



IMPACT OF AN 8-WEEK AEROBIC DANCE EXERCISE PROGRAMME ON WEIGHT REDUCTION OF OVERWEIGHT CHILDREN AGED 10 AND 11 YEARS AT A SCHOOL IN CHITUNGWIZA, ZIMBABWE

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Abstract:

The study set out to examine the impact of an 8-week aerobic dance programme on weight reduction of children aged 10 to 11 years in a school in the city of Chitungwiza. The focus was on the examination of whether aerobic dance programme have an impact on reducing the weight of overweight children aged 10 to 11 years. Fifty children were divided into two groups which are the experimental and control. Four instruments used for the collection of data were a bathroom scale for measuring weight, a stadiometer for height, a stopwatch for measuring time, and an aerobic dance programme as an intervention. The results show that the 8-week aerobic dance intervention has a minimal weight reduction effect on the subjects. There were very marginal changes in the weight loss and BMI of the subjects during the 8-week aerobic exercise programme. The study also concluded that despite the lack of significance in the marginal changes during the intervention, there was a positive forecast for the continued effect of aerobic dance exercise on weight reduction. The study recommends that aerobic dance exercises in children need an appropriate aerobic dance model to affect body composition in terms of reducing body weight. The research findings also indicate that the intervention for weight reduction must be done continuously for a long period, and research studies should also be directed at determining the use of waist circumference percentiles in conjunction with BMI percentiles to measure weight reduction among children and youth. The study also recommends further studies on interventions that combine aerobic dance exercise and resistance training or aerobic exercise programme combined with an appropriate dietary regime to achieve weight reduction in children.

Keywords: aerobic dance, overweight, Chitungwiza, Harare

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1. Introduction

In both industrialized and developing nations, the prevalence of overweight and obesity among children and young people is rising (Ogunleye, 2011; Pronk & Boucher, 2000). However, despite recent stabilisation, research shows that the high prevalence of childhood overweight and obesity is still a major public health concern (Ogden, Carroll, Curtin, Lamb & Flegal, 2010). It has also been noted through research that most youths are overweight and have physical inactivity and this has its roots in childhood through adolescence, a period mainly characterised by marked changes in both body and behavioural changes (Ogunleye, 2011). Some studies show that children who are overweight or obese are more common in developed Middle Eastern and Asian nations (Derakhshan *et al.*, 2017). In line with these studies, an experiment carried out in India, noticed that the prevalence of overweight and obesity is raising nowadays, with some health implications that affect the lives of a sizable population of Indians, both children and adults. (Singh & Ghuman, 2017; Dretz, 2008; Stump, 2004). Numerous studies have shown that childhood obesity and overweight are serious medical disorders that have a negative impact on the development of the next generation. (Ayatollani, 2005). Therefore, studies to address the situation at hand are necessary the world over.

In a recent study conducted by the World Heart Foundation, it is believed that between 60% and 80% of the larger population of children and youth did not engage in physical activity adequate to attain health benefits. This has also been experienced by many children worldwide during the COVID-19 pandemic era. The surge of the pandemic restricted many children from participating in physical activities as they spent most of their time indoors. Additionally, it is stated that modernization and dangerous environments are two factors that may contribute to the rising prevalence of overweight and obesity in children (Ajala *et al.*, 2020). This situation has pushed the status of many children into a health risk. It was also noted through research studies that modern inventions have positively altered the way some activities are carried out, and this has contributed to a sedentary lifestyle in most of the population (Underhay, de Ridder, Van Rooyen & Kruger, 2002). In many industrialized nations, like the United States, Canada, Great Britain, and Australia, the rapidly rising prevalence of overweight has also been linked to a decline in physical fitness (Tomkinson & Olds, 2017; Tremblay *et al.*, 2010). Furthermore, studies involving young people aged 6 to 19 from 27 nations showed that between 1970 and 2003, aerobic fitness declined by 0.4% a year (Tomkinson & Olds, 2007). This has negative consequences because aerobic dance exercises have been shown to reduce body fat, thereby contributing to the loss of body weight and preventing overweight, and positively enhancing total fitness (Emiola *et al.*, 2002; Hoeger & Hoeger, 2005; McGlym, 1999).

Despite many studies conducted on weight reduction using aerobic exercise programmes, fewer studies have been done on the impact of aerobic dance exercise on variables such as weight reduction in both girls and boys whose age ranges are between 10 and 11 years. The study used the city of Chitungwiza, which is a large area. However,

some of the samples used in the previous studies consisted of participants of all genders. The current study used both boys and girls of equal numbers. It is also noted that the COVID-19 pandemic contributed to the increase in the overweight of many children the world over, including the continent of Africa (Chang *et al.*, 2021). Therefore, some exercise intervention programmes are needed in the form of physical activity to address the health problem. In this study, the researcher examined how an eight-week aerobic dancing fitness program affected children's weight loss at a school in the city of Chitungwiza.

2. Literature review

2.1 Effects of aerobic dance exercise on weight reduction

Many studies contributed to the designing and implementation of interventions that led to the monitoring and control of overweight and obesity in people. The studies resulted in the establishment of various effects of aerobic dance on weight reduction across populations. Research has conclusively shown that individuals require self-confidence to have healthy and calm lives (Welcome to Wellness, 2006). Additionally, it is believed that people's self-confidence rises when they are fit and healthy. It is, therefore, imperative to have some health interventions to curb some of the health problems such as overweight and obesity. Most of the health interventions were examined to test their impact on solving some health problems, such as being overweight in children, but they dwelt on some age groups. Numerous research, including those by Lai *et al.* (2013), Davis *et al.* (2012), Lee *et al.* (2012), and Ossanloo *et al.* (2012) looked at the benefits of aerobic dancing exercise on weight loss (2012). These studies found that aerobic dance exercise can be the most efficient method for losing weight and have a favourable impact on decreasing body fat (Gokyarek *et al.*, 2016). According to the findings of the study by Gokyarek *et al.* (2016), individuals who attempted to lose weight solely through food lost 28% of their fat-free body mass, whereas those who added an exercise regimen to their diet only lost 31% of their fat-free body mass. It is clear from the study that aerobic exercise can provide longer-term weight loss maintenance as compared to the use of diet only. However, neither Jaywant (2013) nor Danielson *et al.* (2012) found any evidence that aerobic exercise significantly reduced body fat percentage in middle-aged women or children.

It is noted that some studies conducted on aerobic exercise with an increase in repeated standing vertical jump height (Alves *et al.*, 2016; Hermassi *et al.*, 2014; Km- Ister, 2006) produce a decrease in measurements of subcutaneous fat and body mass index (Ghorbani *et al.*, 2014; Ozturk *et al.*, 2013). Stretching, a vertical jump, a shuttle run, and push-ups were anticipated by many as physical activities to combat obesity, and Euro fit was thought to have impacts on weight loss, which is in line with this study (Elgar, 2005). It is also noted that in one of the aerobics exercise program based on these parameters, a significant difference was also seen at the level of $p > 0.05$. The research conducted by Gokyurek *et al.* (2016) demonstrates that aerobic exercise programs reduce the prevalence of obesity in a manner consistent with weight loss. A further finding from the study is that aerobic exercise can help people who are overweight or obese by lowering

measurements of weight and body fat. Similarly, in line with this research, Ozvergili (2013) found out that "aerobic exercise"—which involves rhythmically working for large muscle groups over time—is the most efficient type of exercise for exercise treatment. According to claims made by Gumusler (2006) and Donnelly (2003), aerobic activity reduces body fat, especially subcutaneous fat, and is effective in this regard (Kokino & Zaleri, 2004). These studies indicate that aerobic exercise can control diseases linked to obesity (Ozturk *et al.*, 2013).

Numerous researches contend that aerobic exercise must be carefully planned to reduce obesity and overweight (Pekmez *et al.*, 2012). In line with the study, step aerobic exercises were found to cause positive physiological changes and can improve body fat ratio, general physical competence, flexibility and endurance (Zorba *et al.*, 2000; Koksall *et al.*, 2006). It is also argued that step aerobic exercises cause a significant decrease in body fat percentages (Kurt *et al.*, 2010; Duygu *et al.*, 2018). However, a different study, (Tortop *et al.*, 2010) found that a step aerobics program that was performed three times a week for a period of 12 weeks at a target heart rate of 60 to 80% resulted in a statistically significant difference in body weight and body mass index (Sevinc & Tekik, 2018). From this study, it is concluded that any aerobic exercise influences weight reduction. The results of the study conducted by (Sevinic & Tetie, 2018) show that women who do step aerobics experience a positive change in visual body structure, reduced body fat and increased aerobic stamina. From these various studies, it appears there is a knowledge gap in the lack of information on the effect of aerobic dance workouts on the weight decrease of overweight children.

Despite the fact that many studies have helped various populations lose weight, there are still individuals in which the body composition has not changed. Some of these studies were conducted by Jaywant (2013) and Niederer *et al.*, (2009). Despite these findings, Okura, Nakata, Numao, Ohkawara, Matsuo, Katayama & Tanaka (2007) reported that aerobic dancing training over the course of 14 weeks reduces body mass index in a group of 209 obese and overweight women. Based on the findings of (Akdur, Sozen, Yigit, Balota & Given, 2007), it is concluded that the use of dance step aerobics paired with a low-calorie diet was the best workout model that has an impact on physical fitness and physiological parameters. According to this study, maintaining fat-free mass and bone-free mass can be impacted by combining a highly intense dance aerobic program with a weight loss diet (Okura, Nakata & Tanaka, 2003). It is from this background that a similar study to examine the impact of dance aerobic exercises without the use of a calorie diet was undertaken. In a related study, Andersen, Wadden, Bartlett, Zenel, Verde, and Franckowiak (2002) found the same outcomes in their research, which demonstrated that following the application of a 16-week aerobic dance programme combined with a low-calorie diet, they were a statistically significant reduction in body weight (8.3 +/- 3.8 kg), fat free mass (0.5 +/- 1.3 kg), serum triglyceride levels (16.3%), as well using a dance aerobics program and a nutritional placebo. In a study conducted by Petrofsky *et al.* (2008) with a sample of 60 female patients engaging in an hour of aerobic

dancing exercise every day for ten days, it was concluded that the use of this program reduced body weight, body mass index, and waist circumference.

Despite the fact that limited studies focused on examining the effects of aerobic dance activities on weight loss in children aged 10 to 11 years, Kravitz, Cisar, Christensen, and Setterland (2013) still recommend the use of the right dance aerobic programme to decrease the body fat mass and body fat percentage. Additionally, research has shown that the mesomorph component of the somatotype rose while the endomorphic component decreased. Shimamoto, Adachi, Takahashi, and Tanaka (2015) examined the idea that low-intensity dance aerobic exercise was a helpful exercise approach for lowering body weight in obese or overweight middle-aged women. Their work was acknowledged by Esfarjani *et al.* (2012). On another note; their finding is supported by the study's findings, which showed a decrease in body weight and body fat %. This is also in agreement with Hopkins, Hoeger, and Rhodes' (2009) findings, which showed that all aspects of functional fitness, including the loss of body fat, were positively impacted by low-intensity aerobic exercise. Contrarily, it was found in a 1987 study on both body composition that aerobic dance in the water was ineffective for reducing either fat-free mass or fat-free mass. (Montero *et al.*, 2014). However, still there are more supporting studies related to weight reduction because of using aerobic dance exercise programmes. For instance, numerous studies that paired an aerobic dance programme with another form of exercise had promising outcomes (Gasti & Hiremath, 2012). The findings of this study demonstrated that aerobic dancing exercise is superior to a callisthenics session alone in terms of increasing lean body mass and lowering the proportion of body fat. According to this combination program, during the course of twelve weeks of exercise, which comprised aerobic dancing, step aerobics, and resistance training, the percentage of body fat decreased (Ossanlvo, Najar & Zafar, 2012). Twenty young female students were used in Engels, Bowen, and Wirth's (2003) to investigate the effects of low-intensity dance aerobics on body composition. The study's findings revealed a statistically significant 3.9% decrease in body fat. Based on these findings, the researchers came to the conclusion that low-intensity aerobic dance was an effective intervention for altering the female student's body composition.

In a different research into the impact of aerobic dance training on weight loss, the "omnibus" aerobic program, which consists of 12 various types of aerobic exercise and other forms of exercise, was administered by Stosiykovic Mandaric, Todorovic, and Mitic (2010) to a sample of 10 women with an average age of 33.6 years for 24 weeks. It should be emphasized that following the program's six-month application, body weight, percentage of body fat, and body mass index all significantly decreased. In another study, rhythmic gymnastics and aerobic dancing helped 220 high school students lose weight and fatty tissue (Viskic, Stalec, Katic, Podvorac & Katovic, 2016). This study supports the findings of a previous research into the impact of dance aerobics on young people's body composition (Stosic, Uzunovic, Velickovic, Zwkovic, Petrovic & Markovic, 2016). According to the study, using the right dancing models can change body composition by lowering body weight, lowering body fat percentage, and boosting lean body mass. A

distinct study on aerobic dance exercise's impact on cardiorespiratory variables and the body composition of obese young people and adolescents in Africa reveals a considerable loss in body weight (Ajala, Adedokun, Adedeyi & Ojo, 2020). The findings (Williams & Woods, 2004) equally showed that continuous aerobic exercises lasting over ten reduces body weight significantly.

A study conducted by Emeghara (2021) showed a significant decrease in the body weight of patients after three months of dance aerobic exercise. Research noted that dance aerobic training has progressively gained popularity in fitness and weight loss intervention programmes (Loss, 2002). Kelley and Kelley (2010) also found that overweight or obese children and adolescents who engaged in regular, strenuous aerobic exercise for at least 45 minutes on three days a week will lose weight. In agreement, the same result was obtained from a study at Duke University Medical Centre (2012) where it was reported that aerobic dance exercise was also a more efficient method of exercise for losing body fat. Five investigations on young women found a statistically significant reduction in body weight after aerobic exercise to music at the $p < 0.01$ level (Kostrzewa-Nowak *et al.* 2015; Stojiljkovic *et al.* 2010; Nikic & Milenkovic 2013; Basting 2015; Kostrzewa-Nowak *et al.* 2015). Positive outcomes for weight loss were obtained from a ten-week research that comprised a low- to moderate-intensity aerobic dancing exercise regimen (Maranda *et al.*, 2013). Additionally, seven studies revealed a statistically significant drop in body weight observed at the $p < 0.05$ level, which may be related to the program's short eight-week duration (Cakmakci, *et al.*, 2011; Mathunjwa *et al.*, 2013; Ljubojevic *et al.*, 2014; Kaya *et al.*, 2016; Vassilopoulou *et al.*, 2017; 2018 Atvie *et al.*, 2018 & Oktay, 2018).

2.2 Types and intensity of aerobic dance exercise which can contribute to weight reduction

It is asserted that dance and aerobics workouts must be incorporated into a program to combat obesity and overweight (Pekmez *et al.*, 2012). The prescribed aerobic exercise should be performed for extended lengths of time, with medium-intensity practices, and should be a joyful activity like play, music, dancing, rhythm, and group work (Gokyurek *et al.*, 2016). It is unclear, though, if the same technique was successful in helping children between the ages of 10 and 11 to lose weight. Furthermore, Marandi, Abadi, Esfarjani, Mojtahed, and Ghaseni (2012) advocated beginning aerobic exercise with a light aerobic dance programme and increasing to severe aerobic exercise. This suggestion is based on the idea that aerobic exercise, both at lower and higher intensities, reduces body weight, body fat percentage, body mass index, and lean body weight (Marandi *et al.*, 2010). It is advised that aerobic dance exercise that relies entirely on the aerobic energy system take into account the principles in order to know the extent to which the exercise may be performed, whether it is low or moderate, according to a study by Adedokun and Ojo-Ogunleye in Nigeria (2020). Exercise should be between 60% and 80% of one's maximum heart rate in intensity (Balaola and Ojo, 2015). The intervention group must follow a continuous, low- to moderate-impact aerobics training regimen, whereas the control

must follow a lifestyle placebo (Adedokun & Ojo–Ogunleye, 2020). The same research also suggests that the aerobic dancing exercise programme starts with a mild effort, raises it quickly to reach an HR max of 60%, and finishes with a cool-down session.

Numerous researches advocated for participating in different types of aerobic dancing activities, emphasizing the benefits of improving one's health state (Donges, Duffield & Drinkwater 2010; Jorgic *et al.* 2011; Kumura & Hozumi 2012; Pantelie *et al.* 2013, Sivvas *et al.* 2015). In his research, Kumar (2016) included aerobic dance programme exercises for duration of 60 minutes to reduce the weight of his participants. It is noted from these studies that the training frequency and type of exercise contributed to the weight reduction of various participants. However, it is not clear whether some of the exercises' frequency, when implemented on children, yielded the same results. The multiple effects of the exercise programs implemented on the body composition of young women were noted in the systematic overview of the parameters that were measured, and this resulted in a decrease in body mass index, with a statistically significant difference favouring the studies with long exercise programmes (Kumar, 2016). In relationship to this, Kumar (2016) found that an exercise program lasting for 12 weeks, with five training sessions per week of 60 minutes each, resulted in the biggest statistically significant decrease ($p > 0.01$) in body mass index. Following this were two studies: one by Kostrzewa-Nowak *et al.* (2015), which lasted 12 weeks and found a statistically significant difference of ($p > 0.01$), and another by Basting (2018), which lasted 14 weeks with a single training session each week of 30 to 70 minutes. With three to four training sessions per week, the aerobic dance exercise programme used in trials lasting eight weeks (Kaya *et al.*, 2016; Ativie *et al.*, 2018) produced a statistically significant difference ($p > 0.05$) in the body mass index in favour of the experimental group. The same statistically significant difference was found in another study (Mathunjwa *et al.*, 2013), whose study ran for 10 weeks with weekly training sessions lasting 60 minutes. The implementation of an aerobic dance exercise program to music with an intensity of 50 to 85% of the maximum heart rate per period and duration of 30 minutes during the main part of the training session allows for greater oxidation of fat that is needed to create energy, which in turn influences the reduction of body fat. This conclusion can be drawn based on the results from the studies (Hadzovic *et al.*, 2020). The author Borer (2008) came to the same conclusion and stated that the majority of the energy used during low-intensity aerobic activity comes from the oxidation of fat that is derived from fat deposits. According to the findings of this study, mild to moderate exercise performed over an extended period of eight weeks can be utilized to reduce visceral, subcutaneous, and total abdominal fat without a change in diet, supporting the assertions made by earlier researchers (Hrvoj *et al.*, 2015). An analysis of different studies concluded that the positive influence of aerobic exercise programmes which lasted 12 or more weeks to music on the parameters of body composition had a greater impact on the reduction and maintenance of body weight, body fat reduction and increased muscle tissue (Hadzovic *et al.*, 2020).

The intensity of aerobic dance exercise programmes should be chosen using the Carvonien method, according to a study by Cakmakci *et al.* (2011) on the effects of aerobic

dance exercise on body composition alterations related to weight change in inactive women. This method recommends that each exercise must be performed according to the target heart rate for each subject under control with the polar device (Cakmakci *et al.*, 2011). The same study suggested aerobic dancing exercises with music that included controlled arm movements, knee bends, lunges, low impact aerobics, running on the spot, and skipping and hopping (high impact) (Cakmakci *et al.*, 2011). This study also recommended a training unit lasting 60 minutes consisting of warm-up and stretching aerobic part, cool down and stretching. However, the initial and main part of the training programme lasted 40-45 minutes, with warm-up stretching and cool-down stretching done in 15 minutes. In addition, numerous studies suggested that aerobic exercises should include music, extended arm motions, and the utilization of large muscle groups (Jakubec *et al.*, 2008; Leelarungrayub *et al.*, 2010).

In relationship to aerobic dance exercise, which depends solely on the aerobic system (Ajayi, Abayomi & Ojo, 2013), it must be well designed using the principles of training in order to the extent to which the exercise can be performed from low, moderate to high (Babalola & Ojo, 2015). For aerobic dancing exercise programmes for obese or overweight young people, Adedokun & Agunleya (2020) recommend exercising at an intensity of between 60% and 80% of one's maximal heart rate. This is in line with other studies that claim that exercising at a moderate level that ranges from 60% to 80% of the participant's maximal heart rate has a good effect on losing weight. The aerobic dance exercise protocol adopted by Adedokun & Ogunleya (2020) had three sessions per week, with the placements on Tuesdays, Thursdays and Saturdays). About this, the current study adopted four sessions per week with a rest on Friday. It is also noted in Adedokun & Ogunleya (2020) that exercises such as the back lunge, grapevine, lateral elbow lift, triceps kick back, left leg side kick, and right leg kick must be adopted in aerobic dance sessions. The aerobic dance exercise must also adopt the progressive workload approach to produce gradual overload work in relation to the recommendation of Ogunleya (2008).

Other types and amounts of aerobic exercises used to control weight (Pantelic *et al.*, 2013) recommended that the structure of the aerobic dance training sessions must have a high model to slow model of aerobic exercise to music. Furthermore, the training session's opening music should be set between 120 and 135 beats per minute (Brick, 1996, cited by Pantelic *et al.*, 2013). The movements utilized for this portion of the aerobic dancing exercises were designed to warm up the joints and the major muscle groups in preparation for the aerobic portion of the training session. As part of aerobic dancing training, it should be emphasized that activities including stationary running and walking as well as swinging the muscles and joints in circular motions, are also advised.

A similar research by Nejad, Habibi, and Ghanbarzadeh (2017), which examined the effects of eight weeks of aerobic exercise on overweight girls aged 10 to 12, advocated aerobic training that included a variety of motions in which speed and flexibility were particularly important. In light of this, the type and quantity of aerobic dancing activities included in the programme must determine the impact of exercise on lowering body fat percentage. According to research, teens should engage in a variety of fun physical

activities that vary from moderate to vigorous activity for at least 60 minutes or more (Guy & Micheli, 2007). However, other researchers recommend aerobic dance exercise sessions lasting for 45 minutes or more. Just like any other aerobic dance exercise recommended by various studies, the main aerobic exercise must include harmonic movements of hands and feet (Johnso *et al.*, 2009). The harmonic movements of hands and feet have been identified as important in the coordination of the whole body enabling those parts with fat deposits to use oxygen in the generation of energy through the process of oxidation (Shanana *et al.*, 2010). The aerobic dancing workout must also involve stretching the neck's flexors and extensors, neck muscular motions, as well as elbow and finger extensors (Nastiti, Fitri & Sultoni, 2019). Waist and hip movements, seated lower-trunk lateral flexor stretch, and legs with ankle rotation are a few of the exercises advised for aerobic dance. As additional essential exercises for aerobic dance intended to help people lose weight in both overweight and obese categories, the quadriceps stretch, V-step, double step, jumping jack, cross squat, knee up, and heel/toe were suggested. Activities for aerobic dance included skipping rope exercises for a 60-minute session, were adopted in a different study on overweight children in Korea (Ham *et al.*, 2016). A study on lowering childhood obesity in England was undertaken by McNarry *et al.* (2015) utilizing workouts such as ladder running, step-ups, star jumps, high knees, jumping jacks, and lateral jumps. Numerous activities adopted from different studies resulted in successful weight loss in participants.

A study done in China by (Tan *et al.*, 2010) examined weight reduction in Chinese children using aerobic dance exercises such as jumping, squatting and crawling (Chen, Lin, Xu, Lu, Hou & Wah Yu, 2021). However, the current study adopted some of the types and amounts of exercise related to the age of the participants. Since walking and jogging are the most popular aerobic dancing exercises (Karacabey, 2009), they were mostly used for warm-up and cool-down exercises. The squat, sit-up, knee extension, knee curl, elbow curl, and seated leg raise were among the exercises employed in a different study conducted in Finland by (Zehsaz *et al.*, 2016). It has been reported that in both China and Finland, these forms of workout regimens assist in regulating children's weight. The National Physical Activity Recommendations (2013) offer advice on how many hours to stand and what kinds of activities to engage in to improve health. It is encouraged that children between the ages of 5 and 12 and 12 and 18 engage in at least 60 minutes of daily moderate to intense physical activity (Australian Institute of Health and Welfare, 2014).

3. Research methodology

3.1 Research paradigm

A quantitative research paradigm was applied in this study. This is because quantitative research focuses on acquiring numerical data and using it to understand a specific event or generalize it across groups of people (Creswell, 2013; Babbie, 2010). In quantitative research, variables of interest are described, predicted, or controlled through the process of collecting data objectively (MacLeod, 2019). This study's objectives were to explore the

causal connections between factors, formulate research questions, and extrapolate findings to a larger group of Chitungwiza community children aged 10 to 11 years. This study was a good fit for the quantitative research paradigm since the results were analysed using statistical analysis, and as statistics are based on the principles of mathematics, the methodology is seen as being rational and scientifically objective (Carr, 1994; Denscombe, 2010). The paradigm is also appropriate since numerical data is less susceptible to ambiguities of interpretation than qualitative data, which is based on measured values and can be verified by others (McLeod, 2019). The quantitative paradigm employed statistical techniques but not always deductive or hypothetical techniques. The information was gathered through observation and BMI readings taken both in pre-test and post-test.

3.2 Research design

The research design serves as a guide or template for carrying out the study in a way that exerts the most control possible on variables that can compromise the validity of the research findings (Veal & Darcy, 2014; Polit & Hungler, 1999). The purpose of this study was to assess the effects of an 8-week aerobic dancing program on weight loss in children aged 10 to 11 at a school in the Chitungwiza community. As such, an experimental research methodology was used in this study. Therefore, the experimental design was suitable because it is closely associated with seeking to establish cause and affect relationships and seeks to capture the principles of causality. The researcher had complete control over all the pertinent factors in the research environment thanks to the experimental research design. Because two groups were created through purposive sampling, an experimental design with a two-group pre-test and post-test was appropriate for this study. Groups for control and experimental conditions were created with the subjects. Pre-test and post-test measures were conducted on each group, and only the experimental group received therapy.

Weight loss was the dependent variable in this study, and the aerobic dance program was the independent variable. An eight-week aerobic dance program was completed by the experimental group. Continuous low-impact aerobic dancing was done to music during the exercise. The control group was told to carry on with their regular routines while they were placed in a lifestyle setting. All of the participants in the experimental group completed consent forms freely and with the assistance of their parents or legal guardians. The experimental group took part in aerobic dance training programmes per week from Monday to Saturday and had a rest on Sunday. Each training session was made up of three segments: warm up, aerobic segment, and cool down. There was a total of 48 training sessions, and the phases of the training session were connected to various tempos. Every part of the training program was accompanied by music with a similar tempo, and each training session per day lasted for a total of 45 minutes.

The opening segment of the training session's exercises was designed to get the joints and big muscles ready for the aerobic dance portion of the intervention. Swings and circular motions warmed up the joints as well as the muscles. The opening segment

lasted for ten minutes. The major portion of the workout lasted 25 minutes and was composed primarily of dancing and aerobic activities. Ten minutes of stretching exercises and relaxation made constituted the training session's last portion. In conjunction with the activity, the participants controlled their breathing while listening to slow, soothing music.

3.3 Sample

A sample is a predetermined number of participants chosen to represent a population. The sample used in the study is largely the stratified one. The sample chosen from the population of 80 subjects aged between 10 to 11 years was divided into homogeneous groupings bearing the same characteristics of being overweight. Purposive sampling is an approach for choosing participants that involves choosing venues, people, or activities with the intention of providing information that cannot be obtained from other options. In this study, subjects of both sexes aged 10 to 11 years formed a stratum in a school set up in the Chitungwiza community. The sample was comprised of 50 subjects selected from a population of 80 subjects using purposive sampling. The fifty subjects were comprised of boys and girls aged between 10 to 11 years being overweight. The subjects were grouped as experimental and control with each group made up of twenty-five subjects who are overweight.

3.4 Data collection procedure

The measures taken to administer tools and collect data for an investigation are known as data collection procedures (Robson, 2002). Data from the study was collected from the observation and measurement of Body Mass Index (BMI) before the intervention (pre-test) mid-test and after the intervention (post-test). Twenty-five volunteers from the experimental group and twenty-five from the control group had pre-tests by the researcher. Prior to the start of the training program, there was an initial test, and there were mid-tests in the third and fourth weeks of the program. After the intervention had been in place for 8 weeks, the last test was conducted.

The data collection procedure involved measuring the weight of the subjects using a bathroom scale. The subjects measured their weight without putting on their shoes and jackets. The weight scores of the subjects were recorded to the nearest 0,1kg on the score sheet. The height of the subjects was measured using a stadiometer without the subjects wearing their shoes and headgear. The height scores were recorded on the score sheet in metres to the nearest 0,1cm. All the measurements were recorded on score sheets with the codes representing the names of subjects in the experimental and control groups. A research assistant helped in the collection of data from the subjects. The Body Mass Index was determined by dividing the weight in kilograms by the square of the height in meters, using the formula shown below:

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}}$$

The Body Mass Index values inside the overweight category, which is in the 85th to less than 95th percentiles, were determined using the BMI-for-age-Boys Growth Chart and the BMI-for-age-Girls Growth Chart. The BMI-for-age charts are included in appendices M and N.

4. Data processing and analysis

The analysis of data is closely related to operations that are performed to summarise the collected data and organise these in such a manner that they will yield answers to the research questions (Wilkinson & Bhandarkar, 2013). This study adopted a quantitative research paradigm that involves the analysis of statistical data based on the principles of Mathematics. The quantifiable data came from BMI assessments taken on children between the ages of 10 and 11. The data from subjects on BMI was computed to determine the T-test, ANOVA, ANCOVA and a forecasting analysis. Data analysis was carried out using SPSS 26 version and Excel 2016. These were run on each of the dependent variables. The threshold for significance was set at an alpha level of $p < 0.05$ for all analyses. Tables and graphs were used to present the data analysis.

4.1. Gender

The table below is a summary of the gender distribution of the subjects in this study.

Table 4.1: Gender distribution of the subjects

	Gender	Frequency	Percent	Valid percent	Cumulative Percent
Valid	Male	22	44.0	44.0	44.0
	Female	28	56.0	56.0	100.0
	Total	50	100.0	100.0	

The data above indicates that males constituted 44% ($n=22$) and females constituted 56% ($n=28$) of the experiment subjects selected.

4.1.1 Age

The table below is a summary of the age distribution of the experiment subjects.

Table 4.2: Age distribution of the experiment subjects

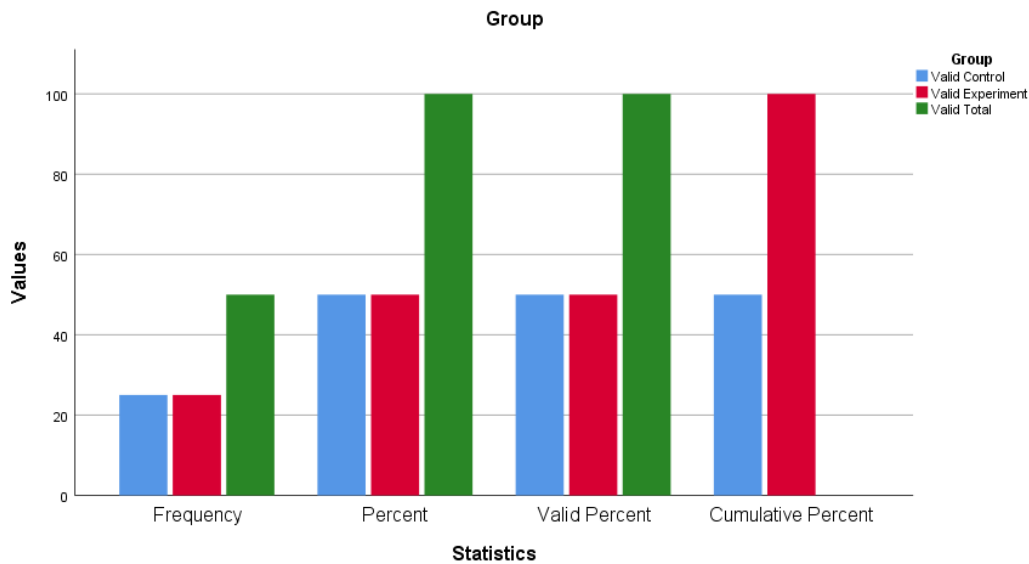
	Age	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10	25	50.0	50.0	50.0
	11	25	50.0	50.0	100.0
	Total	50	100.0	100.0	

The experiment was based on testing the impact of aerobics dance exercise on two distinct age groups and the data above show an equal distribution of age between the 10 years age group (50%) and 11 years age group (50%) to make a total of 50 participants equally divided on the two age groups.

4.1.2 Treatment

The graph below summarises the treatment of the subjects in the study.

Table 4.3: Treatment of the subjects



The experiment subjects were divided into two treatment groups which are the control which had 50% (n=25) and the experiment which had 50% (n=25). This was key in the procedure as it allowed the experimentation design to be carried out effectively.

4.1.3 Cross tabulation of gender-treatment-age

The data below summarise the demographic descriptive data of cross-tabulated distribution among the subjects.

Table 4.4: Cross tabulation of gender treatment age

Gender * Treatment * Age Crosstabulation					
Count					
Age			Group		Total
			Control	Experiment	
10	Gender	Male	5	4	9
		Female	8	8	16
	Total	13	12	25	
11	Gender	Male	6	7	13
		Female	6	6	12
	Total	12	13	24	
Total	Gender	Male	11	11	22
		Female	14	14	28
Total			25	25	50

The data above indicate that in the 10-year age group, there are more subjects in the control group (n=13) than in the experiment group (n=12). The girls dominated the two

groups with 8 subjects in both groups. In the 11-year-age groups, the control group has 12 subjects and the experiment has 13 subjects. There is an equal number of girls and boys in the control group (=6) and more boys (n=7) in the experiment group as compared to girls (n=6).

4.1.4 Weight Distribution

Table 4.5: Weight distribution

Descriptive Statistics						
	N	Min	Max	Mean		Std. Dev
Pretest_Weight	50	30	49	39.36	.690	4.881
Midtest1_Weight	50	30	49	39.30	.688	4.867
Midtest2_Weight	50	30	49	39.18	.688	4.864
Post-test Weight	50	30	49	39.00	.685	4.845
Valid N (listwise)	50					

The data above indicates a minimal change in weight comparable from the pre-test to post test. The pre-test mean weight is 39.36kg, and the post-test mean weight is 39.0 kg. This is indicative of marginal loss of weight, which may be attributed to the aerobic dance exercise.

4.1.5 BMI distribution

The data below summarises the distribution of BMI from pre-test to post-test.

Table 4.6: Distribution of BMI from pre-test to post-test

Descriptive Statistics						
	n	Min	Max	Mean		Std. Dev
Pretest_BMI	50	19.2	23.1	20.538	.1082	.7650
Midtest1_BMI	50	19.2	22.4	20.504	.1022	.7228
Midtest2_BMI	50	19.2	22.0	20.454	.0988	.6987
Posttest_BMI	50	18.7	22.0	20.390	.1072	.7579
Valid N (listwise)	50					

The data above indicates a marginal decrease in the BMI of the subjects from 20.538 in the pre-test to 20.390 in the post-test. These marginal changes may be attributed to the treatment variable after the aerobic dance exercise programme.

4.2 Obesity test

The weight status categories in this study were based on the Division of Nutrition, Physical Activity, and Obesity, USA (2021) were those in the 5th percentile and below were considered underweight and those in the 85th to 95th percentile were considered overweight and those above the 95th were considered obese. The obesity test statistics for gender and age on BMI were determined as follows; girls in the 10 years were considered obese if they were 20+ and 11 years if they were 21+. While boys in the 10 years age group

were considered obese at 19.2 and those in the 11 years age group were considered obese at 20.

4.2.1 Pre-test BMI

Table 4.8: Pretest BMI

Statistics		
Pretest_BMI		
N	Valid	50
	Missing	0
Mean		20.538
Median		20.342 ^a
Mode		20.4
Percentiles	5	19.450 ^b
	25	20.088
	50	20.342
	75	21.150
	85	21.350
	95	21.875

The pre-test data indicate that the selected subjects were generally above the normal BMI as shown in the percentile data above.

4.2.2 Post test

Table 4.9: Post-test BMI

Statistics		
Posttest_BMI		
N	Valid	50
	Missing	0
Mean		20.390
Percentiles	5	19.300 ^a
	25	19.900
	50	20.310
	75	20.900
	85	21.300
	95	21.750

The grouped data indicates that after the treatment most of the subjects in the experiment group remained overweight as the mean BMI in the 85th and 95th percentile remained above 21+.

4.3 Inferential analysis

This section will focus on inferential statistics of t-test, ANCOVA and repeated measures ANOVA to determine if the BMI changes have significance and effect size to conclude

that the 8-week aerobics exercise programme was successful in weight reduction among children of 10 and 11 years.

4.3.1 One sample T-Test

The table summarises one sample t-test findings in the study.

Table 4.11: One sample T-Test

One Sample						
Age	Gender		N	Mean	Std. Dev	SEM
10	Male	Posttest_BMI	9	19.844	.8472	.2824
	Female	Posttest_BMI	16	20.306	.6933	.1733
11	Male	Posttest_BMI	13	20.223	.4622	.1282
	Female	Posttest_BMI	12	21.092	.5696	.1644

The data shows that there are differences in the age and gender means in the post-test BMI results, however, a t-test will indicate if these means are significant if tested against the standard BMI indexes of age vis a viz gender according to the Division of Nutrition, Physical Activity, and Obesity, USA, (2021). The output table indicates the significant levels of the one sample t-test of gender and age.

Table 4.12: One sample test

One-Sample Test								
Age	Gender		Test Values = [19.2 (10 males); 20 (10year females & 11-year males); 21 (11-year females)]					
			t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
							Lower	Upper
10	Male	Posttest_BMI	2.282	8	.052	.6444	-.007	1.296
	Female	Posttest_BMI	1.767	15	.098	.3063	-.063	.676
11	Male	Posttest_BMI	1.740	12	.107	.2231	-.056	.502
	Female	Posttest_BMI	6.639	11	.056	1.0917	.730	1.454

The one sample t-test above indicates that there are no significant results across age and gender on the post-test BMI results in this study. This means that based on the accepted BMI test values used, the subjects' weight did not reduce in a significant way after the 8-week aerobics dance programme.

4.3.2 Paired Sample T-Test

In this investigation, the Paired Samples t-test is used to compare the means of two measures taken from the same experiment subjects. Pre-test and post-test scores, which were measured twice at different periods in this study with an intervention given in between, are examples of these "paired" measurements.

Table 4.13: Paired sample statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest_BMI	20.538	50	.7650	.1082
	Posttest_BMI	20.390	50	.7579	.1072

The comparative data show a modest standard deviation difference between the pre-test and post-test means. The statistic, however, does not demonstrate the importance of the paired differences. The output table below shows the significance of the tested paired samples.

Table 4.14: Significance of tested paired samples

Paired Samples Test									
		Paired Differences					t	df	Sig. (2 tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest_BMI - Posttest_BMI	.1480	.5581	.0789	-.0106	.3066	1.875	49	.067

The data in the table above indicate $t (df 1.49) = 1.875$, $p=0.067 > 0.05$, $CI = [-0.0106 \text{ to } 0.3066]$. This finding shows that there is no significant weight loss during the 8-week aerobic exercise programme.

4.3.3 ANCOVA tests

In this study, analysis of covariance (ANCOVA) was used since it offers a technique to statistically control the (linear) effect of factors that one does not wish to explore. An extraneous variable is largely controlled statistically using the analysis of the covariance approach. Covariates, also referred to as control variables, are these additional factors. The interval or ratio scale should be used to measure covariates. By dividing the variation attributable to this extra variable, or covariate, into separate halves, ANCOVA, which combines regression analysis and analysis of variance (ANOVA), controls the effects of this extra variable. The researcher is then better able to look into the consequences of the main independent variable.

4.3.4 Between Subject Factors

To carry out ANCOVA there should be at least two categories that should be used in the treatment and the table below confirms the factors between the subjects that this test used in its analysis of covariance.

Table 4.16: Between subjects' factors

		Volume label	N
Treatment	1	Control	25
	2	Experiment	25
Gender	1	Male	22
	2	Female	28
Age	1	10	25
	2	11	25

4.4 Levene's Test of Equality of Error of Variance

Table 4.17: Levene's Test

Levene's Test of Equality of Error Variances ^a			
Dependent Variable: Posttest_BMI			
F	df1	df2	Sig.
7.725	7	42	.230
Tests the full hypothesis that the error variance of the dependent variable is equal across groups.			
a. Design: Intercept + Pretest_BMI + Treatment + Gender + Treatment * Gender + Treatment * Age + Gender * Age + Treatment * Gender * Age			

The data indicates a significant result of $F(7.42) = 7.725$, $p = 0.001 < 0.05$ which suggests homogeneity of variance. It tests the null hypothesis that the error variance of the dependent variable is equal across groups. The results indicate a non-significant p-value hence homogeneity.

4.4.1 Between Subjects Effects-Treatment

Table 4.18: Tests of Between-Subjects Effects

Dependent Variable: Posttest_BMI						
Source	Type III Sum of Squares	df	Mean Square	F	Sig	Partial Eta Squared
Corrected Model	15.487 ^a	2	7.743	28.751	.000	.550
Intercept	1.420	1	1.420	5.272	.026	.101
Pretest_BMI	15.269	1	15.269	56.694	.000	.547
Treatment	.431	1	.431	1.600	.212	.033
Error	12.658	47	.269			
Total	20815.75	50				
Corrected Error	24.145	49				
a. R Squared = .550 (Adjusted R Squared = .531)						

The data above indicates that R Squared is 55% (and an Adjusted R Squared = 53.1%) indicating the strength of the model in predicting the effects of the covariates on the dependent variable. The treatment variable has an $F = 1.600$, $p = 0.212 > 0.05$, while the effect size PES is 0.33. The F measures how well the treatment is working. This test is based on pairwise comparisons of the estimated marginal means that are linearly independent.

According to the results, an 8-week aerobic dance test does not significantly modify BMI; the effect size is 0.033, which translates to a 3.3% decrease in BMI after the aerobic dance test.

Table 4.19: Between Subjects Effect on Treatment-Gender and Age

Gender and age						
Dependent Variable: Posttest_BMI						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	17.637 ^a	8	2.205	8.602	.000	.627
Intercept	.014	1	.014	.053	.819	.001
Pretest_BMI	7.631	1	7.631	29.775	.000	.421
Treatment	.402	1	.402	1.568	.218	.037
Gender	.453	1	.453	1.768	.191	.041
Age	.265	1	.265	1.032	.316	.025
Treatment * Gender	1.260	1	1.260	4.916	.032	.107
Treatment * Age	.688	1	.688	2.683	.109	.061
Gender * Age	.204	1	.204	.795	.378	.019
Treatment * Gender * Age	.200	1	.200	.781	.382	.019
Error	10.508	41	.256			
Total	20815.750	50				
Corrected Total	28.145	49				

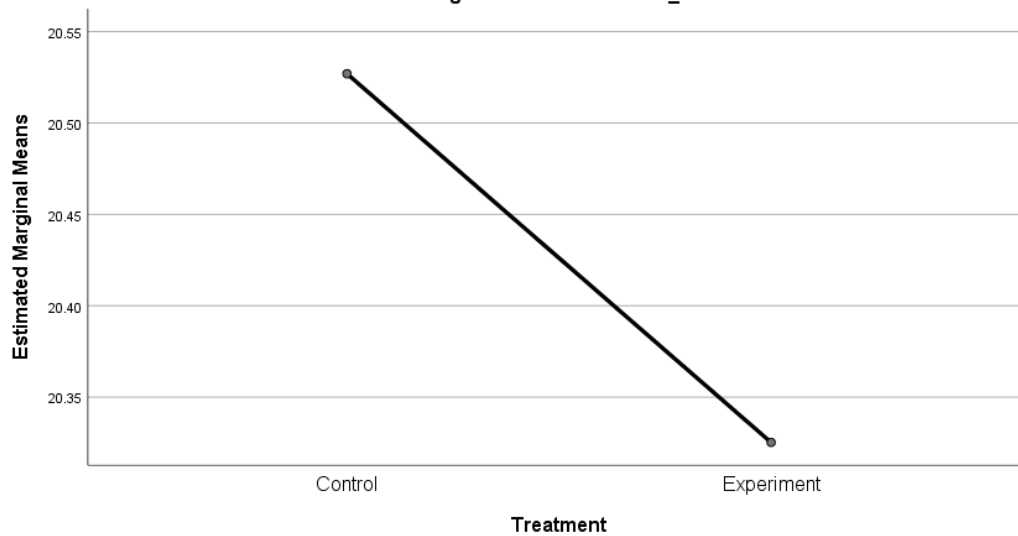
a. R Squared = .627 (Adjusted R Squared = .554)

The information above shows that the model's accuracy in predicting the effects of covariates on the dependent variable is indicated by the fact that R R-squared is 62.7%. $F=1.568$, $p=0.218>0.05$, and a PES of 0.37 are the statistics for the treatment variable. The F measures the impact of Treatment. On pairwise comparisons of the calculated marginal means that are linearly independent, this test is based. The data shows that an 8-week aerobic dance test did not significantly improve BMI. The effect size is 0.037, which translates to a 3.7% decrease in BMI after an 8-week aerobic dance therapy. The observation between subjects' effect on gender has a $p=0.191>0.05$ and age has a $p=0.316>0.05$. The Treatment*Gender has a $p=0.032<0.05$ but the effects size is 10.7%.

4.5 Estimated Marginal Means

The figure below is a plot of the estimated marginal means of the post-test BMI

Figure 4.20: Estimates Marginal Means of Posttest_BMI



Covariates appearing in the model are evaluated at the following values: Pretest_BMI = 20.538

4.6 Repeated measures ANOVA

Table 4.21: Box's Test of Equality of Covariance Matrices^a

Box's M	17.289
F	1.107
df1	12
df2	1339.749
Sig	.350
Tests the full hypothesis that the observed covariance matrices of the dependent variables are equal across the groups.	
a. Design: Intercept + Pretest_BMI + Treatment + Gender + Treatment * Gender + Treatment * Age + Gender * Age + Treatment * Gender * Age	

The data above show that the multivariate test of BMI, pretest, and treatment does not show any relevance. The results of all four tests—Trace, Pillai's Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root—showed that the multivariate tests were not statistically significant.

4.7 Within Subjects Effects

Based on the partial eta squared the data above indicate that they are very marginal changes in the weight loss and BMI of the subject during the 8-week aerobics dance exercise programme.

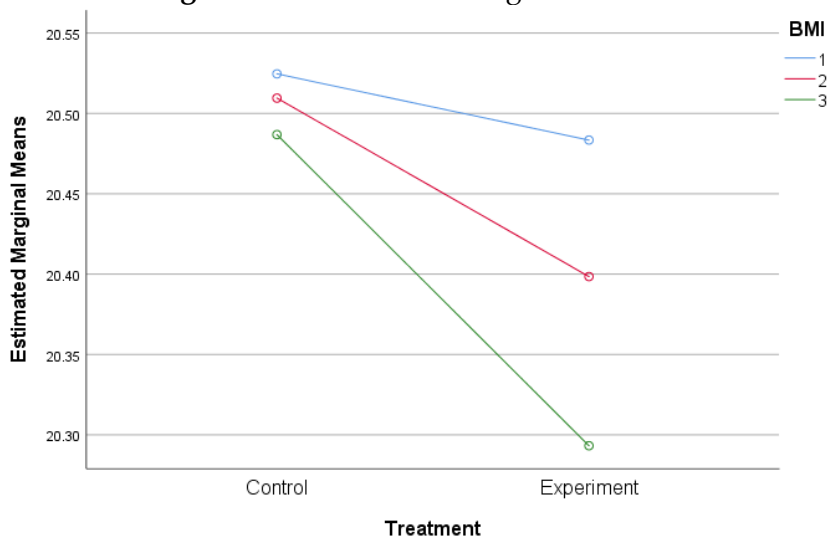
Table 4.22: Tests of within-subjects' effects

Measure: MEASURE_1							
Source		Type II Sum of Square	df	Mean Square	F	Sig.	Partial Eta Squared
BMI	Sphericity Assumed	.392	2	.196	3.022	.053	.060
	Greenhouse Geisser	.392	1.237	.317	3.022	.079	.060
	Hyunh-Feldt	.392	1.307	.299	3.022	.076	.060
	Lower Bound	.392	1.000	.392	3.022	.089	.060
BMI + Pretest_BMI	Sphericity Assumed	.418	2	.209	3.224	.074	.064
	Greenhouse Geisser	.418	1.237	.338	3.224	.069	.064
	Hyunh-Feldt	.418	1.307	.319	3.224	.066	.064
	Lower Bound	.418	1.000	.418	3.224	.079	.064
BMI * Treatment	Sphericity Assumed	.134	2	.067	1.033	.360	.022
	Greenhouse Geisser	.134	1.237	.108	1.033	.330	.022
	Hyunh-Feldt	.134	1.307	.102	1.033	.334	.022
	Lower Bound	.134	1.000	.134	1.033	.315	.022
Error (BMI)	Sphericity Assumed	6.089	94	.065			
	Greenhouse Geisser	6.089	58.124	.105			
	Hyunh-Feldt	6.089	61.451	.099			
	Lower Bound	6.089	47.000	.130			

Despite the assumed significant sphericity, the PES in BMI repeated measures is 0.06 which means there is a 6% effect of aerobics dance in weight reduction and BMI reduction. While BMI and pretest score indicate a PES of 0.064 which means from the pretest measure of BMI, the aerobics dance had a 6.4% effect in weight reduction among the subjects. BMI and Treatment had an effect of 0.02 which means that there was a 2% effect in the weight loss between the experiment group and the control group. The data, therefore, concludes that an 8-week aerobic dance programme has a minimal weight reduction effect on the subjects.

4.8 Estimated Marginal Means of Measure 1

Figure 4.23: Estimated Marginal Means of MEASURE_1



Covariates appearing in the model are evaluated at the following values: Pretest_BMI = 20.538

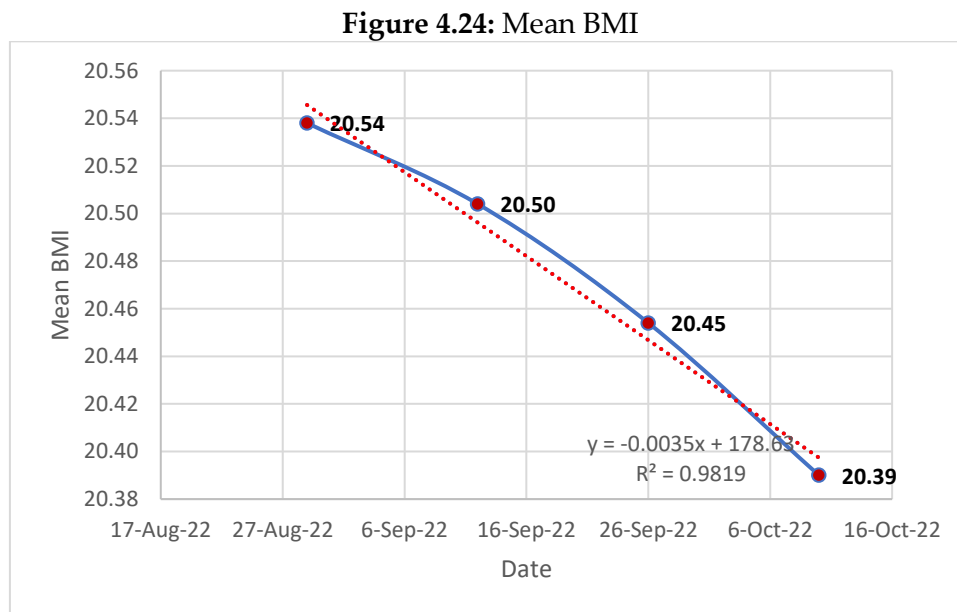
The data indicate a decrease in BMI from the midtest 1 (blue line), midtest 2 (red line) and the posttest (green line). The covariates are appearing in the model based on the pretest BMI = 20.538. Despite the lack of significance in the marginal changes during the 8-week aerobics dance exercise and a meaningful effect size, the data points towards a positive forecast in the continued effect of aerobics dance exercise in weight reduction.

4.9 Forecasting

The data collected is limited to 8 weeks of aerobic dance exercises; however, the major factor in weight loss exercises is not just intensity but time and consistency. The study, therefore, carried out a forecasting analysis to predict the BMI of the subjects in six months. The data below summarises the forecasting results.

4.9.1 Repeated Measures Trend Plot

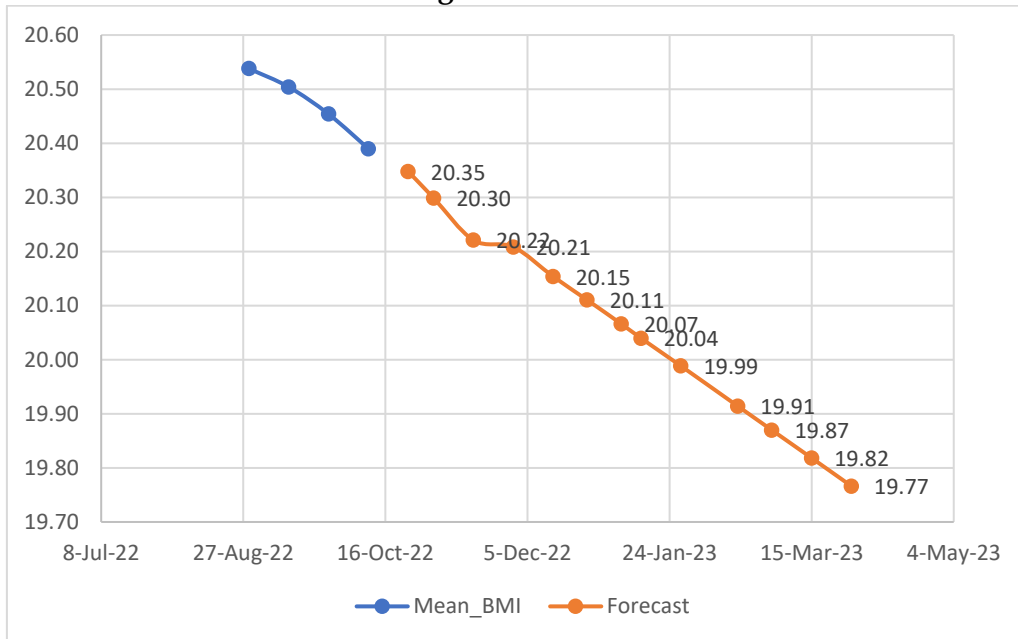
The measured mean of BMI from the pre-test to the post-test is indicated in the figure below. Included is the regression line with the formula and the R Squared value.



The trend line in the repeated measures is indicative of weight loss and decreasing BMI but the time frame has indicated that the decrease has no effect and is not statistically significant.

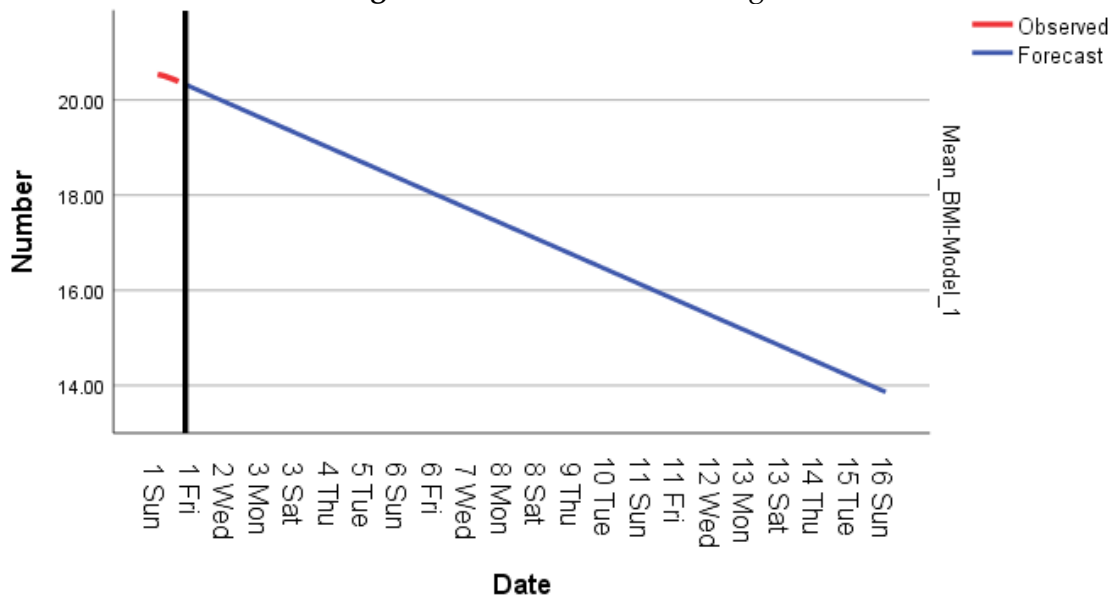
4.9.2 BMI Forecasting

Figure 4.25: BMI



4.9.3 16-week forecasting

Figure 4.26: 16 Week forecasting



The data above indicates that there is a significant weight loss over a period of six months if the participants are consistent in the aerobic exercise programme. The time series analysis and forecasting indicate that aerobics dance exercises are a slow-paced

intervention in the weight loss management among children between the age of 10 and 11 years.

5. Discussion of findings

The study's findings show that, children between the ages of 10 and 11 can lose weight marginally through 8 weeks of aerobic dancing workouts. The pre-test, mid-test, and post-test results showed that the mean weight of the experiment group's children had somewhat decreased, according to descriptive data such as mean weight and BMI. The findings show that after eight weeks children had lost 0.36kgs and the BMI dropped from 20.538 to 20.390 kg/m². This shows a marginal decrease in the BMI of children. This is in line with the findings of studies by Jaywant (2013) and Danielson *et al.* (2012), which found no appreciable impact of aerobic exercise on lowering fat percentage in middle-aged women or children. To determine the relevance and extent of the changes, more testing was done on the declining weight and BMI. The study used t-test, ANCOVA, and ANOVA. These tests indicated that there is no significant change in the weight reduction of children caused by the 8-week aerobics dance exercise. For example, the paired samples t-test had the following results $t(d f 1.49) = 1.875, p=0.067>0.05, CI = [-0.0106 \text{ to } 0.3066]$, these indicate a non-significant change in the BMI of the children in the experiment.

There was no discernible causal effect of aerobics on the subjects' BMI, as indicated by the multivariate ANOVA test's partial eta square of 0.064. The partial eta squares measurement of the experiment's overall effect was 0.02, which indicates a difference of 2% in the rate of weight loss between the experiment group and the control group. The data, therefore, concludes that an 8-week aerobic programme has a minimal weight reduction effect on the participants. This is also related to some of the studies conducted by (Jaywant (2013); Niederer *et al.*, 2009) which indicate that minimal changes in weight reduction can be yielded through aerobic dance exercises. The results of the investigation revealed no discernible differences between the various age groups used in the trial. Given that the weight loss program had the same effect on both groups; age did not have a substantial causal impact on it. This data is in line with extant literature reviewed in chapter 2 which also indicates that weight reduction requires more intense rigorous exercise if the difference is to be significant in a short to medium-term weight reduction programme (Pekmez *et al.*, 2012).

Previous literature also supported the finding stating that aerobics exercise must be well-programmed in reducing obesity and overweight (Pekmez *et al.*, 2012). If well managed, literature found that aerobic exercises were found to cause positive physiological changes and can improve body fat ratio, general physical competence, flexibility, and endurance (Zorba *et al.*, 2000; Koksall *et al.*, 2006). Despite the marginal decrease in body weight found in the experiment, literature argued that dance exercises cause a significant decrease in body fat percentages (Kurt *et al.*, 2010; Duygu *et al.*, 2018). In a different study, (Tortop *et al.*, 2010) found that adopting a step aerobics program of

60-80% target heart rate performed for 60-90 minutes three days a week for 12 weeks resulted in a statistically significant difference in body weight and body mass index (Sevinc & Tekik, 2018). The causal relationship between duration and weight reduction during aerobic dance workouts is the most obvious distinction between the literature and the current study. The present study was constrained by time which resulted in marginal changes recorded in weight reduction.

The study also found that there was a need for various types and high-intensity aerobic dance exercises so that there would be effective weight reduction in children aged 10 to 11 years. The present study observed a limited number of dance aerobics and limited times due to constraints beyond the researcher's control. Despite the limited types and intensity, they were marginal changes in the weight of the children in the experiment. These findings are in agreement to the previous literature which recommended the increase in the intensity of continuous aerobic dance programmes where there is 55% to 70% of the maximum heart rate (Mavridis, Filippou, Rokka, Bousiou & Mavridis, 2004). The literature further noted that an aerobic dance training programme with intensity increased to 70-90% of the maximum heart rate and music of 140-150 beats per minute has an impact on weight reduction in children aged 6 to 7 years old. Therefore, it was going to make a significant difference if the intensity was increased unlike the short period of the 8-week aerobics dance programme adopted in this study.

The researcher observed that children require a free, fun-filled and, jovial mood to keep pace with the rigour required in aerobics. This finding concurred with the advice in the earlier literature. The recommended aerobics exercise should involve pleasurable activities like play, music, dance, rhythm, and group work and should be performed for extended period with rehearsals at a medium level (Gokyurek *et al.*, 2016). Fighting fat, obesity, and being overweight are socio-psychological issues that required mental training and behaviour change. It was observed that children had changed their attitude mostly after three to four weeks and they enjoyed the accompaniment of music and dance in their fight against obesity. This is in line with (Williams *et al.*, 2018) who stipulate that a change in behaviour and a positive approach to weight reduction will effectively help children to work hard in aerobics or any other weight reduction intervention programmes.

6. Recommendations

The following recommendations were offered in light of the study's findings and conclusions. It is suggested that:

- Aerobic dance exercises in children need an appropriate dance aerobic model to affect body composition in terms of reducing body weight. The use of high impact aerobic dance must be used for aerobic fitness and low impact must be used for overweight to reduce body weight.
- Aerobic dance exercises must be used more often for a long time to control overweightness and obesity in children.

- Along with aerobic dance exercise programme, an appropriate dietary regime must be implemented continuously for a long period of time in order to achieve weight reduction in children.
- Future research should be directed at determining the use of waist (girth) circumference percentiles in conjunction with BMI percentiles to measure weight reduction among children and youth.
- Future research is needed in order to determine whether aerobic dance exercises combined with resistance training will have an impact on the weight reduction of children who are overweight and obese.

7. Limitations

The present research has its own limitations. The sample was focused on students studying at one school in Chitungwiza city. Results may be reliable if the study samples covered the student population from many schools in the city.

8. Conclusion

The research used a true experimental design to examine the impact of an 8-week aerobic dance programme on weight decrease of children aged 10 to 11 years in the city of Chitungwiza. Grounded on the results of this study, it was concluded that the 8-week aerobic dance intervention had a minimal weight reduction effect on the subjects. The data from the analysis indicate that they were very marginal changes in the weight loss and BMI of the subjects during the 8-week aerobic exercise programme. The study also concluded that despite the lack of significance in the marginal changes during the intervention and meaningful effect size, the data points towards a positive forecast in the continued effect of aerobic dance exercise on weight reduction. Furthermore, data was carried out on forecasting analysis to predict the BMI of the subjects in six months that is if the subjects are consistent in the aerobic dance exercise. It is also concluded that aerobic dance exercises are slow paced as an intervention for the weight reduction among children between the age of 10 and 11 years. This type of intervention on weight reduction though slow leads to physically healthy organisms for all age categories. The use of low to moderate intensity aerobic dance exercises reduces body weight, body mass index, body fat percentage and cardiovascular disease when only it is conducted regularly for a long time.

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References

- Adedokun, K.L., & Ojo – Ogunleye, O.R. (2020). Aerobic dance exercise and its effects on cardiorespiratory variables and body composition of obese youth and adolescents in the College of Education Ila – Orangan, Nigeria. *The International Journal of Humanities & Social Studies* 8(8), 22-28.. Retrieved from https://www.researchgate.net/publication/344041205_Aerobic_Dance_Exercise_and_its_Effect_on_Cardiorespiratory_Variables_and_Body_Composition_of_Obese_Youth_and_Adolescents_in_College_Of_Education_Ila-Orangun_Nigeria
- Ajala, R.B., Adedokun, K.I., Adedeji, O.C., & Ojo. C. (2020). Aerobic dance exercise and its effect on cardiorespiratory variables and body composition of obese youth and adolescents in College of Education of Ila- Orangun Nigeria. *The International of Journal of Humanities and Social Studies* 8(8), 22-28. <http://dx.doi.org/10.24940/theijhss/2020/v8/i8/HS2008-023>. Retrieved from https://www.researchgate.net/publication/344041205_Aerobic_Dance_Exercise_and_its_Effect_on_Cardiorespiratory_Variables_and_Body_Composition_of_Obese_Youth_and_Adolescents_in_College_Of_Education_Ila-Orangun_Nigeria
- Akdur, H., Sozen, A.B., Yigit, Z., Balota, N., & Given, O. (2007). The effects of walking and step aerobic exercise on physical fitness parameters in obese women. *Istanbul Tip Fakultesi Dergisi Cult*, 70 (3), 64-69. Retrieved from <https://cdn.istanbul.edu.tr/file/1CD58DF90A/D11FC8FC5FC548C5B88153E707DF4860?doi=>
- Alves, A.R. *et al.* (2016). Concurrent training prepubescent children the effects of sequences of strength and aerobic training on explosive strength and VO2 max. *The Journal of Strength and Conditioning Research*, 13, 68-94. Retrieved from <http://dx.doi.org/10.1519/JSC.0000000000001294>
- American Academy of Paediatrics. (2014). About childhood obesity. Available from: <http://www.aap.org/obesity/about.html> (last accessed 2022 September 20).
- Anast, H., Margellos, H., Ashah, A.M.R. & Whitman, S. (2008). Prevalence of Obesity among children in six Chicago communities: *Association of Schools of Public Health*, 123(1), 117-123. <https://doi.org/10.1177/003335490812300204>

- Andersen, R.E. Wadden, T.A., Bartlett, S.J., Zenel, B., Verde, T.J. & Frankowvak, S.C. (2002). Effect of lifestyle activity vs. structured aerobic exercise in obese women. *The Journal of the American Medical Association*, 281 (4), 335-40. doi: 10-1001/pubs.JAMA-ISSN-0098-7484-281-4-joc80705. Retrieved from <https://jamanetwork.com/journals/jama/fullarticle/188404>
- Atvie, R.N., Aigbiremolen, A.A., Ohwin, P.E., Okemuo, A.J., Odigie, O.M., Agono, J., & Igweh, J.C. (2018). Modulations of 8-week aerobic dance exercise on selected overweight females. *Journal of Applied Life Sciences International*, 16(3), 1-8. <http://dx.doi.org/10.9734/JALSI/2018/38052>
- Australian Institute of Health and Welfare. (2014). *Australia's Health Series No. 14*. <https://www.aihw.gov.au/reports/australias-health/australias-health-2014/overview>
- Ayato Ilani, S.M.T. (2005). Young adulthood body mass index and weight-for-height reference curves for Southern Iran. *International Journal of Multidisciplinary Research Communion*, 8(2),123-230
- Babalola, J.F. & Ojo, O.R. (2015). Effects of interval programme on selected physiological parameters of soccer layers selected. *Journal of Nigeria Association of Sports Science and Medicine*, 16, 98-102. Retrieved from https://www.researchgate.net/publication/342788453_Effects_of_Interval_training_program_on_selected_physiological_parameters_of_soccer_players
- Babbie, E. (2010). *The Practice of Social Research*, 12th Edition, Wadsworth, Belmont.
- Bajpai, B. & Bajpai, R. (2014). The goodness of measurement: reliability and validity, *International Journal of Medical Science and Public Health*, 3(2), 112. <http://dx.doi.org/10.5455/ijmsph.2013.191120133>, Retrieved from https://www.researchgate.net/publication/271186978_Goodness_of_Measurement_Reliability_and_Validity#:~:text=Validity%20is%20concerned%20with%20the,a n%20instrument%20to%20measure%20consistently.
- Baxter, S. D., Hardin, J. W., Guinn, C. H., Royer, J. A., Mackelprang, A. J., & Devlin, C. M. (2010). Children's body mass index, participation in school meals, and observed energy intake at school meals. *The international journal of behavioral nutrition and physical activity*, 7, 24. <https://doi.org/10.1186/1479-5868-7-24>
- Bhave, S., Bavdekar, A., Otiv, M., & IAP National Task Force for Childhood Prevention of Adult Diseases: Childhood Obesity (2004). IAP National Task Force for Childhood Prevention of Adult Diseases: Childhood Obesity. *Indian pediatrics*, 41(6), 559–575. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/15235162/>
- Borer, K.T. (2008). How effective is an exercise in producing fat loss? *Division of Kinesiology*, pp. 40, 2. <https://doi.org/10.2337%2Fds17-0013>
- Cakmakci, E., Arslan, F., Taskin, H. & Cakmakci, O. (2011). The effects of aerobic dance exercise on body composition changes associated with weight change in sedentary women. *Selcuk University Journal of Physical Education and Sport Science: 13(3)*, 298-304. Retrieved from

- <https://acikerisim.aksaray.edu.tr/xmlui/bitstream/handle/20.500.12451/918/cakmakci-evrim-2011.pdf?sequence=1&isAllowed=y>
- Castro-Rodriguez, J.A Halberg, C.J. (2001). Increased incidence of asthma-like symptoms in girls who become overweight or obese during the school years. *American Journal of Medical Care* 163:134-9. <https://doi.org/10.1164/ajrccm.163.6.2006140>
- Chen, T., Lin, J., Ku, L., Lu, D., Hou, L., & Wah Yu, C.C. (2021). Effects of aerobic exercise and resistance exercise on physical indexes and cardiovascular risk factors in obese and overweight school age-children: A systematic review and meta-analysis Taipei Medical University, Taiwan. <https://doi.org/10.1371/journal.pone.0257150>
- Child Growth Foundation (2010). An approach to primary prevention of obesity in children and adolescents. Retrieved from <https://childgrowthfoundation.org/>
- Cohen, M. & Morrison (2011). Research methods in Education. 7th Ed. Taylor & Francis Group. London. Retrieved from <https://www.routledge.com/Research-Methods-in-Education/Cohen-Manion-Morrison/p/book/9781138209886>
- Cook, S. & Kavey, R.E. (2011). Dyslipidaemia and paediatric obesity. *Paediatric Clinic North AM*, 58(6), 1363-73. <https://doi.org/10.1016/j.pcl.2011.09.003>
- Cornette, R. (2008). The emotional impact of obesity on children. *World views of evidence-based nursing*. 5, 136-141. Retrieved from <https://doi.org/10.1111/j.1741-6787.2008.00127.x>
- Creswell, J.W. (2013). Research design: Qualitative, quantitative and mixed methods approach (3rd ed). Newbury Park. Retrieved from https://www.ucg.ac.me/skladiste/blog_609332/objava_105202/fajlovi/Creswell.pdf
- Daniels, S. (2006). The consequences of childhood overweight and obesity. *The Future of children* 16, 47-68. <https://doi.org/10.1353/foc.2006.0004>
- Das, S., Samiran, B., SudipData, B. & Bose, K. (2012). Body mass index percentiles for rural Bengalee preschool children aged 2-6 years in comparison with the W.H.O reference and other studies. *Acta Biologica Szegediensis*, 56(1): 25-30. Retrieved from https://www.researchgate.net/publication/233926212_BMI_percentiles_for_rural_Bengalee_pre-school_children_aged_2-6_years_in_comparison_with_the_WHO_reference_and_other_studies
- Davis, C.L., Pollock, N.K., Waller, J.L., Allison, J.D., Dennis, B.A, Bassali, R., Melendez A., Boyle, C.A & Gowe, B.A (2012). Exercise dose and diabetes risk in overweight and obese children, a randomized controlled trial. *Journal of the American Medical Association*, 308 (11). <https://doi.org/10.1001/2012.jama.10762>. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3487697/>
- Denscombe, M. (2010). Communities of practice: a research paradigm for the mixed methods approach. *Journal of Mixed Methods Research*, 2(3), 270-83. <https://doi.org/10.1177/155868980831680>

- Derakhshan, N.M., Habibi, A.H & Ghanbarzadeh, M. (2017). Effect of eight – week aerobic exercises in 10 to 12 years old overweight girls. *Journal of Research in Biology*, 7(2), 2188-2195. Retrieved from https://www.academia.edu/36225535/Effect_of_eight-week_aerobic_exercises_in_10_to_12_years_old_overweight_girl
- Dharuman, M. (2011). Effects of isolated and combined effects of aerobic dancing and resistance training on body composition of Type-2 diabetic patients. *Journal of Advances in Sports and Physical Education*, 4 (2), 15-18. Retrieved from https://www.researchgate.net/publication/349026711_Effects_of_Isolated_and_Combined_Effects_of_Aerobic_Dancing_and_Resistance_Training_On_Body_Composition_of_Type-2_Diabetic_Patients
- Dietz, W.H. (1998). Health consequences of obesity in youth: childhood predictors of adult disease. *Paediatrics*, 101 (3), 518-525. Retrieved from https://publications.aap.org/pediatrics/article-abstract/101/Supplement_2/518/28078/Health-Consequences-of-Obesity-in-Youth-Childhood?redirectedFrom=fulltext
- Division of Nutrition, Physical Activity, and Obesity. (2021). Obesity and Excess Weight increase the risk of severe illness; Racial and Ethnic Disparities Persist, Centers for Disease Control and Prevention. <https://www.cdc.gov/obesity/data/obesity-and-covid-19.html>
- Donnelly, J.E. (2003). Effects of a 16- month randomised controlled examine trial on body weight and composition in young overweight women and men. *Archives of International Medicine* (3), 39-44. Retrieved from <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/215659#:~:text=No%20significant%20changes%20occurred%20in,weight%20management%20in%20young%20adults.>
- Donges, C.E., Duffield, R., & Drinkwater, E.J. (2010). Effects of resistance or aerobic exercise training on interleukin – 6, C-protein, and body composition. *Medicine and Science in Sports and Exercise*, 42(2), 304-313. <https://doi.org/10.1249/mss.0b013e3181b117ca>
- Drost, E.A. (2011). Validity and reliability in Social Sciences Research. *Education Research and Perspectives*, 38, 105-123. Retrieved from <https://www.erpjournal.net/wp-content/uploads/2020/02/ERPv38-1.-Drost-E.-2011.-Validity-and-Reliability-in-Social-Science-Research.pdf>
- Elgar, F.J. *et al.* (2005). Sedentary behaviour physical activity and weight problems in Adolescents in Wales, *Public Health* WO: 119, Retrieved from <http://dx.doi.org/10.1016/j.puhe.2004.10.011>
- Emeghara, G. (2001). The physical and physiological effects of a three-month aerobic exercise on rehabilitation of cardiac patients at Lagos University Teaching Hospital Ph.D. Thesis: Department of Human Kinetic and Health Education, University of Ibadan.

- Emiola, L.M, Talabi, A.E. Ogunsakin, A. (2002). The effect of activity level on the fitness and health status of primary school children. *African Journal for Physical Activity and Health Sciences*, 8(2)
- Engels, H.J., Bowen, J., & Wirth, J.C. (2003). Routine use of external weights during a low impact aerobic dance conditioning programme; Training benefit. *Research in Sports Medicine*, 5(1) 282-291. Retrieved from <https://doi.org/10.1080/15438629509512025>
- Freedman, D.S., Dietz, W.H, Srinivasan, S.R, Berenson, G.S (1999). The relation of overweight to cardiovascular risk factors among children and adolescents: The Bogalusa heart study. *Paediatrics* 103: 1175-1182. Retrieved from <https://publications.aap.org/pediatrics/article-abstract/103/6/1175/62291/The-Relation-of-Overweight-to-Cardiovascular-Risk?redirectedFrom=fulltext>
- Gasti, A.M & Hiremath, R.M. (2012). Effects of callisthenic, and aerobic dance on body composition of adolescents. *Asian Journal of Research in Social Science & Humanities*, 2 (12), 37-46.
- Geserick, M., Vogel, M., Gausche, R., Lipek, T., Spielau, U., Keiler, E. (2018). Acceleration of BMI in early childhood and risk of sustained obesity, *English Journal of Medicine*. 379 (14) 1303-12. Retrieved from <https://www.nejm.org/doi/full/10.1056/NEJMoa1803527>
- Ghorbani, F., Heisarimoghadam, R., Kurami, M., Faith, K., Minasian, V & Bahram, M.E, (2014). The effect of an aerobic training programme on cardiovascular fitness, body composition among female students, *Journal of Research in Health Science*, 20:1-4. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/25503280/>
- Gokyarek, B., Sokmen, T. & Usta, A. (2016). The effects of aerobics exercise programmes on body composition and some physical parameters for the pre-obese class / obese students at high school aged 15-17. *International Journal of Human Movement and Sport Sciences* 4(3): 39-44. Retrieved from <https://www.hrpub.org/download/20160730/SAJ2-19906449.pdf>
- Griffiths, L.J, Parsons, T.J, Hill A. (2010). Self-esteem and quality of life in obese children and adolescents: A systematic review. *International Journal of Paediatrics Obesity* 5: 282-304. Retrieved from <https://doi.org/10.3109/17477160903473697>
- Gumusler, A. (2006). The obesity rate of high school students in Cayeli/ Rize and eating habits. M.A thesis, Trabzon. Retrieved from <https://www.internationaljournalsrsg.org/IJNHS/2021/Volume7-Issue3/IJNHS-V7I3P104.pdf>
- Guy, J.A. & Micheli, L.J. (2001). Strength training for children and adolescents. *Journal of the American Academy of Orthopaedic Surgeons*, 9(1): 29-36. Retrieved from <https://doi.org/10.1177%2F1941738109334215>
- Hadzovic, M., Lilic A., Prvulovic, N., Ilic, P. & Stankovic, M. (2020). Effects of the aerobic exercise program with music on the body composition and subcutaneous fat of young women: A systematic review. *Journal of Anthropology of Sport and Physical Education*. 4. 45-55. Retrieved from https://www.researchgate.net/publication/345313545_Effects_of_the_Aerobic_Ex

[ercise Program with Music on the Body Composition and Subcutaneous Fat of Young Women A Systematic Review](#)

- Ham, O.K, Sung, K.M., Lee, B.G., Choi, H.W., Im, E.O. (2016). Transtheoretical Model Based Exercise counselling combined with music skipping rope exercise on childhood obesity. *Asian Nursing Research (Korean Social Nursing Science)*, 17:234-40, Retrieved from <https://doi.org/10.1016/j.anr.2016.03.003>
- Heale, R. & Twycross A. (2015). Validity and reliability in quantitative studies. *Evidence Based Nursing*, 18(3), 66-7. Retrieved from <https://ebn.bmj.com/content/18/3/66>
- Hermassi, S., Ingebrigtsen, J., Schwesig, R., Fieseler, G., Delank, K. S., Chamari, K., Shephard, R. J., & Chelly, M. S. (2018). Effects of in-season short-term aerobic and high-intensity interval training program on repeated sprint ability and jump performance in handball players. *The Journal of sports medicine and physical fitness*, 58(1-2), 50–56. <https://doi.org/10.23736/S0022-4707.16.06770-0>
- Hopkins, D. R., Murrah, B., Hoeger, W. W., & Rhodes, R. C. (1990). Effect of low-impact aerobic dance on the functional fitness of elderly women. *The Gerontologist*, 30(2), 189–192. <https://doi.org/10.1093/geront/30.2.189>
- Hyppönen, E., Virtanen, S.M., Kenward, M.G., Knip, M., Akerblom, H.K., & Childhood Diabetes in Finland Study Group (2000). Obesity, increased linear growth, and risk of type 1 diabetes in children. *Diabetes care*, 23(12), 1755–1760. <https://doi.org/10.2337/diacare.23.12.1755>
- Jaywant P.J. (2013). Effect of aerobic dance on the body fat distribution and cardiovascular endurance in middle age women. *Journal of Exercise Science and Physiotherapy*, 9(1), 6-10. Retrieved from <http://www.efha.in/wp-content/uploads/2015/01/JESP-9-6.pdf>
- Johnson, R. & Onwuegbuzie, Anthony & Turner, Lisa. (2007). Toward a Definition of Mixed Methods Research. *Journal of Mixed Methods Research*, 1, 112-133. *Journal of Mixed Methods Research*. 1. 112 -133. 10.1177/1558689806298224. Retrieved from https://www.researchgate.net/publication/235413072_Toward_a_Definition_of_Mixed_Methods_Research_Journal_of_Mixed_Methods_Research_1_112-133
- Jorgic, B., Pantelic, S., Milinkovic, Z. & Kostic, R. (2011). The effects of physical exercise programme on neuro-cognitive function in the elderly. *Psychology of Sport Exercise*, 13(5): 623-9
- Karacabey K. (2009). The effect of exercise on leptin, insulin, cortisol and lipid profiles in obese children. *The journal of international medical research*, 37(5), 1472–1478. <https://doi.org/10.1177/147323000903700523>
- Kaya, F., Nar, D., Erzeybek, M.S., & Bozdogan, Z. (2016). Among the physical fitness workouts, the efficiency of weight training and Zumba exercises on the body composition in men and women. *International Congresses on Education*, 31:1-5. <https://doi.org/10.1051/shsconf/20163101018>
- Kelly G.A. and Kelly K.S., Pate R.R. (2010). Evidence and BMI in overweight and obese children and adolescence. *Journal of Evidence-based Medicine*, 10 (2), 108A – 128.

- Kin-Isler, A., & Kosar, S. N. (2006). Effect of step aerobics training on anaerobic performance of men and women. *Journal of strength and conditioning research*, 20(2), 366–371. <https://doi.org/10.1519/R-16144.1>
- Klop, B., Elte, J.W., & Cabezas, M.C. (2013). Dyslipidaemia in obesity: mechanisms and potential targets. *Nutrients*, 5(4): 1218-40. <https://doi.org/10.3390%2Fnu5041218>
- Kokino, S., & Zaleri, C. (2004). Obesity and Exercise, *Turkiye Klinikleri Journal of Physical Medicine Rehabilitation Vol. 4, Issue: 3*.
- Koksal, G. & Ozel, H.G. (2008). Obesity in the preschool period. Turkish Ministry of Health General Directorate of Primary Health Services Nutrition and Physical Activities Department Publications, Ankara.
- Kostanski, M., Fisher, A., & Gullone, E. (2004). Current conceptualisation of body image dissatisfaction: have we got it wrong?. *Journal of child psychology and psychiatry, and allied disciplines*, 45(7), 1317–1325. <https://doi.org/10.1111/j.1469-7610.2004.00315.x>
- Kostic, R., Duraskovic, R., Miletic, D. & Mikalacki, M. (2006). Changes in the cardiovascular fitness and body composition of women under the influence of aerobic dance. *Facta University – Series Physical Education and Sport*, 4(1), 59-71. Retrieved from <https://openurl.ebsco.com/EPDB%3Agcd%3A14%3A26909118/detailv2?sid=ebsco%3Aplink%3Ascholar&id=ebsco%3Agcd%3A23130868&crl=c>
- Kostrzewa-Nowak, D., Nowak, R., Jastrzębski, Z., Zarębska, A., Bichowska, M., Drobnik-Kozakiewicz, I., Radzimiński, Ł., Leońska-Duniec, A., Ficek, K., & Cieszczyk, P. (2015). Effect of 12-week-long aerobic training programme on body composition, aerobic capacity, complete blood count and blood lipid profile among young women. *Biochemia medica*, 25(1), 103–113. <https://doi.org/10.11613/BM.2015.013>
- Kravitz, L., Cisar, C. J., Christensen, C. L., & Setterlund, S. S. (1993). The physiological effects of step training with and without handweights. *The Journal of sports medicine and physical fitness*, 33(4), 348–358. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/8035583/>
- Kumar, S. (2016). The effect of Zumba and aerobics exercise training on physical fitness variables. *International Journal of Physical Education, Sports and Health* 3(5), 275 – 276. Retrieved from <https://www.kheljournal.com/archives/2016/vol3issue5/PartE/3-5-65-879.pdf>
- Kumira, K. & Hozomi, N. (2012). Investigating, the acute effects of an aerobic dance exercise programme on neuro-cognitive function in the elderly. *Psychology of Sport and Exercise*, 13: 623-629. Retrieved from <https://psycnet.apa.org/record/2012-15652-016>
- Kurt, S., Hazr, S., Ibis, S., Alby, B. & Kurt, Y. (2010). Evaluation of the effects of 8-week step aerobic exercise programme on some fitness parameters at middle aged sedentary women. *International Journal of Human Sciences*, 7(1). Retrieved from <https://www.j-humansciences.com/ojs/index.php/ijhs/article/view/1142>

- Lai, A. Wenhe, C & Kelly, H. (2013). Effects of exercise – induced weight loss of obese children and adolescents of Han Chinese. *International Journal of Biology Sciences*, 10,130-245
- Lee, S., Bacha, F., Hannon, T., Kuk, J. L., Boesch, C., & Arslanian, S. (2012). Effects of aerobic versus resistance exercise without caloric restriction on abdominal fat, intrahepatic lipid, and insulin sensitivity in obese adolescent boys: a randomized, controlled trial. *Diabetes*, 61(11), 2787–2795. <https://doi.org/10.2337/db12-0214>
- Leelarungrayub, D., Saidee, K., Porthongsunun, P., Pratanaphon, S., Yankai, A., & Bloomer, R.J. (2010). Six weeks of aerobic dance exercise improves blood oxidative stress. *Journal of Bodyweight*, 1-8. <http://dx.doi.org/10.1016/j.jbmt.2010.03.006>
- Ljubojevic, A., Jakovljevic, V., & Poprsen, M. (2014). Effects of Zumba fitness programme on body composition of women. *Sportlogia*, 10 (1), 29-33. <http://dx.doi.org/10.5550/sgia.141001.en.004L>
- Loos, R. J., Beunen, G., Fagard, R., Derom, C., & Vlietinck, R. (2002). Birth weight and body composition in young women: a prospective twin study. *The American journal of clinical nutrition*, 75(4), 676–682. <https://doi.org/10.1093/ajcn/75.4.676>
- Macleod, S. (2019). Sampling Procedure, Simple Psychology, Retrieved from <https://www.simplepsychology.org/sampling.html>
- MacMillan, J. H. & Schumacher, S. (2010). *Research in Education: Evidence-Based Inquiry* (7th ed) New Jersey. Pearson Education, Inc. Retrieved from <https://eric.ed.gov/?id=ED577250>
- Marandi, S. M., Abadi, N. G., Esfarjani, F., Mojtahedi, H., & Ghasemi, G. (2013). Effects of intensity of aerobics on body composition and blood lipid profile in obese/overweight females. *International journal of preventive medicine*, 4(Suppl 1), S118–S125. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/23717761/>
- Mathunjwa, M. L., Semple, S. J., & du Preez, C. (2013). A 10-week aerobic exercise program reduces cardiometabolic disease risk in overweight/obese female African university students. *Ethnicity & disease*, 23(2), 143–148. <https://pubmed.ncbi.nlm.nih.gov/23530293/>
- Mavridis, G., Filippou, S.T., Rokka, S.T., Bouslour T. & Mavridis, K. (2004). The effects of a health – related aerobic dance programme on elementary school children. *Journal of Human Movement Studies*, 47: 337-349. Retrieved from https://www.researchgate.net/publication/259864493_The_Effect_of_a_Health-Related_Aerobic_Dance_Program_on_Elementary_School_Children#:~:text=The%20findings%20revealed%20that%20an,each%20to%20a%20different%20degree.
- McNarry, M.A., Lambrick, D., Westrupp, N., & Faulkner, J. (2015). The influence of a six-week high intensity games intervention on pulmonary oxygen uptake in prepubertal obese and normal weight children. *Applied Physiology Nutrition Metabolism*, 40: (10), 1012-18. Retrieved from <https://doi.org/10.1139/apnm-2015-0051>
- Milanovic, Z., Pantelic, S., Traj Konic N. & Sporis, G. (2011). Basic anthropometric and body composition characteristics in an elderly population: *Facta University Physical*

- Education and Sports*, 9(12) 173-82. Retrieved from https://www.researchgate.net/publication/220009742_Basic_anthropometric_and_body_composition_characteristics_in_elderly_population_A_Systematic_Review
- Milanovic, Z., Sparis, G, Pentelic S., Traykovic, N. & Aleksandrovic, M. (2012). The effects of physical exercise on reducing body weight and body composition of obese middle-aged people. A systematic review. *Health Medical Journal* 6(6), 2115-2189. Retrieved from https://www.researchgate.net/publication/235989314_The_Effects_of_Physical_Exercise_on_Reducing_Body_Weight_and_Body_Composition_of_Obese_Middle_Aged_People_A_Systematic_review
- Mohajan, H. (2017). Two Criteria for good measurements in research: validity and Reliability. *Annals of Spiru Haret*, 17(4), 56-82. Retrieved from https://mpira.ub.uni-muenchen.de/83458/1/MPRA_paper_83458.pdf
- Mozafray, H., & Nabaie, N. (2002). Prevalence of obesity and overweight in primary school girls in Tehran, *Iran Payesh*, 1(4), 15-19. Retrieved from <http://payeshjournal.ir/article-1-857-en.html>
- Nasti, C.L., Fitri, M.F. & Sultoni K. (2019). Sport Science Study Programme, Faculty of Sport and Health Science Education, Universitas Pendidikan Indonesia, Bandung, Indonesia. *Advances in Health Science Research*, Volume 21, 236-412
- Nejad, D., Habibi, A. & Ghanbarzadeh, M. (2017). Effect of eight aerobic exercises in 10 to 12 years old overweight girls, *Journal of Research in Biology*, 7(2), 88-2195. Retrieved from https://www.academia.edu/36225535/Effect_of_eight-week_aerobic_exercises_in_10_to_12_years_old_overweight_girl
- NHMRC (National Health and Medical Research Council) (2013). Australian Dietary Guidelines. Canberra: NHMRC. Retrieved from <https://www.nhmrc.gov.au/adg>
- Niehoff, V. (2009). Childhood obesity: A call to action. *Bariatric Nursing and Surgical Patient Care* 4: 17-23. Retrieved from <https://doi.org/10.1089/bar.2009.9996>
- Nikic, N., & Milenkovic, D. (2013). The efficiency of step aerobics programme in younger women. *Acta Medica Medianae*, 52(3), 25-34. Retrieved from https://publisher.medfak.ni.ac.rs/AMM_1/amm-stari/2013-html/3-broj/4-Natasa%20Nikic-Aerobic.pdf
- Ogden, C.L., Carroll, M.D., Kit, B.K., & Flegal, K.M. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA*, 311(8), 806–814. <https://doi.org/10.1001/jama.2014.732>
- Ogunleye, B.O. (2011). “Team Pair Solo” cooperative, learning and personality type as determinants of students’ achievement. *International Multidisciplinary Journal* 5(6):’ 23, 259-276. <https://doi.org/10.4314/afrev.v5i6.22>
- Oktay, G. (2018). Investigation of effects of 8-week Zumba exercise of women on health-related physical fitness factors. *European Journal of Physical Education and Sport Science*, 4(6), 16-24. Retrieved from <https://oapub.org/edu/index.php/ejep/article/view/1650>

- Okura, T., Nakata, Y., & Tanaka, K. (2003). Effects of exercise intensity on physical fitness and risk factors for coronary heart disease. *Obesity research*, 11(9), 1131–1139. <https://doi.org/10.1038/oby.2003.154>
- Okura, T., Nakata, Y., Ohkawara, K., Numao, S., Katayama, Y., Matsuo, T., & Tanaka, K. (2007). Effects of aerobic exercise on metabolic syndrome improvement in response to weight reduction. *Obesity (Silver Spring, Md.)*, 15(10), 2478–2484. <https://doi.org/10.1038/oby.2007.294>
- Ossanlo, P., Nayar, L. & Zafar, A. (2012). The effect of combined training on body fat percents and lipid profiles in sedentary females at Al Zahra University. *European Journal of Experimental Biology*, 2(5) 1598-1602. Retrieved from <https://www.researchgate.net/publication/304353811> The Effects of Combined Training Aerobic Dance Step Exercise and Resistance Training on Body Fat Percents and Lipid Profiles in Sedentary Females of AL ZAHRA University
- Ozturk, M.A., Saygin, O. & Babayigit Irez, G. (2013). The effects of regular aerobic exercises on blood lipids and some physical fitness parameters of obese boys. *Middle East Journal of Scientific Research*. (23), 67-89. Retrieved from <https://www.researchgate.net/publication/345764254> The Effects of Regular Aerobic Exercises on Blood Lipids and Some Physical Fitness Parameters of Obese Boys
- Pantelic, S., Kostic, R., Mikalacki, M., Duraskovic, R., Cokorilo, W., Mladenovic, I. (2007). The effects of a recreational aerobic exercise model on the functional abilities of women. *Physical Education and Sport*, 5(1), 1935. Retrieved from <https://www.researchgate.net/publication/343690292> The Effect of a Recreational Aerobic Exercise Model on the Functional Abilities of Women Facta Universitatis
- Pantelic, S., Milanovic, Z., Sporis, G., & Stojanovic – Tomic, J. (2013). Effects of a twelve-week aerobic dance exercises on body composition parameters in young women. *International Journal of Morphology*, 31(4) 1245-1250. Retrieved from <https://www.scielo.cl/pdf/ijmorphol/v31n4/art16.pdf>
- Pekmez, C.T., Ozdemir, G., Ersoy, G. & Obezite, G. (2012). The importance of exercise to obesity treatment. *International Journal of Human Sciences*, 9(2).1124-1768
- Petrofsky, J., Batt, J., Berk, L., Collins, K., & Young, T.N. (2008). The effects of an aerobic dance and diet programme on cardiovascular fitness, body composition and weight loss in women. *Journal of Applied Research*, 8(3). 179-189. Retrieved from <https://www.researchgate.net/publication/289419138> The effect of an aerobic dance and diet program on cardiovascular fitness body composition and weight loss in women
- Pinhas-Hamiel, O., Dolan, L.M., Daniels, S.R., Standiford, D., Khoury, P. R., & Zeitler, P. (1996). Increased incidence of non-insulin-dependent diabetes mellitus among adolescents. *The Journal of pediatrics*, 128(5 Pt 1), 608–615. [https://doi.org/10.1016/s0022-3476\(96\)80124-7](https://doi.org/10.1016/s0022-3476(96)80124-7)

- Polit, D.F. & Hungler, B.P. (2001). *Nursing research provides and methods*, 6th ed: Philadelphia, Lippincott Co.
- Reilly, J. J., & Wilson, D. (2006). ABC of obesity. Childhood obesity. *BMJ (Clinical research ed.)*, 333(7580), 1207–1210. <https://doi.org/10.1136/bmj.39048.503750.BE>
- Reilly, J.J., Methven, E., McDowell, Z.C., Hacking, B., Alexander, D., Stewart, L., & Kelnar, C.J. (2003). Health consequences of obesity. *Archives of disease in childhood*, 88(9), 748–752. <https://doi.org/10.1136/adc.88.9.748>
- Res-Vos, A.S. and Fourche, C.B. (2002). *Qualitative Research Designs: For the Social Sciences and Human Service Professions* 2nd Edition Van, Schack, Pretoria, 137-149.
- Robson, C. (2002). *Real World Research*. (Second Edition). Oxford: Blackwell. Retrieved from <https://www.wiley.com/en-ie/Real+World+Research%2C+5th+Edition-p-9781119523604>
- Ruiz-Montero, P. J., Castillo-Rodriguez, A., Mikalački, M., Nebojsa, C., & Korovljević, D. (2014). 24-weeks Pilates-aerobic and educative training to improve body fat mass in elderly Serbian women. *Clinical interventions in aging*, 9, 243–248. <https://doi.org/10.2147/CIA.S52077>
- Sahoo, K., Sahoo, B., Choudhury, A. K., Sofi, N. Y., Kumar, R., & Bhadoria, A. S. (2015). Childhood obesity: causes and consequences. *Journal of family medicine and primary care*, 4(2), 187–192. <https://doi.org/10.4103/2249-4863.154628>
- Sawyer, M. G., Miller-Lewis, L., Guy, S., Wake, M., Canterford, L., & Carlin, J. B. (2006). Is there a relationship between overweight and obesity and mental health problems in 4- to 5-year-old Australian children?. *Ambulatory pediatrics: the official journal of the Ambulatory Pediatric Association*, 6(6), 306–311. <https://doi.org/10.1016/j.ambp.2006.08.005>
- Schwimmer J.B., Burwinkle T.M., Varm, J.W. (2003). Health-related quality of Life of severely obese children and adolescents. *JAMA*. 289-1813-9. doi:10.1001/jama.289.14.1813. Retrieved from <https://jamanetwork.com/journals/jama/fullarticle/196343>
- Sevinc, D., & Tekik, S. (2018). The effects of a 12-week step aerobics and Pilates exercise programme on the physical parameters of sedentary women. *The Online Journal of Recreation and Sport* 7(7). Retrieved from https://www.researchgate.net/publication/328023144_The_Effects_of_A_12-Week_Step-Aerobic_and_Pilates_Exercise_Program_on_The_Physical_Parameters_of_Sedentary_Women
- Shahana, A., Usha, S.N. & Hasrani (2010). Effects of aerobic exercise programme on health-related physical fitness components of middle-aged women. *British Journal of Sports Medicine*, 44(1):119. Retrieved from https://www.researchgate.net/publication/254744828_Effect_of_aerobic_exercise_programme_on_health_related_physical_fitness_components_of_middle_aged_women

- Singh, P. & Ghuman, P.S. (2017). Prevalence of overweight and obesity among children. *International Journal in Management and Social Science*, 5(7), 254.
- Sivvas, G., Batsiou, S., Vasoglou, Z., & Filippou, D.A. (2015). Dance contribution to health promotion. *Journal of Physical Education and Sport*, 15(3), 484-489. Retrieved from https://www.researchgate.net/publication/283103753_Dance_contribution_in_health_promotion
- Stojil, Kovic, S., Mandaric, S., Todorovic, K., & Mitic D. (2010). Effects of 'omnibus' aerobic training on body composition. *Physical Culture*, 64 (2) 59-67. Retrieved from <http://www.fizickakultura.com/en/previous-issues/2010/physical-culture-64-2/277-the-effects-of-the-omnibus-aerobics-application-on-womens-body-composition>
- Stosic, D., Zivkovic, *et al.* (2016). Effects of dance aerobic on body composition. International Scientific Conference. Retrieved from https://www.researchgate.net/profile/Dejan-Stosic-2/publication/310648224_EFFECTS_OF_DANCE_AEROBIC_ON_BODY_COMPOSITION/links/5834a5c208ae004f74c88742/EFFECTS-OF-DANCE-AEROBIC-ON-BODY-COMPOSITION.pdf
- Tan, S., Yang, C., & Wang, J. (2010). Physical training of 9 to 10-year-old children with obesity to lactate threshold intensity. *Paediatric Exercise Science* 22(3) 477-85. Tan, S., Yang, C., & Wang, J. (2010). Physical training of 9- to 10-year-old children with obesity to lactate threshold intensity. *Pediatric exercise science*, 22(3), 477-485. <https://doi.org/10.1123/pes.22.3.477>
- Tomkinson G. R., Olds T. S. (2007). Secular changes in pediatric aerobic fitness test performance: the global picture. *Med Sport Sci.*; 50:46-66. doi: 10.1159/000101075. PMID: 17387251.
- Tortop, Y., On, B.O., Ogun, and E.S (2010). The effect of step aerobics program applied for 12 weeks on some physical fitness parameters in women. *Selcuk University Physical Education and Sport Science Journal*, 12(2), 91.
- Tremblay, M. S., & Willms, J. D. (2003). Is the Canadian childhood obesity epidemic related to physical inactivity?. *International journal of obesity and related metabolic disorders : Journal of the International Association for the Study of Obesity*, 27(9), 1100-1105. <https://doi.org/10.1038/sj.ijo.0802376>
- Underhay, C. DeRidder, J.H. Van Rooyen, J.H & Kruger, H.S. (2002). The effect of urbanization on the relationship between physical activity and obesity in 10-15-year-old males in North West province of South Africa. *Journal of Research in Sport, Physical Education*, 25(2): 77-92. Retrieved from <https://hdl.handle.net/10520/EJC108762>
- Uzunovic, S. *et al.* (2008). The prediction of competitive success in disco dance Facta Universitatis Series. *Physical Education and Sport*, 9(3), 229-238. Retrieved from <http://facta.junis.ni.ac.rs/pe/pe201103/pe201103-02.pdf>
- Vassiloprulou, E., Piperari, G., & Christoforou, C. (2017). Is Zumba Fitness effective to manage overweight without dietary intervention? *Arab, Journal of Nutrition and*

- Exercise*, 1(3), 113-121.
<https://knepublishing.com/index.php/AJNE/article/view/1228/2685#:~:text=Is%20Zumba%20Fitness%20Effective%20to%20Manage%20Overweight%20without%20Dietary%20Intervention%3F&text=Background%3A%20Zumba%E2%93%87%20Fitness%20is,the%20type%20of%20diet%20followed.>
- Veal, A.J. & Darcy, S. (2014). *Research Methods in Sport Studies and Sport Management. A practical approach.* London, Routledge. Retrieved from <https://www.routledge.com/Research-Methods-in-Sport-Studies-and-Sport-Management-A-Practical-Guide/Veal-Darcy/p/book/9780273736691>
- Viskić-Stalec, N., Stalec, J., Katić, R., Podvorac, D., & Katović, D. (2007). The impact of dance-aerobics training on the morpho-motor status in female high-schoolers. *Collegium antropologicum*, 31(1), 259–266. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/17598411/>
- Wilkinson, T.S & Bhandarkar, P.L (2013). *Methodology and techniques of Social Research* Book Review Mumbai; Himalaya Publishing House.
- Williams S.E. & Greene J.L. (2018). Childhood Overweight and Obesity: Affecting factors, education and intervention. *Journal of Childhood Obesity*, Vol 3: 2-9. Retrieved from <https://www.primescholars.com/articles/childhood-overweight-and-obesity-affecting-factors-education-and-intervention-95881.html>
- Zametkin A.Z, Zoom C.K., Klein H. W., Munson (2004). Psychiatric aspects of child and adolescent obesity. A review of the past 10 years, *Child Adolescence Psychiatry* 134-50. <https://doi.org/10.1176/foc.2.4.625>
- Zehsaz, F., Farhangi, N., & Ghahramani, M. (2016). The response of circulating omeqntin-1 concentration to 16-week exercise training in male children with obesity. *Physical Education and Sports*: 44(4): 355-61. Retrieved from https://www.researchgate.net/publication/309143956_The_response_of_circulating_omentin-1_concentration_to_16-week_exercise_training_in_male_children_with_obesity
- Zohrabi, M. (2013). Mixed methods research instruments, validity, reliability and report findings. *Theory and Practice in Language Studies*, (3), 254-262. <http://www.academypublication.com/issues/past/tpls/vol03/02/06.pdf>
- Zorba, E., Yaman, R., Yildirim, S., Saygin, J. (2007). Effects of aerobic dance. *The Journal of Sports Medicine and Physical Fitness* 28(2) 157-570.

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