water exercise interventions (Katsura et al., 2010; Nagle et al., 2007; Pinto et al., 2014). In conclusion, Aqua Zumba is a potential form of exercise modality in combating obesity. It is a workout which able to induce positive changes physiologically and physically with a good retention rate. However, future studies comparing Aqua Zumba with other exercise modalities are warranted.

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