Effects of Aqua Exercises Towards Improving The Quality of Life (QoL) of Obese Women in Malaysia

Noor Liyana binti Karim¹, Asma Diyana binti Abd Jalil¹, Noor Haninah binti Hasri¹, Hezlin Aryani binti Abd Rahman¹, Maisarah binti Shari² and Nur Izzati binti Idris²

¹Centre of Statistical and Decision Science Studies, Faculty of Computer and Mathematical Sciences, Universiti Teknologi Mara Malaysia 40450 Shah Alam
²Faculty of Sports & Recreational Science, Universiti Teknologi Mara Malaysia 40450 Shah Alam

Corresponding address : nliyanakarim@gmail.com, asmadiyana43@gmail.com, noorhaninahhasri@gmail.com, hezlin@tmsk.uitm.edu.my, izzatiidris12@gmail.com

Abstract. Aqua exercise is a form of water exercise, done in the water which is beneficial for weight loss as well as improving the quality of life. It is suitable for all age group and fitness levels whereby due to the water buoyancy makes it easier to perform exercises especially for obese and knee-injured people. However, there was not much study done to measure the effectiveness of the aqua exercises in improving the quality life. Thus, this study aims to investigate and compare the effectiveness of aqua exercises towards obese women within eight domains of the Quality of Life (QoL). This study uses the 36-Items Short Form Health Survey (SF-36) questionnaire and a purposive sample of 61 participants to measure the effectiveness of the aqua exercise before and after 36 days of aqua workout. As the nature of the data collected was not normally distributed, hence the Wilcoxon signed rank test was used as the statistical method of analysis. The findings of this study showed that there was a significant difference between the overall QoL pre and post since the p-value < 0.05. In addition, it was also found that five out of the eight domains of QoL; the physical functioning, general health, social functioning, mental health, and health transition were the domains showing significant difference between the pre and post-test (p-value < 0.05), and where majority of the participants showed a significant improvement after the aqua workouts. Thus, it can be concluded that aqua exercises is effective in improving the general QoL of obese women.

1. Introduction

Obesity is categorized as an abnormal or excessive fat accumulation in the body that may effects the health of obese people. It can be measured by measuring the Body Mass Index (BMI) which is a simple index of weight for height that commonly used to identify underweight, normal, overweight and obesity in adults. BMI can be calculated by dividing a person's weight in kilograms with the square of his height in meters (kg/m²). The people with BMI greater than or equal to 30 are categorized as obese.

The current statistics by World Health Organization reported that over 600 million adults were obese and about 11% of men and 15% of women of the world’s adult population were obese up till 2014. The prevalence of obesity had increased rapidly in Malaysia in the last decade of the twentieth century covering till the years of 2015.
Malaysia is one of the ASEAN country that have a high prevalence of obesity. Malaysia is in the ranked of sixth in the Asia-Pacific region for obesity and tops the list in South-East Asia for both obesity and diabetes. The National Health & Morbidity Survey (NHMS) 2015 reported that the national prevalence of overweight, obesity and abdominal obesity rose by 0.6%, 2.6% and 2.0% respectively as compared to the previous findings of NHMS 2011.

Obesity is known as a major determinant of chronic terminal diseases such as cancers, gall bladder diseases, respiratory problems, musculoskeletal disorders and induces type 2 diabetes mellitus (Ghee, 2016). It appears to be more prevalent in women compared to men since women are less likely to do exercises during their leisure time when compared to men. Most of the previous studies also reported that women are more obese than men (Ismail et al., 2002; Ghee, 2016).

One way of reducing the percentage of obesity in Malaysia is by encouraging these obese people to exercise. There are two types of exercises that can be practice which are land-based exercises and water-based exercise. There are many types of water-based exercises such as aqua zumba, water yoga, aqua aerobics, and aqua jogging. The practice of exercises in water is suitable for obese people since it can increase energy consumption compared to running training on land, in addition reducing the risk of injury. In addition, usually the obese people will have certain knee-injury problem. This adds to the need of a low-knee-impact exercise to reduce the weight problem and aqua exercising is a great option for these people.

Previous studies stated that water-based exercises are more effective compared to land exercises especially for obese and older people with knee and joint problems. This is because 90% water buoyancy assist in supporting the body and making exercise feel easier since it acts as a shock absorb and reducing stress on joints. It gives the obese people to do exercises without feeling pain.

Since women are more prevalent in becoming obese as compared to men and achieving an ideal weight through exercise is important in improving the quality of life of obese women, hence, this study purpose to investigate the effectiveness of aqua exercises (aqua zumba and aqua jogging) towards obese women and to compare the effectiveness of aqua exercises towards obese women within the eight domains of Quality of Life (QoL).

2. Exercising and Quality of Life (QoL)

Exercise is a vital part in reducing the weight. Exercise refers as any body movement that enhances health and increases energy expenditure. Exercises can be divided into two which are land exercise and water exercise. Both exercises give benefits towards body and lifestyle. Land exercise is the familiar exercise such as jogging, running, aerobic, zumba and many more. Oh et al., (2015) state that land based exercises improve the lower limb strength of elderly people, as well as other physical functions. Land exercise offers tremendous benefits, but too often benefits are accompanied by aches and pain, overheating, sweating and feeling exhaustion (Madhankumar & Sundar, 2016). Aqua exercises also known as water aerobics, aqua fitness or aqua fit. Water aerobics is a form of aerobic activity involving long dynamic exercises performed at moderate intensity (Kantyka, Herman, Rocznio, & Kuba, 2015). There are different forms of aqua exercises such as aqua zumba, water yoga, aqua aerobics, and aqua jog (Madhankumar & Sundar, 2016). Pasetti, Gonçalves & Padovani (2012) cited that the practice of exercises in water environments may be interesting for obese people since it can increase energy consumption compared to running training on land and it can reduce the risk of injury.

Improving ones’ quality of life in the recent years has been an important study. Quality of life (QoL) is defined as how an individual measures the goodness of multiple aspects of their life (Theofiliou, 2013). QoL are subjective experiences, thus, making effective measurement difficult. Knowing the patients’ QoL are vital to better understanding how a disease, in our case obesity, affects the patients’ day to day life and the personal burden resulting from the illness (New & Somani, 2016).

According to Oh et al. (2015) water-based exercise gives greater effect in improving daily-life-activities related and other items, such as role-physical and bodily pain. Wouters, Van Nunen, Geenen, Kolotkin, & Vingerhoets (2010), also reported that aqua jogging give effects towards the QoL of obese women since there are improvements in QoL. Studies done proved that only some aspects of QoL were found to change as the result of a 6-month period of an exercise program, as the program
was not long enough to obtain maximum results. However, visible changes of overall QoL can still be achieved (Vécseyné Kovách, Kopkáné Plachy, Bognár, Olvasztóné Balogh, & Barthalos, 2013).

3. Methodology

A sample of 61 participants was selected using purposive sampling strategy. The purposive sampling technique is a non-probabilistic sampling technique, where some criterions were imposed in the selection of the sample. The criterions includes selecting participants were female aged 20 to 59 years old, having body mass index (BMI) and fat percentage range from 30 to 40 kg/m2 and 35 to 45% respectively. A total of 110 participants were participated in this study and randomly assigned into 3 different intervention groups (aqua Zumba, aqua jogging and control). However, due to some constraints only 61 participant were able to complete this experiment within the time given (36 days).

This study measures the effectiveness of aqua exercise in improving the QoL by using the 36-Items Short Form Health Survey (SF-36), which divided the QoL into eight domains of QoL; (i) physical functioning, (ii) role functioning, (iii) bodily pain, (iv) general health, (v) vitality, (vi) social functioning, (vii) mental health, and (viii) health transition. The data were scored by using the scoring rules for the RAND 36-Item Health Survey.

The statistical method use in this study was Wilcoxon Sign Rank Test. This method was selected because the data was not normally distributed.

4. Results and Discussions

4.1 Description of Data

The participants were assigned with of two different types of aqua exercises which are aqua jogging and aqua Zumba. There was also one control group. The highest respondents come from aqua jogging with 24 (39.3%) respondents while aqua zumba with 22 (36.1%) respondents. The least of our respondents were control group with 15 (24.6%). Due to the experimental nature of this study, the number of respondents who completed the whole study was very limited.

| Variable          | n (%)   | Mean (SD)     |
|-------------------|---------|---------------|
| Age               | 30.79 (10.52) |
| Pre Weight        | 82.70 (12.67)    |
| Post Weight       | 32.86 (4.25)    |
| Height            | 158.54 (5.77)    |
| Pre BMI           | 81.08 (12.64)    |
| Post BMI          | 32.16 (4.35)    |
| Types of Aqua Exercise |       |               |
| Jogging           | 24 (39.3)   |
| Zumba             | 22 (36.1)    |
| Control           | 15 (24.6)    |

4.2 Testing Overall Score of QoL Before and After Workout

To test the difference between overall QoL for the pre-workout and post-workout, we used the Wilcoxon signed rank test since the data was not normally distributed. The table 2 below shows that the highest score of overall total post – overall total pre were positive ranks with total of 39 respondents. This value means that majority (39 respondents) have the score of overall total post higher than the score of overall total pre. The mean value of positive and negative rank was 34.06 and 20.13 respectively. Whereas the significance level shown in table 3 concluded that the score between overall QoL for pre-workout and post-workout experiments was statistically significant since the p-value (0.000) < 0.05. Therefore, we can conclude that the two overall scores of QoL, for the group before and after joining the aqua workouts were significantly different and that the majority of the participants achieved a generally improved QoL after joining the 36-days aqua exercise program.
Table 2. The Negative and Positive Ranks Value of Overall Pre and Post.

|                  | n     | Mean Rank |
|------------------|-------|-----------|
| Overall Total Post – Overall Total Pre | Negative Ranks | 19<sup>a</sup> | 20.13 |
|                  | Positive Ranks | 39<sup>b</sup> | 34.06 |
|                  | Ties          | 3<sup>c</sup>  |  |

*Overall Total Post < Overall Total Pre* <sup>a</sup>*Overall Total Post > Overall Total Pre* <sup>b</sup>*Overall Total Post = Overall Total Pre* <sup>c</sup>

Table 3. The Differences between Overall QoL Score for Pre and Post Workout.

|                  | Z-Value | P-Value |
|------------------|---------|---------|
| Overall Total Post – Overall Total Pre | -3.662  | 0.000   |

Table 4. The Negative and Positive Ranks Value of Total Pre and Post Score within Domains of QoL.

|                  | n     | Mean Rank |
|------------------|-------|-----------|
| Total Post PF – Total Pre PF | Negative Ranks | 15<sup>a</sup> | 16.83 |
|                  | Positive Ranks | 37<sup>b</sup> | 30.42 |
|                  | Ties          | 9<sup>c</sup>  |  |
| Total Post RF – Total Pre RF | Negative Ranks | 18<sup>d</sup> | 24.03 |
|                  | Positive Ranks | 24<sup>e</sup> | 19.60 |
|                  | Ties          | 19<sup>f</sup> |  |
| Total Post BP – Total Pre BP | Negative Ranks | 13<sup>g</sup> | 16.85 |
|                  | Positive Ranks | 18<sup>h</sup> | 15.39 |
|                  | Ties          | 30<sup>i</sup> |  |
| Total Post GH – Total Pre GH | Negative Ranks | 8<sup>j</sup>  | 22.38 |
|                  | Positive Ranks | 42<sup>k</sup> | 26.10 |
|                  | Ties          | 11<sup>l</sup> |  |
| Total Post Vitality – Total Pre Vitality | Negative Ranks | 19<sup>m</sup> | 18.37 |
|                  | Positive Ranks | 20<sup>n</sup> | 21.55 |
|                  | Ties          | 22<sup>o</sup> |  |
| Total Post SF – Total Pre SF | Negative Ranks | 15<sup>p</sup> | 24.60 |
|                  | Positive Ranks | 32<sup>q</sup> | 23.72 |
|                  | Ties          | 14<sup>r</sup> |  |
| Total Post MH – Total Pre MH | Negative Ranks | 14<sup>s</sup> | 20.36 |
|                  | Positive Ranks | 28<sup>t</sup> | 22.07 |
|                  | Ties          | 19<sup>u</sup> |  |
| Total Post HT – Total Pre HT | Negative Ranks | 10<sup>v</sup> | 25.10 |
|                  | Positive Ranks | 36<sup>w</sup> | 23.06 |
|                  | Ties          | 15<sup>x</sup> |  |

<sup>a</sup>Total Post PF < Total Pre PF<sup>b</sup>Total Post PF > Total Pre PF<sup>c</sup>Total Post PF = Total Pre PF<sup>d</sup>Total Post RF < Total Pre RF<sup>e</sup>Total Post RF > Total Pre RF<sup>f</sup>Total Post RF = Total Pre RF<sup>g</sup>Total Post BP < Total Pre BP<sup>h</sup>Total Post BP > Total Pre BP<sup>i</sup>Total Post BP = Total Pre BP<sup>j</sup>Total Post GH < Total Pre GH<sup>k</sup>Total Post GH > Total Pre GH<sup>l</sup>Total Post GH = Total Pre GH<sup>m</sup>Total Post Vitality < Total Pre Vitality<sup>n</sup>Total Post Vitality > Total Pre Vitality<sup>o</sup>Total Post Vitality = Total Pre Vitality<sup>p</sup>Total Post SF < Total Pre SF<sup>q</sup>Total Post SF > Total Pre SF<sup>r</sup>Total Post SF = Total Pre SF<sup>s</sup>Total Post MH < Total Pre MH<sup>t</sup>Total Post MH > Total Pre MH<sup>u</sup>Total Post MH = Total Pre MH<sup>v</sup>Total Post HT < Total Pre HT<sup>w</sup>Total Post HT > Total Pre HT<sup>x</sup>Total Post HT = Total Pre HT

3.3 Testing the 8 Domains of QoL Before And After Workout

To test the differences between the 8 domains of QoL for pre-workout and post-workout, the Wilcoxon signed rank test was used since each of the domains tested were not normally distributed. Table 4 shows 5 out of 8 domains that have the highest positive ranks value where the total post greater than total pre score within domains of QoL were physical functioning with respondents of 37 (30.42), role functioning with respondents of 24 (19.60), general health with respondents of 42 (26.10), social functioning with respondents of 32 (23.72), mental health with respondents of 28 (22.07) and health transition with respondents of 36 (23.06). The remaining domains were bodily pain and vitality has the same score between total post and pre with respondents of 30 and 22 respectively.
Based on the table 5, only 5 domains were significantly different for the pre-workout and post-workout, which are: physical functioning, general health, social functioning, mental health and health transition (p-value < 0.05). The remaining 3 domains (role functioning, bodily pain and vitality) were not found to be significantly different (p-value > 0.05).

Therefore, it can be concluded that majority of the participants have felt improvements in 5 out of 8 domains of QoL, which are: physical functioning, general health, social functioning, mental health and health transition. However, in 3 out of 8 domains, the participants felt no improvement or lacking of improvements. The three domains are; role functioning, bodily pain and vitality.

Table 5. The Difference between Total Pre and Post Score Within Domains of QoL.

| Domain               | Z-Value | P-Value |
|----------------------|---------|---------|
| Physical Functioning | -4.001  | 0.000   |
| Role Functioning     | -0.239  | 0.811   |
| Bodily Pain          | -0.571  | 0.568   |
| General Health       | -4.462  | 0.000   |
| Vitality             | -0.580  | 0.562   |
| Social Functioning   | -2.101  | 0.036   |
| Mental Health        | -2.103  | 0.035   |
| Health Transition    | -3.170  | 0.002   |

5. Conclusion
This study was to investigate the effectiveness of aqua exercises towards improving the QoL of obese women within the eight domains of QoL. The results shows that overall, the aqua exercise improved the QoL of the 61 obese participants significantly. There were also significant improvements found in the overall scores for 5 out of 8 domains of QoL exercises. Hence, the aqua exercises were effective in improving the overall QoL of obese women.

The five domains of QoL which were found to improve significantly are the physical functioning, general health, social functioning, mental health, and health transition. However, the other three domains of QoL which are role functioning, bodily pain and vitality were found not to have significant improvements in the QoL of obese women.

As stated in a study by Vécseyné Kovách, Kopkáné Plachy, Bognár, Olvasztóné Balogh, & Barthalos (2013), only a few domains will be significantly showing improvements in the QoL due to many unforeseen reasons. Among the biggest reasons are the duration of the experiment (36 days) were not enough to study improvements in a person’s body and the small sample size. Although the program started of with quite a number of participants, however, due to the human nature, it can’t be avoided to have a portion of drop-outs throughout the experimentation period.

6. Recommendation
For the future study, we recommend to investigate the effectiveness regarding the types of aqua exercises (aqua Zumba & aqua jogging) in further investigating the important domains in improving the QoL of obese women. It is also important to have a bigger sample size for future studies.

7. Acknowledgement
We would like to acknowledge the Universiti Teknologi Mara Shah Alam and Studies Faculty of Computer and Mathematical Sciences for giving opportunities to us to carry out this research. We would also acknowledge to our advisor Puan Hezlin Aryani binti Abd Rahman, Ms Maisarah binti Shari and other lecturers for giving advice and support to finish this research.
References

[1] Ismail, M. N., Chee, S. S., Nawawi, H., Yusoff, K., Lim, T. O., & James, W. P. T. (2002). Obesity in Malaysia. *Obesity Reviews, 3*(3), 203–208. https://doi.org/10.1046/j.1467-789X.2002.00074.x.

[2] Kantyka, J., Herman, D., Rocznioł, R., & Kuba, L. (2015). Effects of Aqua Aerobics on Body Composition, Body Mass, Lipid Profile, and Blood Count in Middle-Aged Sedentary Women. *Human Movement, 16*(1), 9–14. https://doi.org/10.1515/humo-2015-0020.

[3] Lim, K. G. (2016). A review of adult obesity research in Malaysia. *Medical Journal of Malaysia, 71*, 1–19. https://doi.org/10.4103/0022.

[4] Madhankumar, M., & Sundar, D. M. (2016). Effect of aqua aerobic exercises and aerobic exercises on body mass index parameters among college men students. *International Journal of Innovative Knowledge Concepts, 2*(9). Retrieved from http://www.ijikc.co.in/sites/ijikc/index.php/ijikc/article/view/259.

[5] Ministry of Health Malaysia. The National Health & Morbidity Survey (NHMS) (2015). *VOLUME II: Non-Communicable Diseases, Risk Factors & Other Health Problems*.

[6] New, F., & Somani, B. K. (2016). A Complete World Literature Review of Quality of Life (QOL) in Patients with Kidney Stone Disease (KSD). *Current Urology Reports, 17*(88), 1–6. https://doi.org/10.1007/s11934-016-0647-6.

[7] Oh, S., Lim, J.-M., Kim, Y., Kim, M., Song, W., & Yoon, B. (2015). Comparison of the effects of water- and land-based exercises on the physical function and quality of life in community-dwelling elderly people with history of falling: A single-blind, randomized controlled trial. *Archives of Gerontology and Geriatrics, 60*(2), 288–293. https://doi.org/10.1016/j.archger.2014.11.001.

[8] Pasetti, S. R., Gonçalves, A., & Padovani, C. R. (2012). Continuous training versus interval training in deep water running: health effects for obese women. *Revista Andaluza de Medicina Del Deporte, 5*(1), 3–7. https://doi.org/10.1016/S1888-7546(12)70002-3.

[9] Rand Corporation (n.d). 36-Item Short Form Survey (Sf-36) Scoring Instructions. Retrieved from https://www.rand.org/health/surveys_tools/mos/36-item-short-form/scoring.html

[10] Theofilou, P. (2013). Quality of life: Definition and measurement. *Europe’s Journal of Psychology, 9*(1), 150–162. https://doi.org/10.5964/ejop.v9i1.337.

[11] Vécseyné Kovách, M., Kopkáné Plachy, J., Bognár, J., Olvasztóné Balogh, Z., & Barthalos, I. (2013). Effects of Pilates and aqua fitness training on older adults’ physical functioning and quality of life. *Biomedical Human Kinetics, 5*(1), 22–27. https://doi.org/10.2478/bhk-2013-0005.

[12] World Health Organization (2016). Obesity and overweight. Retrieved from http://www.who.int/mediacentre/factsheets/fs311/en/

[13] Wouters, E. J. M., Van Nunen, A. M. A., Geenen, R., Kolotkin, R. L., & Vingerhoets, A. J. J. M. (2010). Effects of Aquajogging in Obese Adults: A pilot study. *Journal of Obesity, 2010*. https://doi.org/10.1155/2010/231074.