



The Effect Of MIIT Water And Land Exercise On Obese College Students

Yang Ruizhu ¹ and Chanchai Siriphan ²

¹ Faculty of Sports Science and Technology Bangkokthonburi University, Thailand

² Faculty of Sports Science and Technology Bangkokthonburi University, Thailand

¹ E-mail: 18646317678@163.com, ORCID ID: <https://orcid.org/0009-0006-4978-475X>

² E-mail: siriphan.cs@gmail.com, ORCID ID: <https://orcid.org/0009-0000-9981-655X>

Received 23/05/2023

Revised 30/05/2023

Accepted 05/06/2023

Abstract

Background and Aim: Currently, obesity presents itself as a grave concern within the public health sphere, and exercise-induced weight loss is regarded as the most practical, safe, and efficient method to address this issue. MIIT exercise is relatively popular recently. MIIT exercise has moderate intensity, high efficiency, and safety. However, there are few studies on the comparison of the fat reduction effect of different MIIT exercise forms. The objective of this study is to compare the effectiveness of these two interventions in terms of fat reduction at the same time and level of exercise.

Materials and Methods: This study will assess the efficacy of the MIIT water exercise program, MIIT land exercise program, INBODY 520, POLAR, and software package as primary tools to measure and analyze body weight, BMI, and body fat percentage. Specifically, the study will focus on 36 obese male college students, who will be randomly assigned to either MIIT water exercise or MIIT land exercise.

Results: After 12 weeks of exercise, the average weight of the MIIT land exercise group decreased by 0.87kg, the MIIT water exercise group decreased by 2.34kg; after 12 weeks of exercise, the mean BMI of the MIIT land exercise group decreased by 0.26, the water exercise group decreased by 0.7; after 12 weeks of exercise, the average body fat percentage of the MIIT land exercise group decreased by 1.5%, the MIIT water exercise group decreased by 3.22%.

Conclusion: MIIT water and land exercise Can help obese male college students to lose fat, but compared with MIIT land exercise, MIIT water exercise has more significant weight changes, BMI, and body fat percentage, at $P < 0.01$.

Keywords: MIIT Water Exercise; MIIT Land Exercise; Body Fat Percentage; Body Weight; BMI

Introduction

Obesity is a serious public health problem today, and the global obese population is expected to reach 1.12 billion by 2030 (Kelly, 2008). According to the famous magazine The Lancet, the obese population is also growing: more than 90 million people are obese, and 12 million have reached or exceeded the limit of severe obesity. Unconsciously, China has become the fattest country in the world. In recent years, the incidence of obesity has gradually become younger, and the incidence of obesity among adolescent college students has significantly accelerated. If it does not stop and continues to develop, it will cause for the health and growth of young people harm.

Obesity is a global problem that threatens human health. Obesity is a health problem that cannot be ignored. Correct assessment of the degree of obesity is of great significance for the prevention and treatment of obesity and weight loss. At present, body weight, BMI, and body fat percentage are the three important indicators of obesity.

Many obese people like to lose weight through running or water exercise, this way of action is relatively simple, and high acceptance, but the effect of different forms of exercise to lose fat is different, commonly used HIIT and MICT, HIIT has good weight loss effect but not suitable for the elderly, children and sick people (Armstrong, 2006); MICT has weight loss effect but needs to persist for a long time (Slordah, 2005), MIIT is a new exercise training method, maybe MIIT can have a good weight loss effect but also can achieve the goal in a very short time. It is hoped that this experiment can provide a theoretical basis for the fat loss effect of MIIT and provide a new fast and effective way of fat loss for obese college students.



Objectives

1. To compare body weight reduction between MIIT land and water exercise.
2. To compare BMI reduction between MIIT land and water exercise.
3. To compare body fat percentage reduction between MIIT land and water exercise.

Literature Review

Engaging in physical activity not only aids in weight loss but also enhances overall well-being. It is crucial to scientifically validate the objectives and variations of exercise intervention programs. A popular method for exercising among obese individuals is performing moderate-intensity exercise for over 60 minutes, known as MICT, which is effective in improving body weight, BMI, and body fat percentage (Wewege, 2007). MICT is commonly defined as a continuous form of movement at 55% to 75% HRmax (Slordah, 2005) with a moderate intensity level, and it is frequently utilized (even in some conditions). However, its long duration can sometimes become tedious and requires a certain level of perseverance. In today's fast-paced lifestyle, lack of time and interest can be a significant obstacle for young people to participate in physical exercise.

The concept of intermittent exercise was first introduced by German cardiologist Leder and teacher Beschler in the 1950s. There are primarily three categories of intermittent exercise methods, namely high-intensity intermittent exercise (HIIT), intensive intermittent exercise (including type A and type B), and developmental intermittent exercise. HIIT is a brief, high-intensity workout routine that involves 75%-95% HRmax (Armstrong, 2006), coupled with low-intensity exercise or rest (Gibala, 2012). HIIT has garnered significant interest among researchers as a means of aiding in weight loss and weight control, with several studies demonstrating its efficacy in reducing body weight, BMI, and body fat percentage among obese adults. However, there have been inconsistencies in the findings of other studies (Dlask, 2017). High-intensity exercises (such as HIIT) may require more rest time due to the greater intensity of the workout, and some individuals (such as the elderly or children) may be at greater risk.

Recent research indicates that there is another form of exercise called moderate-intensity interval exercise (MIIT), which shares a basic structure with high-intensity intermittent exercise (HIIT) but has a lower overall intensity. During MIIT, heart rates are controlled to range from 60% to 90% of the maximum. MIIT has been found to be effective in promoting weight loss, reducing body mass index (BMI), and lowering body fat percentage. Multiple studies have been conducted on the effects of MIIT and HIIT on obese adults, and they showed an increase in fat loss after MIIT intervention. In addition, although both MIIT and HIIT interventions resulted in an increased preference for all food categories, there was a significant reduction in appetite after the interventions. Few reports exist pertaining to MIIT intervention and body composition in obese adolescents, however, direct observation of MIIT intervention on obese girls demonstrated lower body weight and fat percentage. Currently, the MIIT intervention study on obesity in China is in its exploratory stage, but due to the potential advantages of MIIT, it has a relatively high research value and its intensity could be acceptable to more people.

Water exercise is a unique fitness program that offers benefits such as entertainment, safety, and unique properties like static pressure, resistance, buoyancy, and thermal conductivity. The body experiences reduced pressure on muscles and joints in water, making it an effective form of exercise for combating obesity, reducing sports injuries, and protecting joints. Unfortunately, this type of exercise has not yet become popular in China's fitness industry. While studies have been conducted on HIIT and MICT exercises, MIIT exercises for obesity are still in their experimental stages. However, MIIT exercises may have many advantages as their intensity can be accepted by a wider audience. Therefore, this research aims to examine the effects of MIIT water and land exercises on body weight, BMI, and body fat percentage in obese students. The results of this study can serve as a theoretical reference for the MIIT water and land movements.

Conceptual Framework

The research title "The Effect Of MIIT Water And Land Exercise On Obese College Students" was designed as the conceptual framework as followed

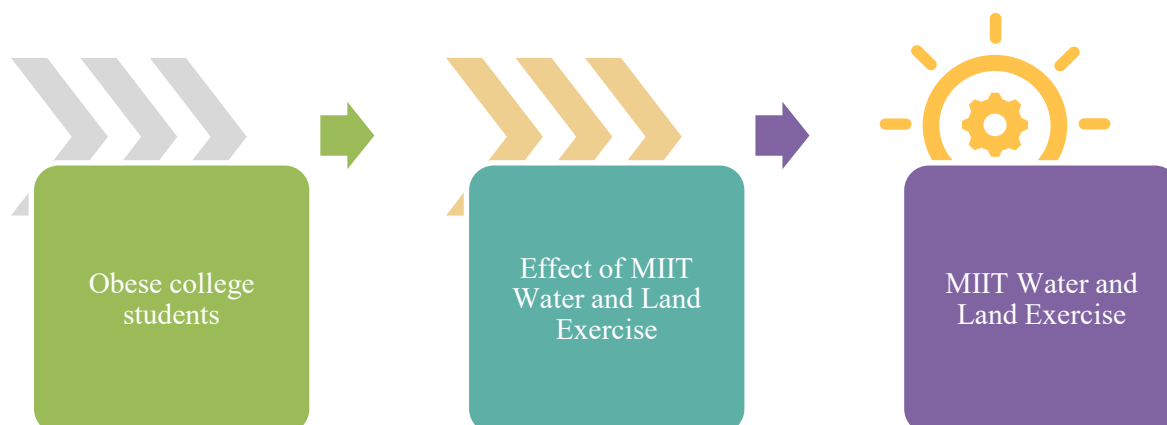


Figure 1 Research Conceptual Framework

Research Hypothesis

The following hypothesizes will be proved:

1. MIIT water exercise was more body weight reduction than MIIT land exercise.
2. MIIT water exercise was more BMI reduction than MIIT land exercise.
3. MIIT water exercise was more body fat percentage reduction than MIIT land exercise.

Methodology

At Harbin Institute of Physical Education, 36 obese male college students (BMI 26-28), aged between 20 and 22 years old, were recruited, 1.74M-1.84M in height and weighed in 78.7KG-94.8KG, body fat percentage $\geq 19\%$. Their body weight has remained stable over the past 90 days. Body weight, BMI, and body fat percentage were similar.

They were randomly divided into two groups of 18 individuals, There was no difference in body weight, BMI, or fat percentage rate. Before the experiment, all of the volunteers were tested, and 36 volunteers did not have cardiovascular disease and also did not use any medication at this stage. Volunteers were analyzed by bioelectrical impedance (INBODY520 tester) before the exercise intervention, including height, weight, BMI, and body fat percentage.

Research tools

1. MIIT water Exercise program.
2. MIIT Land Exercise program.
3. Body indicators were measured by INBODY 520, The device is operated by a hospital physician. Before the test, the test object must be empty, light, and close-fitting, and shall not wear rings, necklaces, and other metal items. During the test, maintain an upright posture.
4. POLAR cardio tachometer (H10, Polar, Finland Monitor exercise heart rate, During the training period, the volunteers wore a chest to monitor the heart rate, detected the cardiac electrical signals through sensors connected to the chest band, and converted the signal to the heart rate data.
5. Software package is used for data collection and analysis.

Before and after the intervention using the software package statistical analysis of the data, the normal distribution of all measurement tests k, Levene homogenous variance test, in the form of \pm standard deviation (mean \pm SD) and T-test, and the non-normal distribution data are displayed using the median. For disobedient data, analysis after log conversion to normal or approximately normal distribution; baseline data with normal distribution, use multivariate As this study showed significant differences between the basal valves according to the subject body weight, MI, and body fat percentage.

Research plans: This is part of a comparative study with an experimental design where 36 volunteers were divided into two groups at random. Both groups underwent exercise intervention consisting of moderate-intensity interval exercises on both land and water for 12 weeks, four times a week. The exercise program started with a 5-minute warm-up followed by 1 round of 60 seconds



interval exercises with 85% HRmax, then another round of 60 seconds interval exercises with 65% HRmax. This was repeated five times per set, and each group performed three sets. Between sets, there was a rest period of 2 minutes, and a cooling down period of 5 minutes at the end of the program, totaling 44 minutes.

The pre-and post-experimental body weight, BMI, and body fat percentage were collected as the experimental data; (1) Body weight, BMI, and body fat percentage index data were collected: Before and after exercise intervention, height, weight, BMI, and body fat percentage data were collected using a Korean INBODY (Korea) analyzer. And (2) Heart rate monitoring: In each training session, let the students wear the chest as required, record the heart rate information, and test the training intensity as MIIT.

Testing and data collection methods: Before and after the intervention using the software package statistical analysis of the data, the normal distribution of all measurement tests k, Levene homogenous variance test, in the form of \pm standard deviation (mean \pm SD), and the non-normal distribution data are displayed using the median. For disobedient data, analysis after log conversion to normal or approximately normal distribution; As this study showed significant differences between the basal values according to the subject group.

Results

Table 1 Physical Data of Two Groups of college students

Changes in 12 weeks of training										
Test	MIIT land exercise				MIIT water exercise				T-test for two groups after the experiment	
Specification	Before	After	T	P	Before	After	T	p	T	p
Weight (KG)	88.19±1.06	87.32±0.52	4.53	<0.01	87.74±1.43	85.40±0.96	6.17	<0.01	7.45	<0.01
BMI	26.51±0.29	26.25±0.36	4.54	<0.01	26.39±0.33	25.69±0.46	6.12	<0.01	4.10	<0.01
Fat Percentages Rate (%)	27.30±0.92	25.80±1.05	12.36	<0.01	27.43±0.84	24.21±1.30	18.67	<0.01	4.03	<0.01

The result of the table1:

1. Body weight: After 12 weeks of exercise, the average weight of the MIIT land exercise group decreased by 0.87kg, a significant decrease compared with the experiment ($P < 0.01$); the average weight of the MIIT water exercise group decreased by 2.34kg, a very significant decrease compared with the experiment ($P < 0.01$). The weight difference between the two groups after the experiment ($P < 0.01$).

2. BMI: After 12 weeks of exercise, the mean BMI of the MIIT land exercise group decreased by 0.26, a significant decrease compared with the experiment ($P < 0.01$); the mean BMI of the MIIT water exercise group decreased by 0.7, a significant decrease compared with the experiment ($P < 0.01$). The BMI of the two groups was significant after the experiment ($P < 0.01$).

3. Body fat percentage: after 12 weeks of exercise, the average body fat percentage of the MIIT land exercise group decreased by 1.5%, which was significantly reduced compared with the experiment ($P < 0.01$); the average body fat percentage of the MIIT water exercise group decreased by 3.22%, significantly compared with the experiment ($P < 0.01$). The body fat percentage between the two groups after the experiment ($P < 0.01$).

Discussion

1. The findings presented in Table 1 demonstrate that both the MIIT water and land exercises had distinct and notable impacts on body weight ($P < 0.01$), resulting in significant reductions in weight for both groups. The study showed a significant difference ($P < 0.01$) in body weight between the two groups, along with extreme changes in body weight from the beginning to the end of the experiment ($P < 0.01$). These results indicate that both HIIT exercise methods can effectively reduce body weight through prolonged aerobic exercise, reducing body fat percentage. The water environment has unique characteristics, with greater heat loss and greater resistance than land-based movement. This results in



greater energy consumption during water exercise, leading to better weight reduction effects compared to land exercise under similar conditions. This finding is consistent with Fan Wenhua (2013) pointed out in the study on the fitness effect of water aerobics that after three months of water aerobics training, young women have lost weight significantly, their body lines are softer and their body is more symmetrical. At the same time, Katz, J.E (2013) in Swimming for Total Fitness Studies has found that water aerobics can not only reduce the injuries caused by exercise, reduce the chance of injury during exercise, but also provide rehabilitation training for people with physical disabilities and injuries. It also points out that water training is more effective in physical training and fat reduction than land training. Thus, in conclusion, MIIT water exercise can more effectively reduce the weight of obese male college students.

2. The study revealed that both the MIIT land exercise group and the MIIT water exercise group experienced a decrease in BMI, with the former decreasing by 0.26 and the latter by 0.7. Furthermore, the BMI change in both groups was deemed very significant ($P < 0.01$) before and after the experiment. According to Ma Ying (2013) in a Study on the fitness effect of water aerobics on ordinary obese female college students. It is pointed out that female college students lose the excess fat in their bodies after their body shape is improved, and the BMI index decreases significantly. If they can adhere to water aerobics training for a long time, they can maintain their body shape and make the body fitter, and the BMI index continues to get better; Wang Meng (2005) in an Experimental study on the comparison of water aerobic exercise and onshore aerobic exercise Pointed out: compared to the land aerobic exercise, after a period of water aerobics training, can greatly reduce the body fat content and improve the body each part of the circumference, make the body fat distribution more evenly, BMI also become smaller, if can match reasonable diet, water aerobic exercise fat reduction effect will be more significant. Thus, in conclusion, The MIIT water exercise can more effectively low BMI.

3. The experiment resulted in a significant reduction in body fat percentage and a subsequent decrease in body weight for both groups. The combined body fat rate of the groups decreased significantly as well. However, the MIIT water exercise proved to be more effective in reducing body fat percentage. Both MIIT training had a significant effect on the groups' body fat percentage ($P < 0.01$). Before the experiment, there was no significant difference in the body fat percentage between the two groups. Post-experiment, the MIIT land exercise group saw a 1.51% decrease in body fat percentage, while the MIIT water exercise group saw a 3.22% decrease. This difference was considered highly significant ($P < 0.01$). This finding is consistent with Katz, J.E (2013) in Swimming for Total Fitness Studies have found that water aerobics can not only reduce the damage caused by exercise, effectively reduce body fat percentage, and reduce the chance of injury during exercise, but also carry out rehabilitation training for physically disabled and injured people; Katz. Jane also pointed out that water training is more effective in physical training and reduces body fat percentage than land training. Thus, in conclusion, the results show that the MIIT water exercise group has a more significant effect on improving the body fat percentage of obese male college students.

Recommendations

1. MIIT exercise approaches can effectively reduce body weight, body fat percentage, and BMI through prolonged aerobic exercise-induced body fat consumption. Nevertheless, the MIIT water exercise is more effective and should be prioritized for weight loss.

2. We are experimenting on male college students who are overweight. When implementing these two exercise techniques, it's important to take into account the physical condition of each individual and not simply replicate the same routine. For instance, older participants must be mindful of their exercise intensity and difficulty levels.

3. The potential for international growth of MIIT water exercise is high despite a comparably low market saturation and insufficient talented professionals. Chinese sports workers must expand their research in MIIT water sports. This can help enhance sports content, delve into relevant studies, and offer a comprehensive base for MIIT and water sports in China.



References

- Armstrong, L., Balady, G., Berrry, M., & et al. (2006). ACSM's Guidelines For Exercise Testing and Prescription. *Journal of physical therapy*, 190- 192.
- Blask, A., Ingul, C.B., Tonning, A.E., & et al. (2017).Effect of High-Intensity Interval Training on Fitness, Fat Mass and Cardiometabolic Biomarkers in Children with Obesity: A Randomised Controlled Trial. *Journal of Sports Medicine*, 48 (3), 733-46.
- Fan, W., (2013). Effect analysis of water aerobics on the body form of young women. *Journal of Jiaying College*, 31 (02), 87-91
- Gibala, M.J., Little, J.P., Macdonald, M.J., & et al. (2012). Physiological adaptations to low-volume, high-intensity interval training in health and disease. *Journal of Physiology*, 590 (5), 1077.
- Katz, J., (2013). Swimming for Total Fitness. *Journal of Sports and Exercise*, 35, 853~856.
- Kelly, T., Yang, W., Chen, C.S., & et al. (2008). Global burden of obesity in 2005 and projections to 2030. *Journal of Int J Obes (Lond)*, 32 (9), 1431-1437.
- Ma, Y., (2013). Study on the fitness effect of water aerobics on ordinary obese female college students. *Small and medium-sized enterprise management and technology (published)*, (05), 245-246.
- Slordah, S.A., & Wange, et al. (2005).Effective training for patients with intermittent claudication. *Journal of Scandinavian Cardiovascular*, 39 (4), 244.
- Wang, M., (2005). *Experimental study on the comparison of water aerobic exercise and onshore aerobic exercise*. East China Normal University.
- Wewege, M., Van Denberg, R., Ward, R.E., & et al. (2017).The effects of high-intensity interval training vs. moderate-intensity continuous training on body composition in overweight and obese adults: a systematic review and meta-analysis. *The Journal of Obesity Reviews*, 18 (6), 635-46.