

SOUTH BAYLO UNIVERSITY

**Effects of Jia Wei Fang Ji Huang Qi Tang on Metabolically Healthy Obesity (MHO)
in Middle-aged Women: Case Series**

by

In Ok Lee

**A RESEARCH PROJECT SUBMITTED
IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE**

Doctor of Acupuncture and Oriental Medicine

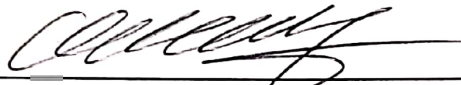
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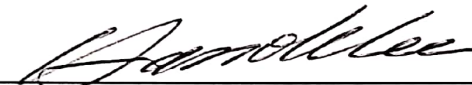
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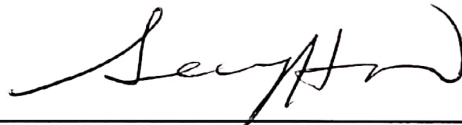
Shan Qin Cui, OMD, L.Ac, Professor



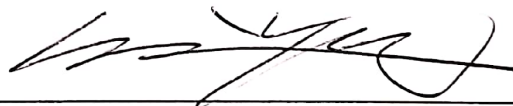
Ki Haeng Cho, Ph. D, L.Ac, Professor



Hanok Lee, DAOD, L.Ac, Professor, Clinic Supervisor



Seong Hwa Hue, DAOM, L.Ac, Doctoral Clerkship Coordinator



Joseph H. Suh, Ph.D, OMD, L.Ac, Doctoral Research Coordinator

South Baylo University

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South Baylo University

Research Advisor: Jaejong Kim, MD, OMD, L.Ac.

ABSTRACT

The view that "Obesity is a potential disease that needs to be actively treated" is the fact that is currently recognized in both Eastern and Western medicine. In recent years, the stability and therapeutic properties of the various methods of Oriental medicine for the treatment of obesity began to receive attention. This study was carried out in response to such a trend, to evaluate one of the main treatments of drug therapy in oriental medical for obesity. The purpose of the study is to assess the effectiveness of *Jia Wei Fang Ji Huang Qi Tang* in the treatment of Metabolically Healthy Obesity (MHO) in middle-aged women, and to contribute to the development and dissemination of standard oriental medicines for obesity treatment in general. The study consisted of 6 patients who aged over 40 to under 60 years old, reported body mass index (BMI; kg/m²) over 25 to under 35, did not have metabolic diseases, and did not have severe cognitive or mental disorders. Participants (n=6) were treated for 6 weeks, only with the decoction, *Jia Wei Fang Ji Hung Qi Tang*. During the time, they were not required to control their eating and life style changes. As the result, there were significant differences for body

weight loss, BMI loss, and waist circumference loss with this herbal medicine treatment for 6 weeks. The Cumulative Body Weight Mean Difference was changed from $80.7 \pm 2.57\text{kg}$ to $76.8 \pm 1.11\text{kg}$ ($p=0.001$) after 6 weeks treatment, and it was kept on $76.8 \pm 1.17\text{kg}$ ($p=0.004$) until after 4 weeks of end-session. And the Cumulative BMI (kg/m^2) Mean Difference was changed from 30.3 ± 1.07 to 28.9 ± 1.36 ($p=0.001$) after 6 weeks treatment, and it was 28.8 ± 1.44 ($p=0.036$) after 4 weeks of the end of treatment. These finding report that the weight lost state is maintained and suggest that *Jia Wei Fang Ji Huang Qi Tang* has statistically significant effect to treat obesity for Metabolically Healthy Obesity (MHO) in middle-aged women.

Key words: *Obesity, Weight control, Fang Ji Huang Qi Tang, Acupuncture and Oriental medicine, Herbal medicine*

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ACKNOWLEDGEMENTS

Spring 2011, I didn't know that my first step of studying in Oriental medicine, which started with 'None of Knowing', would make this long journey to the highest level of academic. For many moments, and I've been overwhelmed with the rush of how to go further and what for next. 'A miracle', that's only expression that comes to mind to describe this moment that I am now completing my final steps after I've passed those rough moments. Thank God for allowing me to have these honorable moments in my life.

I would like to give an appreciation to everyone who helped me academically and emotionally during the studying: my sincere gratitude towards my research advisor, Jaejong Kim, MD, OMD, L.Ac., host family Mr. & Mrs. Kim (Sehna's family), and an angel-like-friend, Rina Kim.

And, I would like to express a special thanks to Dr. Joseph H. Suh, Ph D, OMD, L.Ac. who made me keep this vast knowledge of Oriental Medicine in my head through the entire period of my Master to Doctoral course and helped me to complete this dissertation until the last minute.

Lastly, I owe a special thanks to my mother and my family in Korea for their support. I love you all.

December 2019

In Ok Lee

I. INTRODUCTION

Obesity can cause serious health problems and is associated with a decrease in quality of life. This is also known as a risk factor for chronic diseases such as hypertension, diabetes, cardiovascular disease and tumors^{1,2)}. In recent years, obesity rates are increasing surprisingly in the world, whether developing countries or developed countries, even though it is more emphasized the need for awareness and management by classifying obesity itself as a disease^{3,4)}. According to the 2010 Korean Adult Health Nutrition Survey, 31% of adults were obese⁵⁾. In 2008, according to the statistics, 68% of the adult population in the US were already obese or overweight, and according to 2014 statistics, 2.1 billion people, which means 30% of the world's population, were classified as obese or overweight^{6,7)}. If the current trend increases, it is estimated that by 2030, about 50% of the world's adult population will be diagnosed as obese or overweight⁸⁾. One fact is that women are more likely to be obese than men⁹⁾, and it is the fact that the obese population of women in Southeast Asia is twice as much as men¹⁰⁾.

Obesity treatments through various diets and exercise regimens have been attempted, but the effects were relatively short-term, which meant, about two-thirds of obese people returned their original weight within a year, and within five years it had been reported to be restored to the original weight in almost all cases¹¹⁾. Therefore, there has been many attempts to increase the efficiency and persistency of obesity treatment by conducting active interventions such as drug therapy or surgery for patients with high obesity or complications of obesity¹²⁾. However, only a handful of obesity treatment drugs approved by the U.S. Food and Administration (FDA), and the available drugs, which

can be prescribed for a long period of time such as more than six months, are extremely limited. Thus, recently, there is a steady increase in the medical interest in the obesity treatment and safety of herbal drugs that have emerged with various studies in recent years¹³). Oriental obesity treatment in the clinical field has been made in a significant frequency and it has been included prescriptions of herbal medicine in most treatments and the patient's satisfaction has been also known to be quite high. However, in most studies, it was accompanied by other medical auxiliary means such as acupuncture, electro acupuncture, food therapy, Qi-Gong or Tui-Na therapy, so the verification of the individual effects of the herbal medicine was not clear. In addition, the standard herbal prescription for obese treatment was also insufficient.

This study was performed to create a clinical case report for one of the main herbal medicines, *Fang Ji Huang Qi Tang*, for treatment obese mainly performed to date, and to devine an experimental significance of only herbal medicine for obese therapy through systematic and statistical analysis, and finally to evaluate the effectiveness and safety of this herbal drug. *Fang Ji Huang Qi Tang* is a prescription to remove damp-phlegm, which is a representative cause of obesity in middle-aged women of simplicity obesity that does not have metabolic diseases. However, the ingredients of *Fang Ji Huang Qi Tang* sold in markets were not unified in each manufacturer and it seemed difficult to expect an effective weight loss with the classical herbal prescription, it would be best to prescribe of my own prescription. I added some herbs in classical *Fang Ji Huang Qi Tang* and named it *Jia Wei Fang Ji Huang Qi Tang*. Through this, I tried to present a basis for the universal clinical application of herbal obesity drugs, and to see its possibility of commercialization as an effective and safe obesity drug.

This was also for presenting the possibility of a further study on the standard prescription for obesity treatment.

OBJECTIVES

This is a study on the effects and side effects of *Jia Wei Fang Ji Huang Qi Tang*, the main herbal drug used in the oriental treatment of obesity. The purpose of this study is to assess the effectiveness of *Jia Wei Fang Ji Huang Qi Tang* for obesity treatment and to learn about its potential as a standard drug for obesity treatment.

The detailed objectives for the performance of this study are as follows:

1. Analyzed the weight loss effect of *Jia Wei Fang Ji Huang Qi Tang* as an herbal obesity treatment through systematic examination of each clinical case.
2. Measured the waist circumference reduction in each case, for using it as a secondary indicator in the evaluation of improvement of obesity.
3. Evaluated the effectiveness and safety of the single-prescription therapeutic effect of this herbal obesity treatment.
4. Reviewed the possibilities for the standardization of this herbal obesity treatment drug and present the further research direction for herbal obesity treatments.

LITERATUE REVIEW

1. 1. Obesity

Obesity can be defined as a disease that can be adversely affected by excessive accumulation of body fat ¹⁴⁾. It may occur in situations where food intake is greater than the energy consumed, wherein the energy of the surplus contributes to the accumulation of fat in the body. Obesity is caused by both genetic influences and environmental influences, which can cause health problems across all ages. The World Health Organization (WHO) has already defined obesity as a "global epidemic" in 2005 by announcing this: The world's overweight population was 1.6 billion in 2005 and 2.3 billion in 2015 ^{15), 16)}. Socially and psychologically, many people tend to think of obesity as a cosmetic problem, but obesity is actually a serious disease. Because it is a key cause of type 2 diabetes, hypertension, cardiovascular disease, respiratory diseases, osteoarthritis, etc. ¹⁷⁾. According to literature reviews, more than 80 percent of diabetics are overweight, which shows that obesity is a major factor in type 2 diabetes. The higher sugar index, the higher the type 2 diabetes induced. According to the research report, weight loss leads to significant improvements in metabolic control and expectations for lifespan ^{18,19)}. Especially for women, fat accumulation is considered a major factor in metabolic disorders ²⁰⁾. In addition, obesity has been reported to affect the occurrence and progress of a variety of cancers, including breast cancer in menopausal women, obesity acts as a trigger factor in about 25% of all cancers, and it has been reported to get worsen the mortality rate of most cancer patients ^{21,22)}.

1. 2. Metabolically Healthy Obesity (MHO)

Metabolically healthy obesity or metabolically-healthy obesity (MHO) is a medical condition characterized by obesity which does not produce metabolic complications.²³⁾ There is no universally accepted criteria exist to define putative MHO, but definitions generally require the patient to be obese and to lack metabolic abnormalities such as dyslipidemia, impaired glucose tolerance, or metabolic syndrome.²⁴⁾ MHO individuals display less visceral adipose tissue, smaller adipocytes, and a reduced inflammatory profile relative to metabolically unhealthy obese individuals.^{25, 26)} Prevalence estimates of MHO have varied from 6 to 75 percent,²⁷⁾ and it has been argued that between 10 and 25 percent of obese individuals are metabolically healthy.²⁸⁾ One study found that 47.9% of obese people had MHO, while another found that 11% did.²⁴⁾ It seems to be more prevalent in women than men, and its prevalence decreases with age.²⁹⁾

2. BMI (kg/m²): Diagnostic criteria for obesity

The most commonly used criteria for the diagnosis of obesity is Body Mass Index, (BMI). Body Mass Index is calculated as body weight (kg)/ height (m)², and depending on this category, assess the degree of obesity and calculate statistics.³⁰⁾ However, obesity classification using BMI values are varied from Asian to Caucasian. In the view of Western, in the graded classification developed by the World Health Organization, BMI under 18.5 is classified as underweight, 18.5 to 24.9 is normal, 25.0 to 29.9 is overweight, and moderate obesity is from 30.0 to 34.9, high obesity is from 35.0 to 39.9, and over 40 denotes ultra-high obesity.³¹⁾ In the BMI classification of The Asia Pacific Standard, BMI from 23.0 to 24.9 is overweight, from 25.0 to 29.9 is obesity and over 30

is considered high obesity. However, body mass index is a limitation that does not detect variations in body composition because it does not separate the weight due to muscle weight and fat. It is necessary to compensate for this.³²⁾

Indicators such as Waist-to-hip ratio (WHR), circumference Waist (WC), waist-to-height ratio (WHtR) are used as indicators of obesity to compensate for these problems of body mass index and to more effectively measure health risks associated with obesity.^{33,34,35)}

3.1. Herbal Obesity Treatment Medications

Herbal drug therapy is the most used treatment method of obesity in Oriental medicine. It has been prescribed in various type of drugs. And recent laboratory and clinical studies are continuously increasing and reporting interesting results.³⁶⁾ However, herbal drug treatment varies depending on the diagnosis of the patient, in some cases, it's also occurs the patient-specific herb adjustment. Therefore, the standardization of herb-used or the efficient data processing of the treatment results is not easy to control.³⁷⁾

According to the document, the most commonly used herbal medicines in Korea are *Sasang-prescriptions*, such as *Tai-yin Tiao Wei* (太陰調胃) or *Tiao Wei Cheng Qi Tang* (調胃承氣湯), and *Fang Feng Tong Sheng San* (防風通聖散) and *Fang Ji Huang Qi Tang* (防己黃耆湯) are also used steadily. Recently, *Che-gam Yi Yi Ren Tang* (薏苡仁湯) and *Gambi Tang* (減肥湯) have been frequently prescribed around certain universities.³⁸⁾ The most frequent used medicines in China are reported to be *San Xia Jiang Qi Tang* (山荷降脂丸), *Gam Bi Tea* (減肥茶), *Do Dam Tang* (導痰湯), *Ling Gui Zhu Gan Tang* (苓桂朮甘湯), *Huo Xiang Zeng Qi San* (藿香正氣散), etc.³⁹⁾ Due to the limitations

and side effects of drug treatment of obesity in Western medicine, a variety of Chinese medicine is being attempted for the treatment of obesity in the United States and more and more studies have been reported. ^{40, 41)}

3.2. Evidence Theory of Using *Fang Ji Huang Qi Tang* for Obesity

From Oriental Medicine point of view, the etiology of obesity is to overeat or eating too much of greasy foods and it makes lost the transportation function of the stomach and spleen. When the losing transportation function of the stomach and spleen, it occurs heat, and the excessed heat boiled down body fluids small. And when if we had Yin Deficiency and got small body fluids, we became to want to intake foods vigorously to compensate it. That's the explanation of causing obesity. In addition, when if had Qi Deficiency, transportation function would be helpless, and it'd secondarily cause losing liquid metabolism function in the body. And it forms damp phlegm. This is seen as causing obesity. ^{42, 43)} This is where the Metabolically Healthy Obesity is in middle-aged women. In order to solve the cause of this obesity, *Fang Ji Huang Qi Tang* used in this experiment were mainly added herbs for supplementing and operating Qi in middle Jiao in the prescription configuration, were increased herbs to drain dampness, and let easy to fall the clogged wet and the wet stubs accumulated in the body by mixing the medicines to release exterior. And it was named newly *Jia Wei Fang Ji Huang Qi Tang*. The detailed drug configuration was described in Table 2.

II. MATERIALS AND METHODS

2.1. Study Design

This study was conducted at West Acupuncture Clinic in Long Beach, California between May and July 2019. Participants were taken the first diagnostic test and measured for weight loss results at every 2nd, 4th, and 6th weeks during the test for total of six weeks of treatment. It was confirmed once again whether the final result persisted in four weeks after the end of treatment. See the Figure 1.

2.2. Participants

A total of six obese participants were screened, and they were limited female aged between 40 and 60 years, middle-aged women, with a body mass index between 25 and 35, simple obese patients only. The criteria of obesity degrees were defined in the range of body mass index (BMI) 25 or more 35 or less, in accordance with pacific standards. The study was completed and conducted by detailing the purpose and procedures of the study to participants, and by selecting obese people who voluntarily expressed their intention to participate. See the detail in Table 1.

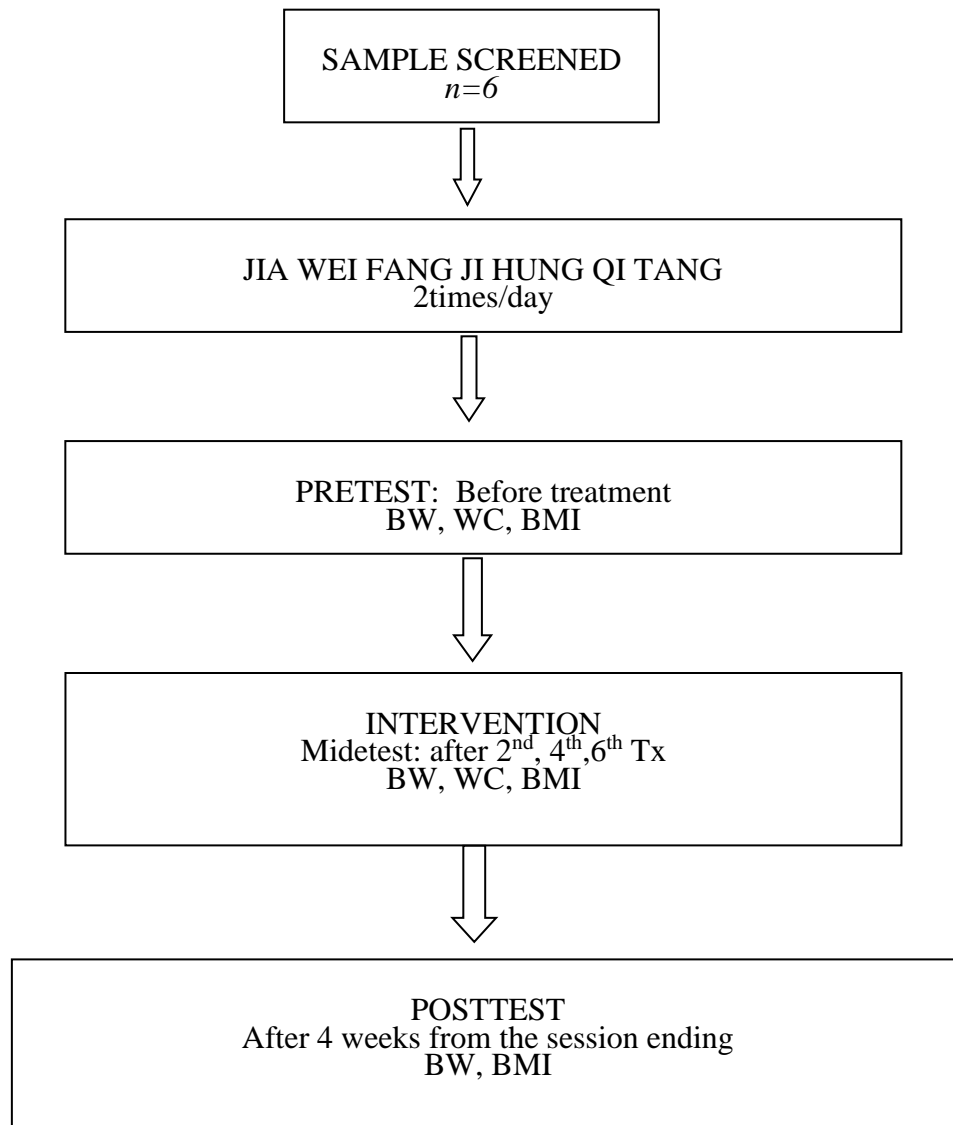


Figure 1. Schemetic Diagram of Trial Procedure

Table 1. Inclusion Criteria and Exclusion Criteria

Inclusion criteria

1. Age between 40 and 60 years old ($\geq 40, \leq 60$), Woman
2. Body mass index $> 25, < 35 \text{ kg/m}^2$

Exclusion criteria

1. Pregnant or lactating women
 2. Childbirth within 6 months
 3. Heart disease, for example, patient with pacemaker, myocardial infraction, cardiac failure
 4. Endocrine disease, for example, thyroid disorder
 5. Metabolic disease, for example, diabetes mellitus (IDDM, NIDDM)
 6. Stroke or otherwise unable to exercise
-

2.3. Treatment

Selected patients were not required to exercise or diet control and other lifestyle changes, but for six weeks of the experimental period, twice a day - after breakfast and dinner, was instructed to take *Jia Wei Fang Ji Huang Qi Tang* warmly. The herbal medicine composition provided is described in detail in Table 2.

Table 2. Jia Wei Fang Ji Huang Qi Tang (dosage of 1 pouch:110cc)

Astragalus Root	Huang Qi	4.5g
Sinomenium Stem	Fang Ji	4.5g
Glycyrrhizac Radix preparata	Gan Cao	3.75g
Ginger	Gan Jiang	3g
Jujube Fructus	Da Zao	3g
Atractylodes Rhizome (蒸)	Bai Zhu	4.5g
Coicis Semen(炒)	Yi Yi Ren	4.5g
Poriae	Chi Fu Ling	4.5g
Cyperi Rhizoma	Xiang Fu Zi	3.75g
Sojae Semen Praeparatum	Dan Du Chi	3.75g
Persicae Semen	Tao Ren	3.75g

2.4. Outcome Measurement

For evaluation, Weight of participants (BW; Body Weight), BMI (Body Mass Index; kg/m^2), and waist circumference (WC; Waist Circumference) were used as indicators of obesity improvement. Participants were examined by a third-party measurement person, not a participant or experimenter, at a designated location every two weeks. The scale used is a CVS Health brand, Digital Body Analysis Scale. The weight measured was used up to one digit of decimal point.

2.5. Statistical Analysis

Statistical analysis and graphs were used in the R program. R version 3.6.1 (2019-07-05)- “Action of the Toes” Copyright ©2019 The R Foundation for Statistical Computing. To see the significance of the difference before and after treatment of BMI and Body Weight, I performed the paired sample t-test after checking of normalization. The reliability was determined that there was a statistically significant difference in the case of $p\text{-value} < 0.05$ or less.

2.6. Ethical Review

The proposal for this study was submitted to the Institutional Review Board of South Baylo University on March 7, 2019 to review and approved.

III. RESULTS

3.1. Results for each case

3.1.1. The State of First Medical Examination

The pre-test condition of the participants in this study, simple obese middle-aged women, was summarized in Table 3. The average age of the participants was 49 years old, consisting of four Asians and two Hispanics, and they had generally light activity. They were all non-smokers, and their sleep was generally good, however there was some difference between eating habits and whether menstruation. Their pre-test BMI(kg/m²) was 29-31 in which was from obesity to high obesity group, the average of height was 163.3cm and weight was 80.7kg.

3.1.2. The Clinical Progress

Weight (BW), waist circumference (WC) and BMI (kg/m²) were measured and used as of obesity degree. The results of the evaluation for six weeks were summarized in Table 4, Table 5 and Table 6. A significant reduction in body weight, BMI, and waist circumference were observed in all six participants during the experiment. In the weight loss results, the first case with the biggest difference was a loss of 6.1kg, and the 6th participants with the lowest weight difference had a reduction of 1.7kg. Changes in waist circumference also showed a decrease in all participants, with a slightly larger variance in individuals, someone was reduced 13cm and the other one showed only a 3cm reduction. BMI (kg/m²) changes also showed improvements in everyone like one step development from high obesity to obesity, however there were no participants who

reached in the normal range of BMI within this six-week period.

3.1.3. The Condition after Treatment

Four weeks later after the end of the drug treatment period, I checked the weight change and maintenance status by phone. It was confirmed that all participants maintained the weight lost for 4 weeks after obesity treatment, by observing the weight change was less than -0.9kg to +0.9kg. The results of each case were summarized in Table 7.

Table 3. The State of the First Medical Examination

Case#	1	2	3	4	5	6
Age	41	47	51	59	44	52
Ethnic	Asian	Asian	Asian	Asian	Hispanic	Hispanic
Occupation	housewife	office worker	Merchant	merchant	housewife	Housewife
Activity	Light	Mid-light	Light	light	light	Light
Menses	Y	Y	N	N	N	N
Drinking	N	N	N	2 bottles of beer 1-2 times/m	N	1 bottle of beer 1 time/m
Smoking	N	N	N	N	N	N
Sleep	good, 7hr	good, 6hr	good, 6hr	good, 6hr	good, 6hr	poor, 6hr
Meal	3times/d	2	2~3	2	2~3	3
Water intake	8cup↑	2~3	4	2~5	6	3~4
Stool	1time/d	1/1~2	1/1	1/1	1/1	1/1~2
Urine	Normal	normal	normal	normal	normal	normal
Obesity ^(*)	H.Obese	Obese	Obese	H.Obese	H.Obese	H.Obese
BMI(kg/m ²)	30.6	28.9	29.2	30.3	31.0	31.7
Hight (cm)	165	170	163	164	161	157
Weigh (kg)	83.3	83.6	77.5	81.5	80.3	78.1

I applied Asia-Pacific standard since the majority of participants were Asian.

* BMI(kg/m²) Classification, Asia-Pacific standard

< 18.5	underweight
18.5–22.9	normal weight
23.0–24.9	overweight
25.0–29.9	obesity
≥30.0	high obesity

Table 4. Clinical Progress of Body Weight

Reduction of Body Weight (BW) kg			
Case	2 weeks weight loss	4-week cumulative loss	6-week total cumulative loss
1	2.8	5.3	6.1
2	1.5	2.5	5.7
3	1	2.3	2.7
4	1.2	1.8	3.9
5	3	2.7	3.6
6	0.4	0.8	1.7

Table 5. Clinical Progress of Waist Circunference

Reduction of Waist circumference (WC) cm			
Case	2 weeks weight loss	4-week cumulative loss	6-week total cumulative loss
1	6	11	13
2	2	4	5
3	4	6	7
4	1	5	9
5	5	5	6
6	1	2	3

Table 6. Clinical Progress of BMI (kg/m²)

Change of BMI : kg/m ²		
Case	Differences	Obesity Degrees
1	30.6 --> 28.4	high obesity --> obesity
2	28.9 --> 27.0	obesity --> obesity
3	29.2 --> 28.2	obesity --> obesity
4	30.3 --> 28.9	high obesity --> obesity
5	31.0 --> 29.6	high obesity --> obesity
6	31.7 --> 31.0	high obesity --> high obesity

Table 7. Condition after treatment / 4weeks later

4weeks after the end of treatment			
Case	Weigh (kg)	BW Differences	Status
1	77	-0.2	Maintaining weight loss
2	77	-0.9	Maintaining weight loss
3	75	+0.2	Maintaining weight loss
4	78.5	+0.9	Maintaining weight loss
5	77	+0.3	Maintaining weight loss
6	76	-0.4	Maintaining weight loss

3.2. Statistical Analysis of Weight Changes

3.2.1. Change of Average Weight

Weight changes before and after treatment of participants were summarized in Table 8 and Figure 2. The average weight of six participants before the experiment was 80.7 ± 2.57 kg, and it was 79 ± 2.21 kg ($p = 0.012$) after two weeks of treatment, and then 78.2 ± 2.04 kg ($p= 0.007$) after 4 weeks of treatment. After 6 weeks of treatment, the average weight of the measurement results showed 76.8 ± 1.11 kg, which was a loss effect of total of 4.0 ± 1.70 kg ($p = 0.001$). It was found that the weight loss was maintained at 76.8 ± 1.17 ($p = 0.004$) even after 4 weeks after the end of treatment. The above results were statistically very significant ($p < 0.05$). *Jia Wei Fang Ji Huang Qi Tang* was shown to be a very effective treatment regimen for weight loss in simple obese people.

Table 8. Change of Average Weight for the Treatment

Time	1	2	3	4	5
Treatment	Before Tx	2 Wks Tx	4 Wks Tx	6 Wks Tx	After 4 Wks Tx
Weight	80.7 ± 2.57	79.1 ± 2.21	78.2 ± 2.04	76.8 ± 1.11	76.8 ± 1.17
Wt Difference	0	1.7 ± 1.03	2.6 ± 1.50	4.0 ± 1.70	4.0 ± 1.97
Wt Difference (%)	0	2.0 ± 1.26	3.2 ± 1.78	4.8 ± 1.96	4.9 ± 2.27
p-value*	NA	0.012	0.007	0.001	0.004

* Paired Sample t Test for Cumulative Weight Difference

Change of Weight for Treatment

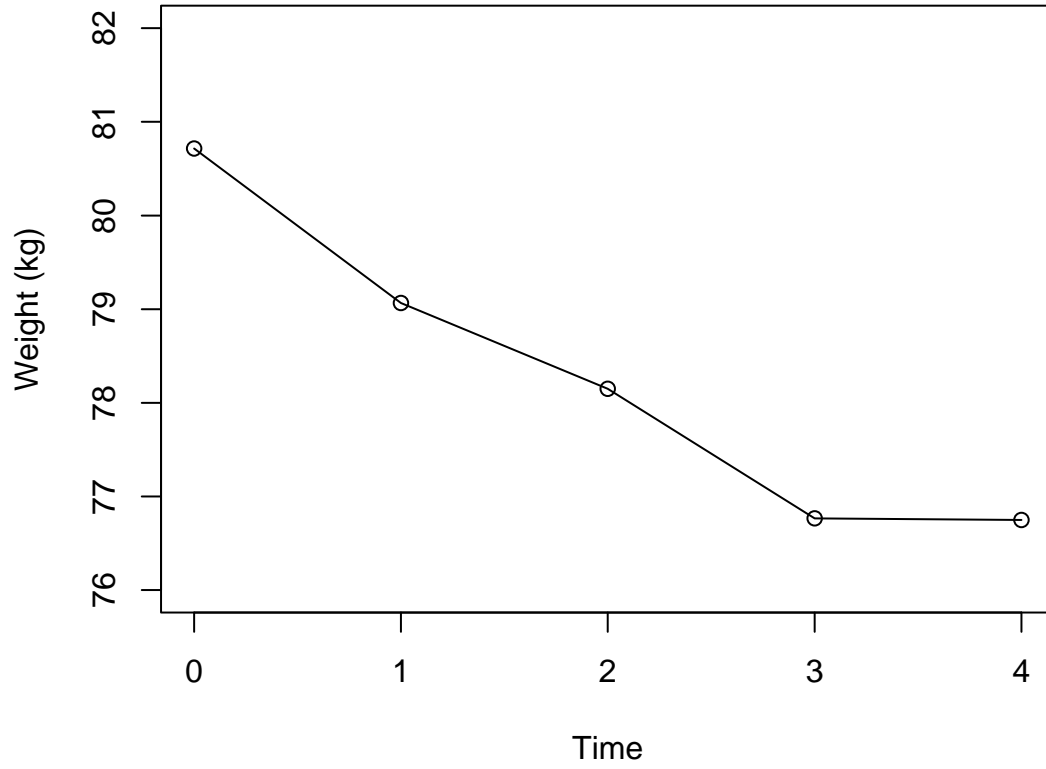


Figure 2. Change of Average Weight for Treatment

3.2.2. Cumulative Weight Difference

The cumulative weight loss changes were summarized in Figure 3, Figure 4. After two weeks of experiments, the average weight loss results were $1.7 \pm 1.03\text{kg}$ ($p = 0.012$), there was a weight loss effect of $2.6 \pm 1.50\text{kg}$ ($p = 0.007$) after 4 weeks of treatment, the results after 6 weeks of treatment had a cumulative average weight loss effect of $4.0 \pm 1.70\text{kg}$ ($p = 0.001$). 4 weeks after the treatment, it was reported to maintain the weight loss state to 4.0 ± 1.97 ($p = 0.004$).

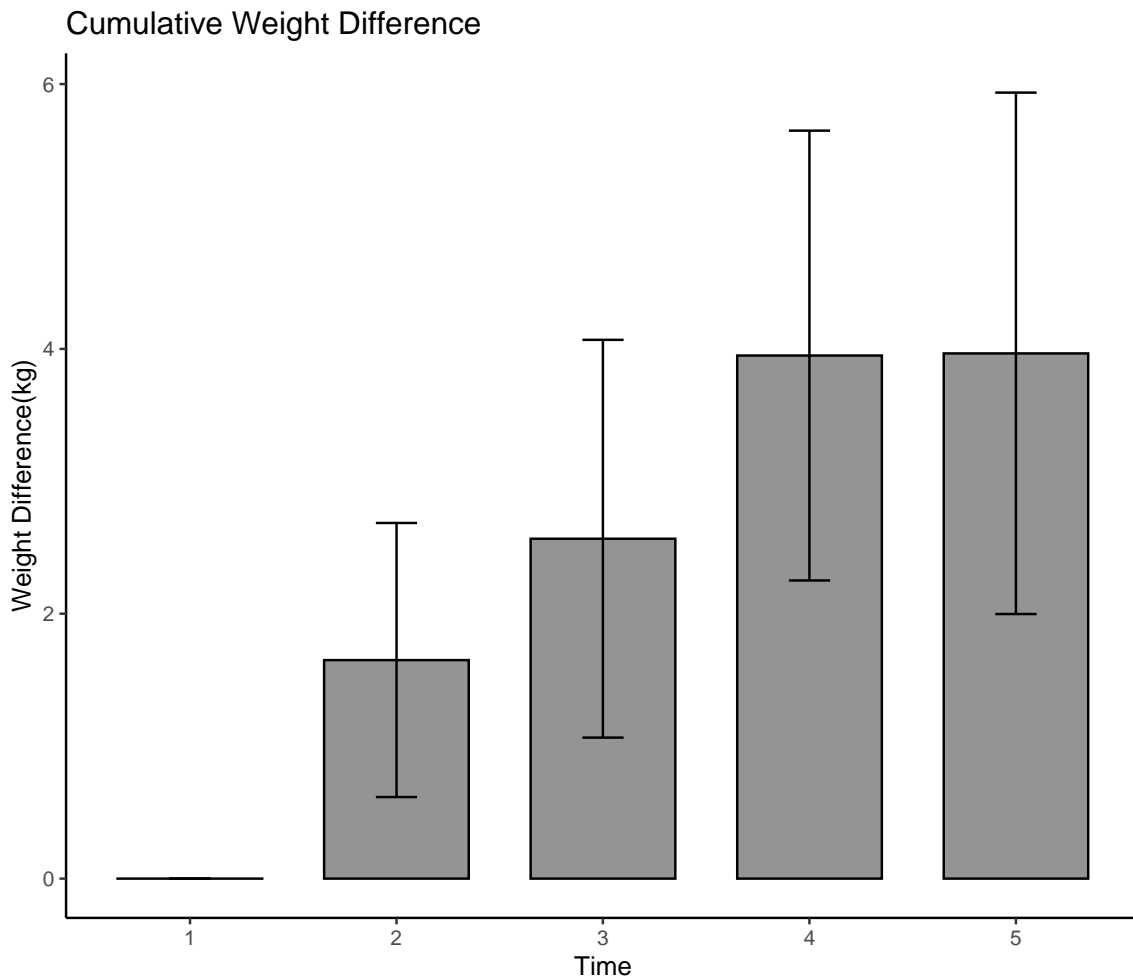


Figure 3. Cumulative Weight Difference

When converting the cumulative weight loss to the percentage, it was the result of $2.0 \pm 1.26\%$ after 2 weeks, 4 weeks after $3.2 \pm 1.78\%$, 6 weeks after $4.8 \pm 1.96\%$ weight loss was reduced, and it was reported to maintain a weight loss of $4.9 \pm 2.27\%$ after 4 weeks from the end of treatment.

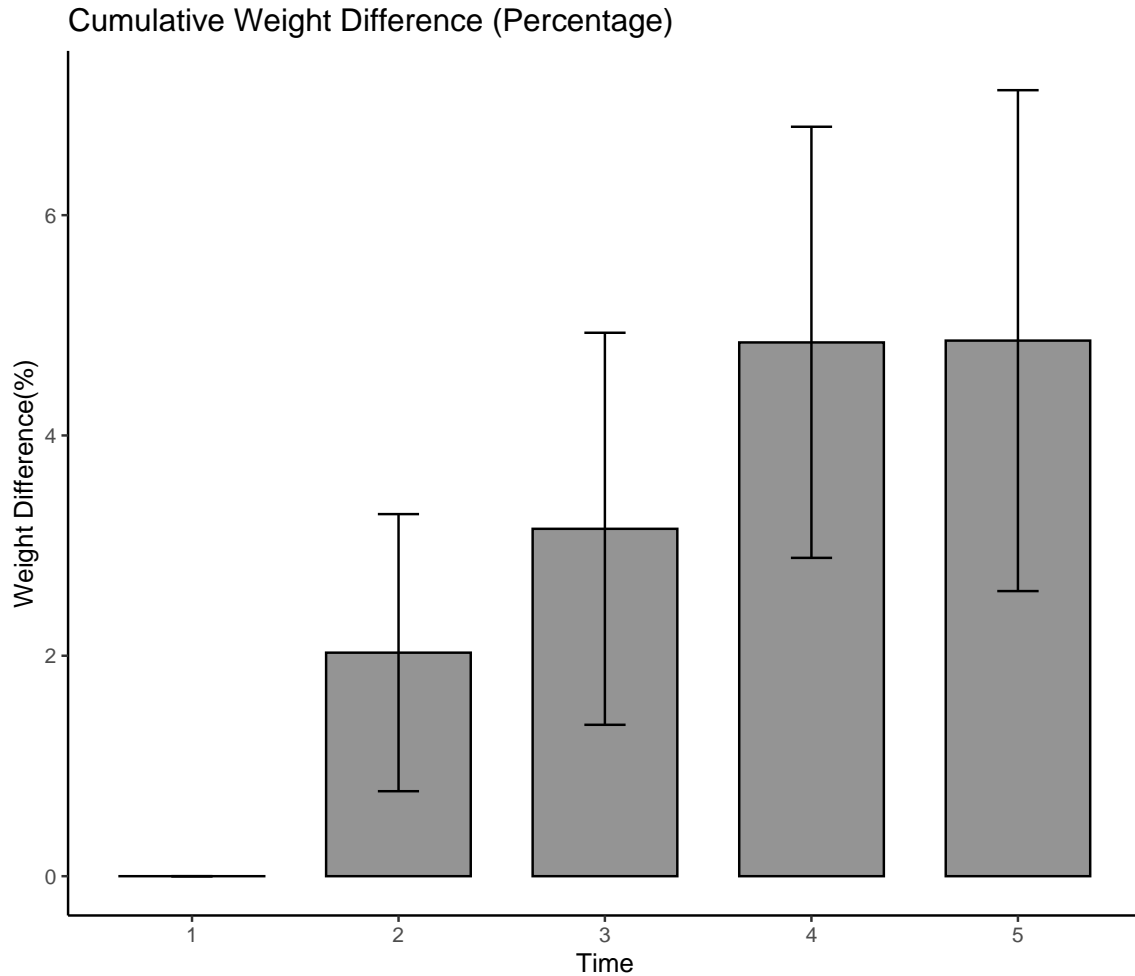


Figure 4. Cumulative Average Weight Difference (Percentage)

3.2.3. Linear Regression of Weight

Linear regression analysis of weight loss was shown in Figure 5. $F(1,2) = 181.5$, $R\text{-squared} = 0.989$, $p\text{-value} = 0.0055$, According to this analysis, the effects of *Jia Wei Fang Ji Huang Qi Tang's* weight loss can be compiled in the following formula:

(*) $\text{Weight (kg)} = 80.59 - 0.64 \times \text{Week}$

* 80.59 is the pre-experimental weight average. This formula has 98.9% descriptive power and it is statistically very significant ($p < 0.01$)

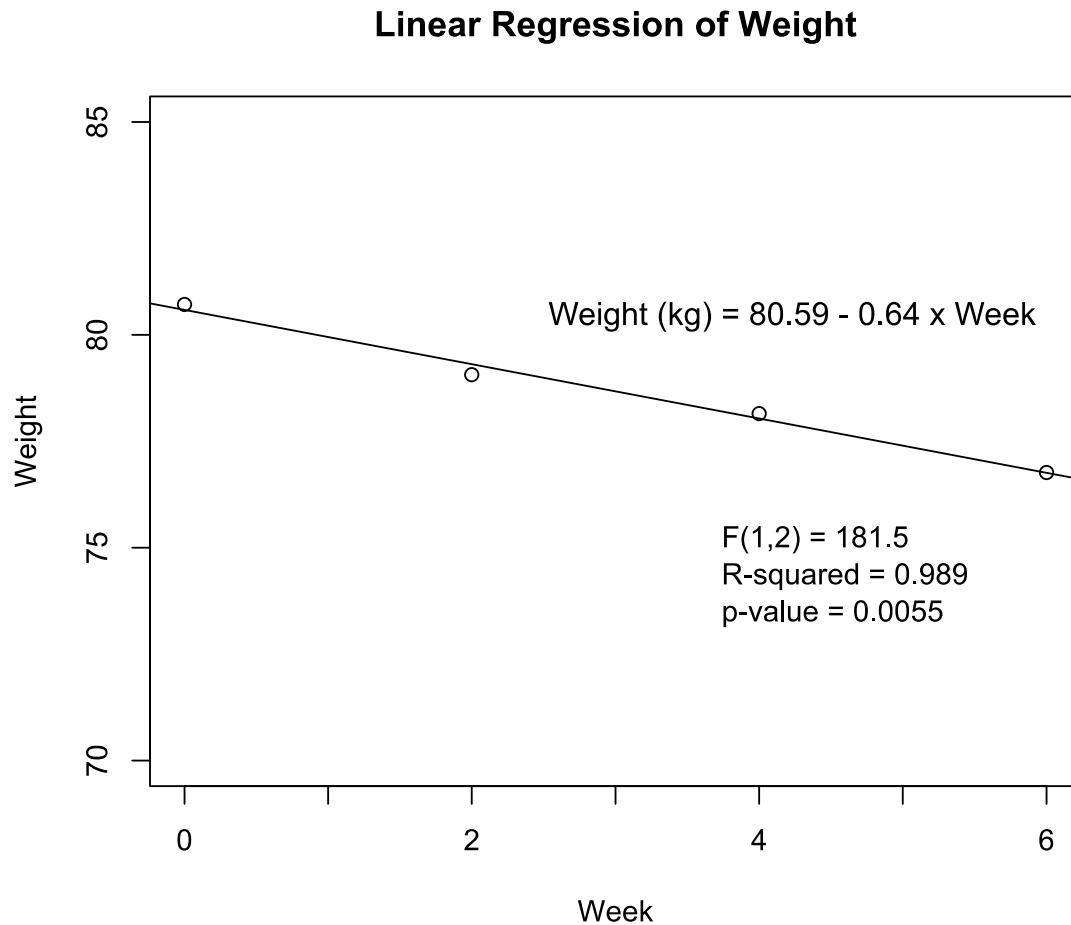


Figure 5. Linear Regression of Weight

3.3. Statistical Analysis of BMI (kg/m²) Changes

3.3.1. Change of Average BMI (kg/m²)

BMI (kg/m²) changes before and after treatments of participants were summarized in Table 9 and Figure 6. The average BMI of six participants before the experiment was 30.3 ± 1.07 , and then 2 weeks later, the results showed a reduction of 0.6 ± 0.39 ($p = 0.012$) to 29.7 ± 1.08 , after 4 weeks of treatment, the average BMI was reduced to 29.3 ± 1.24 with a reduction 1.0 ± 0.54 ($p = 0.007$), and the average BMI measured after 6 weeks of treatment was showed a reduced effect of 1.4 ± 0.55 ($p = 0.001$) to 28.9 ± 1.36 . BMI average measured after four weeks from the end of treatment was found to maintain BMI loss to 28.8 ± 1.44 ($p = 0.036$). This was a statistically very significant result.

Table 9. Change of Average BMI (kg/m²) for the Treatment

Time	1	2	3	4	5
Treatment	Before Tx	2 Wks Tx	4 Wks Tx	6 Wks Tx	After 4 Wks Tx
BMI (kg/m ²)	30.3 ± 1.07	29.7 ± 1.08	29.3 ± 1.24	28.9 ± 1.36	28.8 ± 1.44
BMI Difference	0	0.6 ± 0.39	1.0 ± 0.54	1.4 ± 0.55	1.5 ± 0.65
p-value*	NA	0.012	0.007	0.001	0.036

* Paired Sample t Test for Cumulative BMI Difference

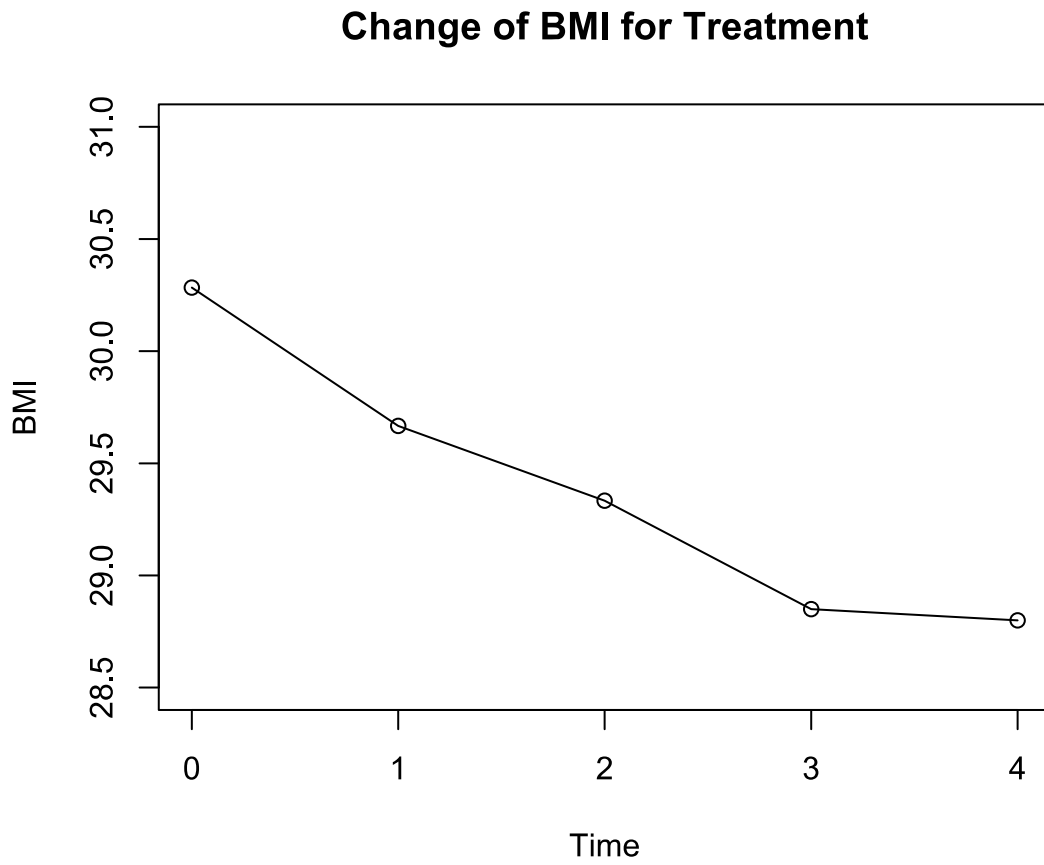


Figure 6. Change of Average BMI (kg/m^2) for Treatment

3.3.2. Cumulative BMI (kg/m²) Difference

The cumulative BMI loss changes were summarized in Figure 7. The first 2-week's average BMI loss was 0.6 ± 0.39 , the 4-week cumulative BMI loss was an average of 1.0 ± 0.54 , and the final 6-week cumulative BMI loss was an average of 1.4 ± 0.55 . And, 4 weeks after the end of the experiment, the cumulative BMI loss average was 1.5 ± 0.65 .

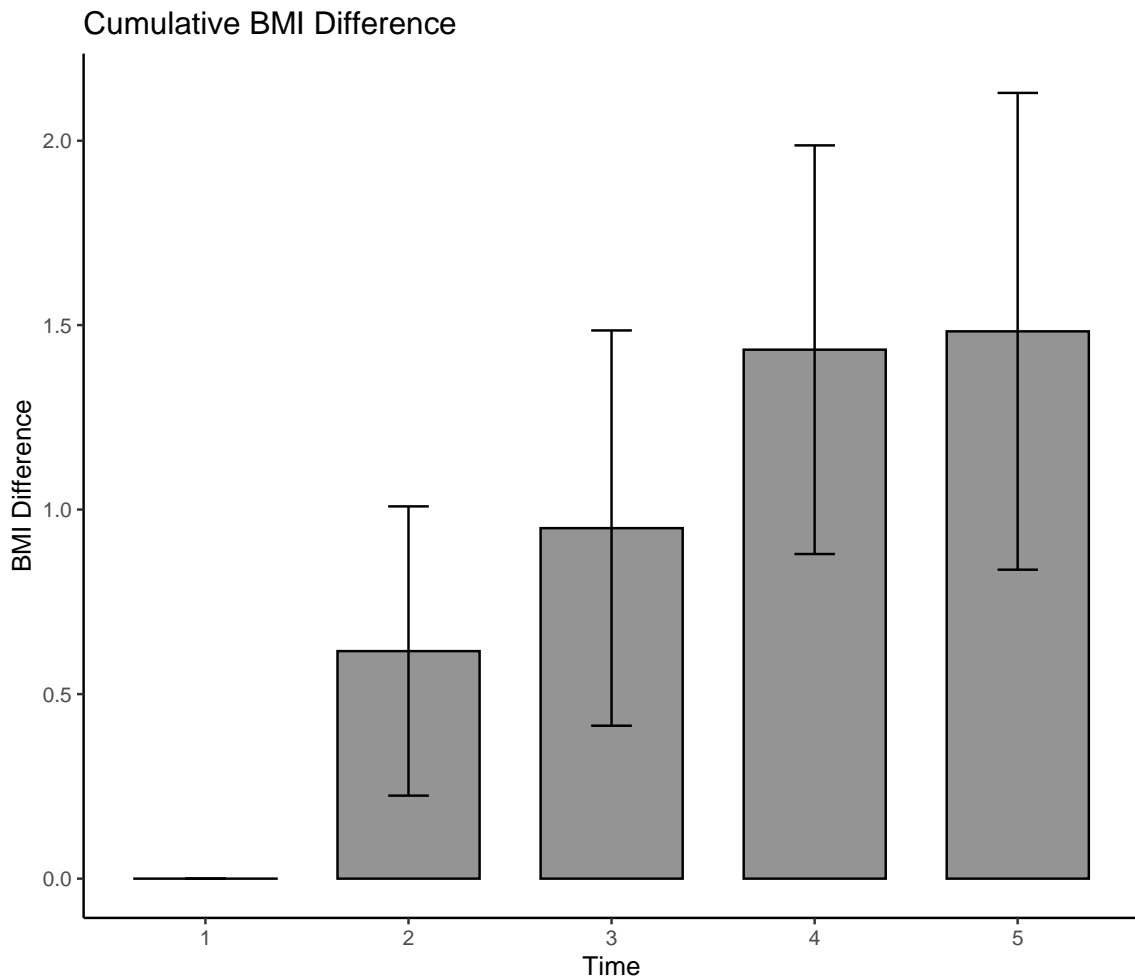


Figure 7. Cumulative BMI (kg/m²) Difference

3.3.3. Linear Regression of BMI (kg/m²)

Linear regression analysis of BMI loss was shown in Figure 8. $F(1,2) = 155.2$, $R\text{-squared} = 0.987$, $p\text{-value} = 0.0064$, according to this analysis, the effects of *Jia Wei Fang Ji Huang Qi Tang's* BMI loss can be compiled in the following formula:

$$(*) \text{ BMI} = 30.23 - 0.23 \times \text{Week}$$

* 30.23 is the pre-experimental BMI average. This formula has 98.9% descriptive power and it is statistically very significant ($p < 0.01$)

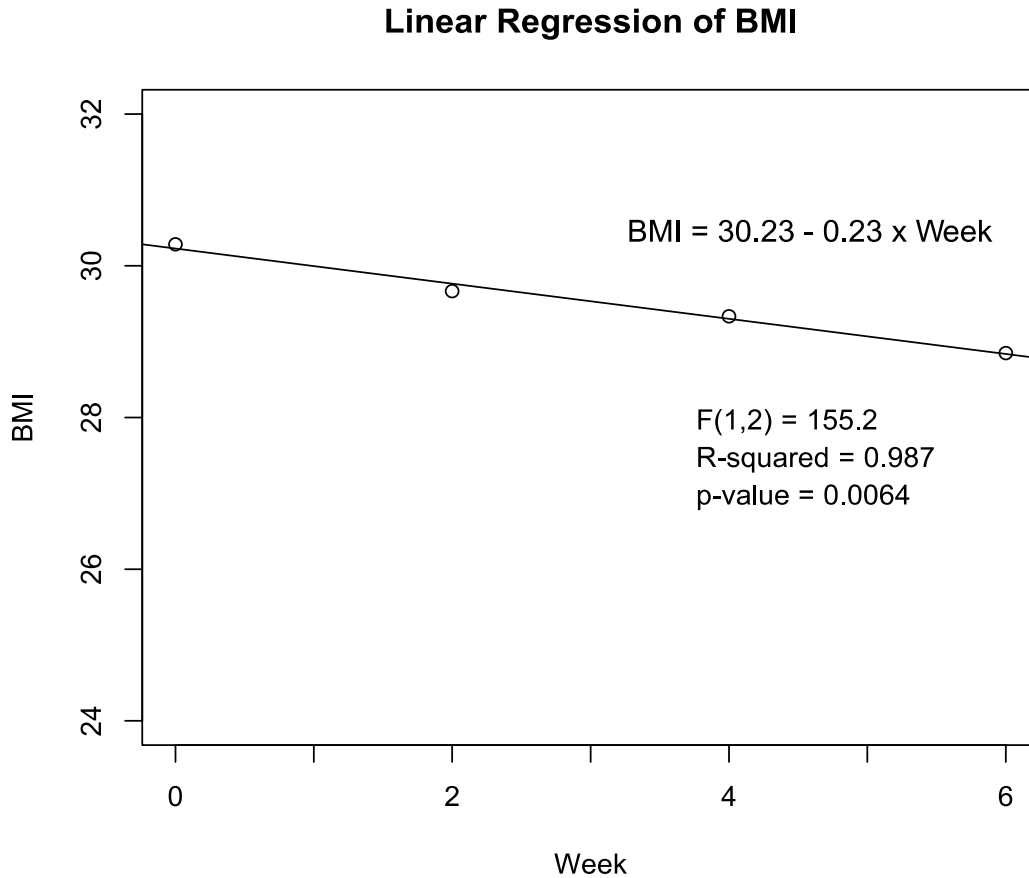


Figure 8. Linear Regression of BMI (kg/m²)

IV. DISCUSSION

4.1. Anticipation of Obesity Improvement Effect with This Prescription

The results of this study confirmed that the effectiveness of *Jia Wei Fang Ji Huang Qi Tang* alone in the treatment and management of obesity was very significant. It was shown that it is possible to utilize as a universal obesity treatment due to the point that these significant weight loss results were derived without paralleling-dong or meal control.

As the result, we can predict the results of the treatment through the linear regression analysis in this study, [Weight (kg) = initial weight - 0.64 x Week], [BMI (kg/m²)= Initial BMI - 0.23 x Week]. Like what if the participants, who had an average weight of 80.59 kg, would receive continued medication, it could be predicted that the expected weight loss after 10weeks will be about 6.4kg, and the average weight of the participants will be 74kg. In another example, if a woman with initial weight of 60kg wanted to get the target weight of 50kg, we could know the expected treatment period by using the formular; it will be required about 16 weeks of medication.

The body mass index can also be used to calculate the expected duration of treatment by substituting the above formula. For example, if the Participants in this experiment, who has the initial BMI average was 30.23, wanted to reach the normal BMI range 23 or less, the expected treatment period would be about 32 weeks.

The expectation of these outcomes will be very useful for consulting patients and planning treatment in clinical trials.

4.2. Considering the Possibility of Standardizing Herbal Drugs

Although the results of this study were very significant, it is necessary to review some unstable experimental conditions performed in this study before considering *Jia Wei Fang Ji Huang Qi Tang* as the standard drug for obesity treatment. I summarized it as below:

1. Throughout the experiment, I felt that I should have detailed check of the “middle-aged” age group. Because, I had missed that the conditions of menstruation, pregnancy, childbirth, and fertility and infertility are the biggest factors that can impact on women's weight changes. If I had experimented with the detailed classification of middle-aged women, I would have deduced a much more accurate weight loss formula.
2. I had a lack of research or understanding of how long participants in the experiment had maintained their obesity status. If I had distinguished between chronic obese people whom with obesity factors from childhood and recently fattened obesity people, there could have been different therapeutic effects.
3. During these 6 weeks experiment, none of participants complained about the possible side effects of *Jia Wei Fang Ji Huang Qi Tang*, such as headaches or gastrointestinal discomfort which may possibly be inferred from the composition of the drug. However, it will be necessary to review the side effects for long term taking of this herbal medicine for being considered its safe for long term used.
4. I think it is necessary to see the results through participants of more diverse races.
5. The study, which analyzed obesity treatment indicators limited to weight and waist circumference, did not confirm exactly how much the actual body fat percentage

decreased. I think the clinical significance would have been greater if I could have confirmed the effect of increasing percentage of fat-free mass and reducing body fat ratio.

V. CONCLUSION

These 6 case studies were performed to learn the weight loss effect of *Jia Wei Fang Ji Huang Qi Tang* as an herbal drug single treatment therapy in the treatment and management of obesity and reported the following results.

1. Six participants showed a very significant weight loss change only by taking the herbal drug *Jia Wei Fang Ji Huang Qi Tang* for 6 weeks, without any combination of lifestyle changes or dietary control and other obesity treatments.

Before the experiment, the average weight was 80.7 ± 2.57 kg, and there was a weight loss result of an average of 4.0 ± 1.70 kg ($p = 0.001$) after six weeks of treatment. This was a weight loss effect of about $4.8 \pm 1.96\%$ in terms of percentage. This weight loss state was maintained in all participants even after four weeks from the end of the six-week experiment and it was reported a statistically very significant result (p -Value < 0.01).

2. BMI (kg/m^2) reduction of the participants was confirmed that the before treatment average BMI 30.3 ± 1.07 was reduced average 1.4 ± 0.55 ($p = 0.001$) after 6 weeks of treatment.

3. The reduction effect of the waist circumference, which was measured as a reference indicator of obesity improvement, was very significant result. After six weeks of treatment, the average WC loss was reported to be 7.2cm.

4. Thus, this study concluded, *Jia Wei Fang Ji Huang Qi Tang*'s therapeutic effect for the simple obese middle-aged women was confirmed statistically very significant (p -value < 0.01).

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APPENDICES

Informed Consent Form

You are invited to participate in a research study about “Effects of Jia Wei Fang Ji Huang Qi Tang on Metabolically Healthy Obesity (MHO) in Middle-aged Women: Case Series”.

Total goal of this research study is to assess the effectiveness of Jia Wei Fang Ji Huang Qi Tang in the treatment of Metabolically Healthy Obesity (MHO) in middle-aged women. .

The study design is that the screened 6 participants will be given the decoction; Jia Wei Fang Ji Huang Qi Tang, for 6 weeks. All participants will be treated with only this herbal decoction w/o lifestyle changes or other therapy. The study period will be 6 weeks and participants will have a total of 4-time visits. The outcomes will be measured every time they visit.

This study is being conducted by In Ok Lee, L.Ac.

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. Whether you choose to participate or not, all the services you receive at this clinic will continue and nothing will change. If you choose not to participate in this research project, you will be offered the treatment that is routinely offered in this clinic. You may change your mind later and stop participating even if you agreed earlier.

Participating in this study may not benefit you directly, but it will help to enrich the knowledge on Acupuncture and Oriental Medicine.

By Participating in this research, it is possible that you will be at greater risk than you would otherwise be. There is, for example, a risk that your condition will not get better and that the new medicine or treatment doesn't work even as well as the old one. If, however, the medicine or treatment is not working, we will give the medication or treatment routinely offered to make you more comfortable. While the possibility of this happening is very low, you should still be aware of the possibility.

The information you will share with us if you participate in this study will be kept completely confidential to the full extent of the law. The information that we collect from this research project will be kept confidential. Information about you that will be collected during the research will not put away and only the researchers will be able to see it. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is and we will lock that information up with a lock and key. It will not be shared with or given to anyone except In Ok Lee, L.Ac.

If you have any questions about this study, please contact In Ok Lee, L.Ac. at 1-562-265-8249 and inokusa@naver.com. If you have any questions or concerns regarding your rights as a subject in this study, you may contact Dr. Jae Jong Kim, Chair of the South Baylo University. Institutional Review Board (IRB) at 213-738-0712 or jaejongkim621@gmail.com.

YOU WILL BE GIVEN A COPY OF THIS FORM WHETHER OR NOT YOU AGREE TO PARTICIPATE.

Certificate of Consent

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Name of Participant (Print)

Name of Witness (Print)

Signature of Participant

Signature of Witness

Date: Day/Month/Year

Date: Day/Month/Year

Statement by the researcher/person taking consent

I have accurately explained the information sheet to the potential participant. I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant

Print Name Researcher (Print)

Signature of Researcher

Date: Day/Month/Year