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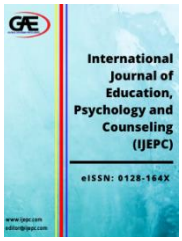

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EFFECT OF DIETARY MEAL PLAN ON ANTHROPOMETRIC AND PHYSIOLOGICAL INDICES AMONG OVERWEIGHT WOMEN PRACTICING ZUMBA

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Abstract:

The aim of this study was to investigate the effects of dietary meal plan on anthropometric and physiological indices such as body weight, Body Mass Index (BMI), waist and hip circumferences, percentage of fat and blood pressure among overweight women practicing Zumba. The participants consisted of 20 overweight women who were aged 18 until 55 years old, which were not involved in weight loss program, not on medication, do not have any chronic diseases and did not consume any weight loss supplement or meal replacement. Body weight, BMI, waist circumference, hip circumference, percentage of fat and diastolic and systolic blood pressure were measured at the end week 1, week 4 and week 8. All participants received Zumba exercise along with dietary meal plan interventions and data were collected using a 24-hour dietary recall and a 3-days food diary. The effects of Zumba exercise with applied meal plan were analyzed by using one-way repeated measures MANOVA. The results showed that Zumba exercise combined with dietary meal plan showed a significant different in body weight ($p<.001$), BMI ($p<.001$), hip circumference ($p<.001$), waist circumference ($p<.001$), and percentage of fat ($p<.001$) after 8-week intervention. However, there was no significant difference in the systolic blood pressure ($p<.05$) after 8 weeks of intervention. Interestingly, these data show a significant difference between week 1 vs week 4 ($p < .001$) in this study. This study concludes that meal plan and Zumba exercise provide significant effects on body weight, BMI, hip and waist circumference, percentage of fat and systolic blood pressure (week 1 vs

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week 4) thus may improve anthropometric and physiological indices among overweight women.

Keywords:

Anthropometric, Body Composition, Physiological, Meal Plan, Zumba

Introduction

Obesity is one major health problem in Malaysia. The National Health Morbidity Survey (NHMS) reported that the prevalence of obesity has continued to increase from 15.1% in 2011 (NHMS, 2011) to 17.7% in 2017 (Chan et. al, 2017). This data is further supported by the World Health Organization (WHO) which stated that 40% of individuals over the age of 18 years old are classified as overweight. Moreover, previous studies have reported that the rate of overweight and obesity are higher in women than in men (Mehrabani & Khazraei, 2018). Similarly, Rossmeissl, Lenk, Hanssen, Donath, Schmid Trucksäss and Schäfer (2016) found that the rate of overweight and obesity was higher in women compared to men in Turkey.

A study by Pengpid and Peltzer (2019) indicated that prevalence of obesity, defined as a BMI ≥ 30 kg/m^2, increased by 14.9% among women. Additionally, Pengpid et al. (2019) reported that the prevalence of obesity among adult women in India keeps increasing the trends from 7% to 24% from 2011 to 2014. Surprisingly, these trends keep increasing to 34.3% in 2013 to 2014. The prevalence of obesity is a growing concern and the latest data reported in February 2020 indicated that obesity has reached epidemic proportions globally, with at least 2.8 million people dying each year due to overweight and obesity (WHO, 2020).

Research by Pengpid et al. (2019) identified several risk factors of overweight and obesity, including higher economic status, middle age, dietary risks, urban residence and unhealthy dietary behaviors. Dietary risk factors may include a high intake of food in sugar and fat, insufficient intake of fruit and vegetables, and lack of exercise. The debate continues regarding the best strategies for managing dietary and physical activity intervention for weight loss. Current studies suggest that a weight loss of 5% to 10% from the initial body weight can have beneficial effects and bring obese individuals closer to normal body weight through lifestyle modification (Foster Schubert, Alfano, Duggan, Xiao, Campbell, Kong & McTiernan, 2012).

Participating in Zumba exercise has shown to improve individual wellbeing (Vendramin et al., 2016). Their findings demonstrated that Zumba exercise shows positive effects on anthropometric, muscular strength and quality of life. The recent study by Arol (2020) reported the positive results after eight weeks of Zumba exercise, including reduction in total body weight, BMI, body fat percentage, functional movement screening and the lower and upper dynamic balance parameters among high school students aged 15 to 17 years old. Research by Miller, Koceja and Hamilton (1997) found that the weight loss through exercise only gives 2-3kg reduction whereas through combining diet and exercise shows a much more reduction in weight which is 10-12 kg or 9kg respectively.

According to the Malaysian Dietary Guideline (2020) stated that 50% - 60% of carbohydrate, 10-20% of protein and 25% - 35% of fat. Regular physical exercise enhances the efficiency of diet through increase in the satiating efficiency of a fixed meal, and is useful for maintaining

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diet-induced weight loss. This is support by a study conducted by Volek et al. (2002) stated that including dietary intervention within 8 weeks' weight loss program shows the significant changes in percentages of fat, body weight and lipid profile among overweight women.

Another research finding by Tovar, Johansson and Björck (2016) highlighted that multifunctional dietary meal intervention showed significant changes in weight and reduction in blood pressure among healthy participants within eight weeks of intervention. Additionally, research by Muhammad, Safika, Wahyuni, Ermamilia and Huriyati (2019) demonstrated that healthy nutrition programs and Zumba exercise effectively improved body fat in normal and overweight participants. One of the study conducted by Clarke et al. (2007) stated that eight weeks physical activity and dietary program shows the significant effect on waist circumference, percentages of body fat, and waist circumference between low-income mother and BMI is $\geq 25 Kg/m^2$.

Combining diet with exercise resulted in 20% greater sustained weight loss after a year intervention than diet alone (Curioni & Lourenco, 2005). Therefore, combining the exercise and dietary modification can increase the reduction in weight as well as the abdominal adipose tissue (Giannopoulou et al., 2005). Generally, it showed that diet and exercise programs produced a three-to-five-fold greater change in anthropometric measurement as compared to applying the exercise programs alone. Proper exercise and eating patterns changes were important and should be on individual needs and belief, as they required high compliance to follow the order and dietary modifications were important on weight loss and fat reduction (Vassilopoulou, Piperari & Christoforou, 2017). Recent studies have reported the beneficial effect on anthropometric in a short-term period at workplace aerobic programs. The data shows the significant difference in BMI, fat index, fat mass and lower limbs compared to the control group (Iturriaga et al., 2020).One of the dietary approach to combat the obesity is a healthy meal plan (Fock & Khoo, 2013). This meal plan needs to be balanced in macronutrients, vitamins and minerals.

In summary, dietary and physical activity interventions are vital tools in promoting weight loss, preventing chronic diseases and improving the self-efficacy among participants. Therefore, the study aims to investigate the effect of dietary meal plan on body weight, Body Mass Index (BMI), hip circumference, waist circumference, percentage of fat and blood pressure at the end of week 1, 4 and 8 among overweight women practicing Zumba.

Literature Review

Modern life is becoming increasingly sedentary and has been associated with an increased risk of obesity. Overweight and obesity are keeping growing health problems in Malaysia as well as worldwide due to such decreasingly in physical activity, increasing in sedentary behaviour with unhealthy dietary practices (Chan et. al, 2017). Globally, the number of overweight and obese people keep increasing almost three folds during the last three decades (from 857 million in 1980 to 2.1 billion in 2013) (Chan et al, 2017). In addition, worldwide in 2014, World Health Organization (WHO) reported that adults aged 18 years and older who were overweight and obese were 39% and 13%, respectively. The prevalence of obesity has reached epidemic levels in many developing countries, and Malaysia is of no exception. This is had been reported by National Health and Morbidity Surveys (NHMSs) carried out in 2006, 2011 and 2015, an increasing trend of overweight and obesity prevalence was observed among Malaysian adults aged 18 years and older: 29.1% and 14.5% in 2006, 29.4% and 15.1% in 2011, 30.0% and

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17.7% in 2015, respectively. Thus, this is shows that the WHO, with the percentages of overweight or obese men and women being 43.8% and 48.6%, respectively, now ranks Malaysia as Southeast Asia's fattest country according to recent reports. One of the strategies to improve or change the overweight and obese categories into the normal range is by managing their weight loss. Weight loss, healthy eating habits and encouraging physical activity and lifestyle changes are better to combat the obesity.

Furthermore, high intensity exercise also would improve the body weight, BMI, body fat, waist circumference Irving et al. (2008) and as well, as give benefits toward the cardiovascular and metabolic functions (Vassilopoulou et al., 2016). This improvement supported by research conducted by Ljubojević & Jakovljević (2014) stated that there is significant improvement on total body weight loss, fat percentage and fat free. One of research study by Clarke et al. (2007) stated that there is significant effect and reduction in body weight, percentages of fat loss and waist circumference among overweight women that are practicing healthy dietary intake and physical activities. Thus, a healthy and balanced diet with daily physical activity is the important tools in order to achieve weight loss or weight maintenance.

Zumba

An interesting finding was demonstrated from a study by Krishnan et al. (2015) stated that there are significant changes in body weight, BMI and percentage in body fat in overweight or obese type 2 diabetes women. Based on their research study, it is clearly proven that Zumba exercise is one of the physical activities that improves on aerobic fitness without experiencing the high amount of cardiovascular stress (Delextrat, Warner, Graham & Neupert, 2016).

It has been noted that dance, music and exercise is one of the most enjoyable exercises. Interestingly, an individual does not feel like they are working out when they are performing the Zumba exercise (Baştug, Ozcan, Gultekin & Gunay, 2016). Therefore, there are many studies conducted to investigate the effects of Zumba exercise as the effective way to present a sedentary lifestyle. Thus far, a number of studies have found that the Zumba exercise motto is "put aside the training and joining the party" (Ljubojević et al, 2014). Ljubojević et al. (2014) that describe the link between Zumba exercise and health benefits. It has been observed by the researcher Suri and Saini (2017) that Zumba exercise does not only reduce the risks of death due to cardiovascular problems as it also helps in stimulating the growth of bone as well as preventing osteoporosis both in men and women.

Previous research has established that twelve weeks of Zumba exercises were conducted to the intervention group and the finding shows positive effects on body weight and BMI (Baştuğ et al., 2016). Another updated research study also shows a significant difference in percentage of body fat, and total muscle mass among women (Bjelica, 2020). Up to date, Zumba exercise was promoted by the fitness industries as an exercise training program. Zumba was also known as a part of physical activity, which demonstrates a positive result in weight loss (Ġmamoğlu & Özdenk, 2019). Baştuğ et al. (2016) stated that with the regular physical activities such as Zumba exercise, walking and Pilates are appearing to be the most effective and popular methods to combat obesity.

One of the updated research studies showed that the significant effect on biceps and triceps skinfolds, sub scapular, supra-iliac, body fat, lean body weight and body composition of college students after six weeks of Zumba exercise program (Wankhade, 2019). One of the most

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interesting findings reported by Jackson (2013) shows a significant decrease in body fat when participating in Zumba exercise for 4 weeks. Perhaps, this is the most interesting finding that the duration of the study with a month showed the significant effect on body fat when involved in Zumba exercise. A study by Barene, Krustrup and Holtermann (2013) reported that practicing Zumba 2-3 times in a week may help in decreasing the percentage of body fat among women. Thus, participating in Zumba exercise gives a high impact aerobic activity and may lead to the decreasing percentage of body fat.

One of the latest systematic reviews by Hadzovic, Lilic, Prvulovic, Ilic and Stankovic (2020) stated that from analysing the compiled studies stated that there is positive effect on exercise programs to music on parameters of body composition and subcutaneous fat among young women. Moreover, the longer of the duration of exercise had greater impact on the reduction and also maintenance of body weight, reduction in body fat, increase in muscle tissue, and also improvement of aerobic capacity among overweight and obese individual who are followed the exercise program.

In other words, Zumba exercise was proved to be very effective to be applied as a daily routine in reducing waist hip ratio among middle aged females. This finding was supported through the studies by Roy and Mandal (2017), there was significant difference on waist hip ratio after the implication of dance fitness routine. Another positive finding conducted by Jain and Nigudkar (2016) showed that the result was significant on anthropometric measurements, body composition and fitness characteristics.

Moreover, Zumba exercise not only improved the body composition but also improve the blood pressure. This statement were supported by pilot study conducted by Araneta and Tanori (2015) stated that among the middle age women, the result shows the reduction in weight and systolic and diastolic blood pressure was improved after the twelve weeks of intervention. Another study conducted by Sydó et al. (2018) stated that gradual reduction in systolic blood pressure was considered as a normal response but the finding shows an increase in diastolic blood pressure. Increasing in diastolic blood pressure had not been validated yet in terms of association with comorbidities diseases such as hypertension. Study by Redman et al. (2011) has reported that aerobic exercise had given the greater reduction of fat compared to anaerobic exercise. A study by Packyanathan and Prathap (2020) mirrors those of the previous studies that have examined Zumba exercise may improve the systolic and diastolic blood pressure. Surprisingly, the remarkable rate of blood pressure showed a decrease after practicing Zumba exercise. To date, the result shows that Zumba exercises have significantly reduced blood pressure without taking any medication. This pilot study provides additional evidence stating that the Zumba dance reduces weight as well as improves systolic and diastolic blood pressure. In addition, this finding stated that the fasting triglyceride also improves after 12 weeks of intervention (Araneta & Tanori, 2014).

Dietary Meal Plan

The National Heart, Lung, and Blood Institute Obesity Education Initiative Expert Panel (NIH) (2000) suggested that the 500 – 1000 kcal/day caloric deficit is used in an individualized dietary strategy combined with 45 minutes of moderate-intensity physical activity in 5 days per week. The average total weight loss was about 8% after 6 months. The recommendation using low-calorie diet that generated the initial deficit of 500 – 1000kcal/day and calorie supplies for women was 1000-1200kcal/day and for man is 1200-1600kcal/day to treat the obesity. A

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surprising research finding was conducted by Curioni and Lourenco (2005) stated that diet alone or diet with exercise produced three-to-five-fold greater change in anthropometric measurement compared to exercise programs alone. Moreover, the weight loss more was improved more through the diet exercise 10-12kg or 9kg respectively after four months of intervention programs and had been studied by Miller et al. (1997) and the result was 20% greater sustained weight loss after a year intervention (Curioni & Lourenco, 2005).

Evidence is presented which is shown by the researcher Campbell et al. (2012) which stated that the 12 months of reduced calorie diet combined with exercise shown significant improvement in weight and statistically significant reduction of postmenopausal hormones among breast cancer survival. Proper lifestyle and eating patterns changes should be based on individuals' needs, beliefs and highly compliance to be followed (Vassilopoulou et al., 2016).

According to Malaysian Dietary Guidelines (2010) which stated that there was strong evidence that the reduction of weight may promote the decreasing of blood pressure, level of lipids and also a reduction in blood glucose level among overweight and obese individual. Moreover, by a reduction of 5% - 10% of weight loss within three to six months of period or by losing weight ½ to 1 Kg per week plus with the calorie deficit diet and balanced macronutrient, and with regular physical activities may promote safe weight loss and maintain the weight. This is proven by one of latest finding reported by Iturriaga et al (2020) that stated that 12 weeks of exercise intervention program with Mediterranean diet quality and nutrient balance demonstrate a significant difference in BMI, total of fat percentage, fat mass index, percentage of lower left limb and percentage of right lower limb among women. Researchers emphasize that the dietary intervention over 12 weeks in dietary pattern and quality of diet show changes in the percentage of consumption of protein, fat, carbohydrate and nutrients which were similar before and after intervention (Iturriaga et al, 2020). Besides, the combination of diet with exercise intervention programs are likely to produce a greater impact on body composition in the women population (Iturriaga et al, 2020). Guerendiain et al. (2019) stated that the dietary intervention which includes the standard portion intake together with dietary advice is important to achieve significant results. Besides, exercise program and diet which is by controlling of energy intake with range 1200 – 1500kcal/day, where the normal distribution of macronutrient (55-60% of carbohydrates, 15 to 20% of proteins and 20-25% of fat) has shown significant changes in body fat body fat, trunk fat and skeletal muscle mass by compliance of exercise program three times per week and semi controlled diet in adult populations (Kukić, Todorović & Cvijanović, 2019).

One of the latest research studies stated that the dairy intake is associated with body composition. The intervention groups that received healthy nutrition education and Zumba exercise showed significant improvement on BMI, skinfolds and weight loss among sedentary employees (Guerendiain, Villa-González & Barranco-Ruiz, 2019). The healthy based nutrition education and Zumba exercise are very useful to improve the body composition among sedentary employees. Lifestyle intervention seems to reduce the general adiposity and increase muscle mass. Besides that, another research by Jain & Nigudkar (2016) stated that group-based lifestyle intervention among working women showed that the participants achieved more than equal to 5% of weight loss and improved their fitness using community based group lifestyle intervention for adults. The effectiveness of the lifestyle modification with Zumba exercise has been exemplified in a report by Doloksaribu & Kacaribu (2017) stating that the diet combined

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with Zumba exercise effectively correlates in reducing the BMI among overweight female college students.

According to Hussain (2018), reduction in body weight, BMI, waist circumference and percentage of body fat was largely associated with lifestyle changes, self-motivation and increasing in the physical activities as well as in proper calorie control. According to Yazdani, Ramazani, Moomnikh and Nasiri (2018), diet with healthy fat and vegetables intake combined with regular aerobic exercise can lead to ideal weight and effectively can improve blood lipid levels as well as prevent the occurrence of cardiovascular problems. A study reported by Vassilopoulou et al. (2016) stated that the healthy diet works better when combined together with Zumba exercise for achieving weight and fat loss especially when the diet is personalized, restricted in calorie and high in protein. In addition, their study showed a positive association with effectiveness in participating in Zumba exercise combined with proper dietary advice which may bring the weight to the normal BMI and fat loss. Another research reported by Khanna et al. (2017) stated that in their research finding that subjects in the diet and exercise intervention group may improve and reduce in their body weight and fat mass when compared to the control group. In other words, dietary and exercise intervention may improve their fitness and health marker. In addition, diet and exercise may improve insulin sensitivity. These are some particularly useful findings.

A large number of studies have reported the association between exercise and dietary intervention for weight loss. It is also important to take note that the regulation of body weight to develop the treatment of obesity (Muhammad et al., (2019). Besides, it has been suggested by Pahdarina (2019) that the most effective diet therapy is by reducing the energy intake or low calorie diet. In addition, a low-calorie diet plus exercise will reduce the risk of cardiovascular disease by maintaining the stability of the cardiovascular working system and blood cholesterol level is balanced. To date, a current study by Pahdarina, Muhammad and Huriyati (2019) stated that low-calorie diet counselling and Zumba toning exercise could reduce the total cholesterol.

Another research study also supported Barene et al. (2013) which stated that apart from exercising, dietary and physical activity also may help in changes (Micallef, 2014). As a result, they are shown to have a positive effect on body fat. Another current research finding by Barranco-Ruiz and Villa-González (2020) stated that 16 weeks on Zumba exercise intervention with healthy nutrition habit seminar by receiving healthy recommendation talk shows the significant improvement in major health related fitness and body composition variables among sedentary women employees.

Several research studies were conducted by implementation of dietary intervention and Zumba exercise. According to research by Jain and Nigudkar (2016) stated that diets that are low in carbohydrates have been reported to enhance weight loss. These finding was supported by research on urban south Indian population that stated a high intake of refined grain was significantly associated with higher waist circumference among Asian Indian who are habitually taking food that high in carbohydrates and less intake of dietary fibers (Samaha et al., 2003).

One of the latest study was conducted by Richardson, Krishnan, Gray, Keim, and Newman (2021) stated that an 8 weeks of dietary guideline intervention shows the significant effects on body mass and BMI among overweight or obese women. Interestingly, short term intervention

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duration shows the positively correlation in reduction in BMI and body mass. The research study carried out to evaluate how effective lifestyle modifications which are the combination of exercise and dietary intervention were the crucial tools on weight loss and also fat reduction. These positive findings by Avenell et al., (2004) show that the combination of both modifications were more effective at twelve month compared to modification in diet only.

Therefore, the aim of this study was to investigate the effect of dietary meal plan on weight, BMI, hip circumference, waist circumference, percentage of fat and blood pressure among overweight women at end of week 1, week 4 and week 8 (Arol, 2020) practicing Zumba.

Methodology

This study was a quantitative study using a quasi-experimental method. Prior to conducting the intervention, the informed consent was taken from the participants. The data of the participants was collected at the end of week 1, week 4 and week 8. After the data was collected, all the participants received the dietary meal plan as an intervention. The duration of the study was conducted within 8 weeks (Ljubojević et al., 2014) (Arol, 2020). This study was conducted at Zumba exercise Studio at Teluk Intan, Perak. In this study, the participants were chosen from the members of the Zumba Centre which conducted the Zumba class 5 times per week.

Participant

Random Zumba Center that is practicing Zumba as its exercise program was selected. Practicing Zumba exercise routine and overweight women (BMI >24.9kg/m²) between ages of 18 – 55 years who are not participating in diet weight loss program were recruited in this study using purposive sampling. This was supported by research by Micallef (2014) in which the sample size in this study was 20 participants. All participants were able to give full commitment on exercise five times per week in this study. They were also not involved in any loss weight program, free from consuming any weight loss supplement or meal replacement. All participants were asked to avoid intensive exercise 24 hours before the intervention program. Participants who had personal problems or any other problem or cannot give full commitment to this research were excluded. Participants that had any other chronic diseases and on medications were also excluded in this study. Apart from that, participants who are unable to give full commitment to the schedule and have tendency to skip the session and meal plan, or even those who had a fever or any kind of health problem that make them failed to complete the eight weeks (Arol, 2020) training were not involved in this study. The inclusion criteria are the participants were healthy and did not have other chronic diseases.

Procedure

Initially, the procedures were explained and consent forms and demographic data were collected from all participants in week 1. A 3-day diet record (2-days weekdays and 1 weekend) and 24 hours' diet recall technique were used to collect the pattern of food intake for all participants. Participants recorded their food consumption for three days with their daily activity routine. There were three phases in this study which were week1, week 4 and week 8. Three days before week 1, three days' diet record and 24 hours' diet recall data were collected from all participants. During the end of the week 1, the data collected for all participants included weight, BMI, hip circumference, WC, percentage of fat and blood pressure. After all the data was collected, participants were given an explanation about the dietary intervention protocol by providing them with the menu plan based on individual's calorie requirement. It was planned by a registered dietitian. Participants must follow the meal plan within the

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intervention period. Exercise protocol and the Zumba exercise were conducted five times per week in the evening from 5.30 p.m to 6.30 p.m. For monitoring phase (at end of week 4) and post intervention phase (at end of week 8), the data including weight, BMI, hip circumference, WC, percentage of fat and blood pressure for all participants were collected. All of the participants were monitored on their meal intake using three days' food records. Zumba training was performed five times per week in the evening from 5.30pm –6.30pm. Each Zumba training (60 minutes) consists of basic exercises: warm-up, workout, cooling down and stretching. Exercise intensity was determined by the tempo of the music with range between 100 bpm – 140 bpm. All participants were asked to avoid any intensive exercise within 24 hours before starting the program.

Data Collection

Data was analysed by using the Statistical Packages for Social Science (SPSS) version 22.0. Descriptive statistics such as mean, standard deviation, and percentage were used to report the demographic data of the study. The data was collected at the end of week 1, week 4 and week 8 were analysed using one-way repeated MANOVA test and Bonferroni test.

Result

One-way repeated measure MANOVA is used to answer the research hypothesis, to investigate the effect of meal plan at the end of week 1, week 4 and week 8 and the relationship between the variables studied based on the hypotheses that have been developed in this study

Descriptive Statistic

Demographic Data (n=20) of Participants

Table 1: Demographic Data (n=20) of Participants

Variables	Frequency (N)	Percentage (%)	Mean ± SD
Age (year)			1.50 ± 0.513
Body Weight (kg)			68.53 ± 10.56
Height (cm)			156.35 ± 5.54
BMI (kg/m²)			28.10 ± 4.11
Marital Status			
- Single	3	15.0	
- Married	15	75.0	
- Widow	2	10	
Occupations			
- Housewife	13	65	
- Teacher	2	10	
- Self-Working	4	20	
- Clerk	1	5	

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Twenty participants (n=20) involved in this research participated in a Zumba exercise and a diet program within eight weeks. The table above shows the demographic data of the participants. Mean age and body weight of participants is 1.50 ± 0.513 years old and 68.53 ± 10.56 Kg at week 1. Participant mean height and BMI at the end of week 1 stated that 156.35 ± 5.54 cm and 28.10 ± 4.11 kg/m². The marital status of participants involved are single, widowed as well as married participants. Within these participants, 15% (n=3) were single, 10% (n=2) were widowed and 75% (n=15) were married. The occupation status of the participants involved are as housewife, self-working, clerk and a teacher. 10% (n = 2) of Participants are work as teachers, 5% (n = 1) as clerks, 20% (n=4) as self-working and the highest occupational status of participants are from housewife categories which is 65% (n = 3).

Effect Of The Dietary Meal Plan On Anthropometric And Physiological Indices On Overweight Women

Table 2: Effect of Meal Plan on Anthropometric and Physiological Indices on Overweight Women

Variables	Week 1 Mean ± SD	Week 4 Mean ± SD	Week 8 Mean ± SD	P value
Body Weight (Kg)	68.53 ± 10.56 ●	67.12 ± 10.81 ●	66.18 ± 10.61●	p <.001
BMI(kg/m²)	28.10 ± 4.11 ●	27.47 ± 4.25●	27.08 ± 4.16●	p <.001
Hip Circumference (cm)	41.98 ± 3.81●	41.03 ± 3.81 ●	40.06 ± 3.74 ●	p <.001
Waist Circumference (cm)	33.14 ± 4.07 ●	32.18 ± 4.26●	31.15 ± 4.12 ●	p <.001
Percentage of fat (%)	37.00 ± 4.43 ●	35.55 ± 4.51 ●	34.32 ± 4.32●	p <.001
Systolic Blood Pressure (mmHg)	127.85 ± 8.86 ■	125.00 ± 6.99 ♦	122.90 ± 7.57▼	p <.001
Diastolic Blood Pressure (mmHg)	83.25 ± 6.62►	83.30 ± 3.48 ►	84.05 ± 3.93 ►	p >.05

Notes: ●=Significant changes between week 1 vs week 4, week 4 vs week 8 and week 1 vs week 8, ■ = significant changes betweek 1 vs week 4, ♦ = Not Significant changes between week 4 and week 8,▼ = No Significant changes between week 1 and week 8,►= Not significant changes between week 1 vs week 4, week 4 vs week 8 and week 1 vs week 8.

The Table 2 above shows the effect of meal plan on anthropometric and physiological indices on overweight women who are practicing Zumba within 8 weeks. There was an average decrease in body weight at the end week 1 (68.53Kg), week 4 (67.12Kg) and week 8 (66.18Kg). The data shows the significant difference in body weight among participants practicing Zumba with meal plan intervention which is p <.001. Significant difference in BMI (p <.001) and the data shows the reduction in BMI from week 1 (28.10 kg/m²), week 4 (27.47 kg/m²) and week 8 (27.08kg/m²). Throughout the intervention period, participants show the reduction in waist

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IJEPC
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Volume 9 Issue 56 (December 2024) PP. 598-616
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circumference and hips circumference. The data shows the significant difference (p <.001) in hips and waist circumference. There is a reduction in waist circumference at week 1 (33.14 cm), week 4 (32.18 cm) and week 8 (31.15 cm). While for hips circumference there are also changes in week 1(41.98 cm), week 4 (41.03 cm) and week 8 (31.15 cm). Percentage of fat shows significant difference in week 1 (37.00%), week 4 (35.55%) and week 8 (34.32 %) with the p <.001. Systolic blood pressure shows significant difference (p <.001) in week 1 (127.85 mmHg) and week 4 (125.00 mmHg). There is not significant difference at and week 1 (127.85 mmHg) and week 8 (122.90 mmHg) and also Week 4 (125.00 mmHg) and week 8(122.90 mmHg) with p > 0.05. Diastolic blood pressure also shows no significant difference (p>0.05) within week 1 (83.25 mmHg), week 4 (83.30 mmHg) and week 8 (84.05 mmHg).

Discussion

This study investigates how an eight week Zumba program combined with a structured dietary meal plan affects anthropometric measurements and physiological indices in overweight women groups (n=20) who are practicing Zumba. The intervention significantly reduced body weight, BMI, waist and hip circumferences, and body fat percentage over the 8-week period. This finding clearly demonstrates that practicing Zumba exercise with proper dietary meal plan gave a positive effect and the result was significant difference in anthropometric measurement. In addition, it has been reported that dietary intervention with strengthening exercise may decrease body mass, fat percentage and fat mass (Swanepoel et al., 2013).

In this study, the 8-week intervention of Zumba with a meal plan resulted in a significant difference in participant's body weight at the end of week 1(68.53kg), week 4 (67.12Kg) and week 8 (66.18g). In addition, changes in body weight require changes in energy balance. In this research, the participants followed the menu plan that was designed by a registered dietitian. After eight weeks with a meal plan and Zumba exercise in week 8, there was a significant difference in body weight. According to Food & Malaysia (2010), it is emphasized that in Malaysian Dietary Guidelines (2010), there was strong evidence that body weight reduction promotes lower blood pressure, lipid levels and glucose levels in overweight and obese individuals. In addition, 5% - 10% of body weight loss in three to six months with a safe body weight loss of ½ - 1 kg/week plus calorie-controlled diet, balanced in macronutrients and physical activity were the best choice for weight loss.

Participant's BMI also shows the significant difference (p<.001) at the end of week 1 (28.10kg/m²), week 4 (27.47kg/m²) and week 8 (27.07kg/m²) accordingly. Reduction in body weight among the participants may lead to reduction in BMI as well. Participants' BMI reductions were consistent with findings from Ġmamoğlu and Özdenk (2019), who noted similar associations between weight loss and reduced chronic disease risks.

A study conducted by Bastuğ, Özcan, GültekİN, and Günay (2016) shows a positive effect on body composition especially in body weight and reduction in BMI. Besides that, Aktas, OzdİL, Bagis, and Guven (2016) found aerobic training applications affected positively weight loss and body composition among the sedentary females. Therefore, Zumba might be promoted as a lifestyle intervention in reducing body weight and BMI, thus lowering the risk of obesity. Interestingly, in this study the reduction of both body weight and BMI were also found at the end of week 1 and continued in reduction at the end of week 4 and week 8. BMI is used to predict the clinical outcome and the study is not clear for adolescent and childrens groups (Wells & Fewtrell, 2006). A significant advantage of the BMI is its availability as extensive

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 9 Issue 56 (December 2024) PP. 598-616
DOI 10.35631/IJEPC.956037

national reference data. This is because BMI is also useful as a tool to monitor and as a treatment of obesity (Duren et al., 2008). Research by Krishnan et al. (2015) stated that 16 weeks of Zumba exercise intervention among overweight and obese type II Diabetes Mellitus women has shown the significantly improvement on muscular endurance, flexibilities, body weight, BMI and percentage of body fat.

Throughout the intervention period, hip and waist circumferences show a significant difference which is hip circumference at the end of week 1 (41.98cm), week 4 (41.03cm) and week 8 (40.06cm) and waist circumference at the end of week 1 (33.14cm) week 4 (31.18) and week 8 (31.15cm) respectively. The eight-week Zumba program was applied to overweight women shows the significant reduction in body weight and BMI Micallef (2014). Waist circumference becomes one of the common parameters to evaluate obesity. High waist and hip circumference may increase risk of health problems. In this study, reduction in waist and hip circumference reduces the risk of chronic diseases. This statement is proven in one of the research studies that states that waist and hip circumference showed a direct association with heart disease (Welborn, Dhaliwal & Bennett, 2003). A study conducted by Vassilopoulou, Piperari & Christoforou (2017) stated that there was strong positive effect on body weight, waist circumference, hip circumference and fat loss when combined Zumba exercise with proper diet as compared to the subjects that received without dietary advice or any general healthy eating guidelines.

Thus, the waist and hip ratio is essential to maintain an optimum health and control obesity. Previous study stated that a three month of exercise among the Turkish population shows a significant decrease in waist and circumference (Turgut, Akbulut, İmamoğlu, & Çinar, 2018). Up to now, latest research study by Pekel, Aydos, Uzun, Bozoglu and Demirel (2020) stated that the result shows the significant improvement on body weight, BMI, waist thickness, arm-chest butt, hips, and chest for both groups which are Zumba and reformer groups.

Participants showed a significant difference in percentage of fat with ($p<.001$) at the end of week 1 (37.00%), week 4 (35.55%) and week 8 (34.32%). Attractive movement pattern in Zumba dance was able to trigger the whole body to move up and help the process of burning fat more quickly. Previous study shows that there was a positive effect of Zumba on body weight, BMI, body fat mass, hormonal profile and also reproductive function. This is supported by previous study carried out by Babayigit, Saygın, Yıldırım, and Ceylan (2014) indicated that weight loss programs by aerobic dance were useful tools which enable to decrease body fat percentage and improve body weight among students.

According to scientific studies stated by Delextrat, Warner, Graham and Neupert (2016) about the benefits of this type of workout, Zumba in healthy women has shown many positive effects in body composition and physical fitness.

Another research study by Suri and Saini (2017) stated that aerobic exercise, if taken regularly, is effective in controlling body weight, blood pressure and body composition. Research conducted by Ljubojevic, Jovanovic, Zrnic, and Sebic (2016) stated that an aerobic dance was an effective fitness program to achieve improvement in functional abilities and alter anthropometric data in women. The findings from the research conducted by Ljubojevic et al. (2016) showed a significant improvement in weight loss, Body Mass Index (BMI), fat percentage and fat mass within the 8 weeks Zumba exercise program. This finding also was

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 9 Issue 56 (December 2024) PP. 598-616
DOI 10.35631/IJEPC.956037

supported by Rossmeissl et al. (2016) showed that the anthropometric parameters showed a small change of the intervention program.

In this study, there were no significant differences in changes of diastolic blood at the end of week 1 vs week 8 and week 4 vs week 8($p > .05$) but there is significant difference between week 1 vs week 4 ($p<.001$). The diastolic blood pressure for week 1 vs week 2 showed a significant difference which is 127.85mmHg. While at the end week 4 (125.00) vs week 8 (122.90) and week 1 (127.85) vs week 8 (122.90) shows no significant difference respectively. The study showed that there is a reduction in diastolic blood pressure by 2.85mmHg from week 1 to week 4 and 2.10mmHg from week 4 to week 8. According to research by Cornelissen & Smart (2013) stated that the reduction in diastolic blood pressure was found 2.5mmHg among 5223 participants although the reduction in blood pressure is small. Systolic blood pressure at the end of week 1, week 4 and week 8 shows no significant difference ($p>.05$) for all weeks. According to a study by Sydó et al. (2018) increased diastolic blood pressure with exercise could increase arterial stiffness which were considered early signs of atherosclerotic vascular disease. A study conducted by Neves et al. (2015) stated that greater increase occurred in diastolic blood pressure which is a variable that is related to myocardial oxygen demand and cardiac work. To date, limited research studies on the effect of Zumba on blood pressure changes. A study conducted by Jitesh and Devi (2016) stated that Zumba dance has significantly improved the diastolic and systolic blood pressure after Zumba dance among hypertensive subjects within two months. However, Rossmeissl et al. (2016) stated that there is no evidence of changes in systolic and diastolic blood pressure. Few studies on mechanism of reduction on systolic blood pressure after exercise were due to decrease in vascular resistance may lead to the changes these studies explained the mechanism of reduction in resting in vascular structure, vascular responsiveness and changes in sympathetic nervous (Farahani et al., 2010).

Latest finding stated that the changes in systolic blood pressure could decrease the development of heart diseases, cardiovascular disease and suffering in stroke (Maisarah et al., 2018). One of the recent studies by Choi, Russell, Shah, Van Winkle and Lee (2020) stated that there were significant differences between the Zumba exercise group for right and left leg balance time (second), systolic blood pressure, diastolic blood pressure among 8 weeks of training. The other parameters show that there is no significant difference in other parameters in young obese women. There is limited research on body composition outcomes associated with physical activity engagement among overweight and obese young adults (Joseph, Casazza & Durant, 2014). Joseph et al. (2014) stated that the finding showed that a 3-month physical activity program was associated with increased bone marrow, body weight, and increase in muscle quality.

This was supported by (Krishnan et al., 2015) which suggested that Zumba exercises were found to improve internal motivation, reduce body weight and body fat, and improve the health of obese women. A study conducted by Vassilopoulou et al. (2017) stated that positive estimation on the effectiveness of Zumba on body weight, waist circumference, hip circumference and percentage of fat when combined with proper dietary plan. Latest study found by Maisarah et al. (2018) the changes in fat mass could affect the changes in body shape including waist circumference. Research study conducted by Mardock et al. (2011) showed that participants in meal plan exercise promote more favourable changes in fat loss. In this study, the percentage of fat loss showed significant improvement.

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 9 Issue 56 (December 2024) PP. 598-616
DOI 10.35631/IJEPC.956037

As a summary, Zumba was one of the aerobic exercises that gave a positive effect on the body weight, BMI, waist circumference, hip circumference and the percentage of fat with proper dietary intervention based on an individual's energy requirement and dietary advice to the participants. Since Zumba exercises are very popular especially among women, children and adolescents, it could be also used as a preventive measure for obesity together with general dietary education, even in large targeted groups. This may suggest that proper dietary advice and plan by taking into consideration eating habits, food preferences and lifestyle should be promoted in weight management with combination of exercises.

Conclusion

In the present study found that after the end of week 8, the data showed significant differences in body weight, BMI, waist and hip circumference, systolic blood pressure (week 1 vs week 4) and percentage of fat loss. However, there were no significant changes in diastolic blood pressure and systolic blood pressure throughout the 8 weeks of intervention. This suggests that regular Zumba exercise along with a healthy diet help in improving body weight, BMI, WC, hips circumference and percentage of fat. Proper dietary meal plan intervention programs combined with Zumba exercise can effectively reduce the anthropometric as well as encourage people to practice healthy eating behaviour, make healthy food choices and engage in physical activity to enhance their lifestyle and reduce the risk of chronic diseases. With proper diet and exercise, these two elements can improve on anthropometric and physiological indices which eventually can help to reduce the risk of chronic, lifestyle diseases like diabetes.

The study explored the challenges participants faced in adhering to dietary advice and meal plans, as well as following the steps during Zumba exercise sessions. Participants struggled with dietary compliance due to various factors, such as personal food preferences, lack of time to prepare meals, and difficulty maintaining motivation. In terms of Zumba exercises, participants had trouble keeping up with the fast-paced routines due to coordination and rhythm challenges, particularly if they lacked prior experience with dance or group exercise. Physical limitations and confidence issues also played a role, with some participants feeling self-conscious in the group setting, which affected their ability to follow the movements. These findings suggest that addressing both dietary and exercise challenges requires a more tailored approach, with support to increase motivation, improve understanding, and adapt the intensity of exercises to individual capabilities.

Recommendation

The study had limitations in terms of its small sample size and short duration, which may have impacted the comprehensiveness of the results. Further research could address these limitations by increasing the sample size and extending the study duration to gain a more reliable and meaningful understanding of the intervention’s impact. Additionally, the participant may assigned into two groups, which are control, and intervention groups. Moreover, future studies could expand the outcome scope by including biological markers such as blood test.

Finally an important area to explore would be how the intervention affects different genders**.** By assessing whether the intervention produces more significant results in one gender over the other, researchers could gain insights into gender group to the intervention. This could lead to more tailored approaches in future health and wellness programs.

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 9 Issue 56 (December 2024) PP. 598-616
DOI 10.35631/IJEPC.956037

In conclusion, extending the study's duration, expanding the sample size, incorporating biological data, and considering gender differences would provide a more comprehensive analysis and improve the generalizability and applicability of the findings.

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