

Body weight training intervention towards weight loss of adolescent with obesity problem during COVID-19 pandemic

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Article Info

Article history:

Received Aug 13, 2022

Revised Feb 20, 2023

Accepted Mar 11, 2023

Keywords:

Adolescents
Body weight training
Community nurses
Obesity

ABSTRACT

The COVID-19 pandemic has brought attention to the rising issue of sedentary behavior, which can lead to obesity. Obesity affects individuals of all ages, including children, adults, and the elderly. Obesity can have negative effects on adolescent body image. Several interventions, such as body weight training, have been shown to help obese adolescents lose weight. This paper proposes an investigation into the effectiveness of body weight training interventions as implemented by community nurses for weight loss in obese adolescents. The intervention involved three sessions per week over the course of four weeks and was administered to several obese adolescents. The results indicated that there was a weight loss of 3.7 kg for the first participant and 3.8 kg for the second participant over the four-week period. Statistical analysis using a paired t-test showed a p-value less than 0.005, indicating a significant effect of the body weight training intervention on weight loss in obese adolescents. It is hoped that community nurses can utilize body weight training as a useful intervention in helping obese adolescents achieve a healthy weight.

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1. INTRODUCTION

Obesity is a serious worldwide health problem as it can lead to metabolic syndrome and death. It carries a significant risk of morbidity, leading to increased mortality [1]–[5]. Overweight is a term that includes both overweight and obesity [6]–[10]. Adolescent obesity is a complex multifactorial disease with a combination of environmental, behavioral, psychosocial, biological, cultural, and genetic determinants. It remains a global public health issue that presents a major challenge to chronic disease prevention and health into adulthood. While schools have a rich opportunity to improve youth health and tackle obesity, they face barriers to fulfilling this function. Obesity can affect all aspects of children's lives, including psychological, cardiovascular health, and overall physical health. It creates a public health problem for children and adolescents. Several physiological systems play an essential role in maintaining a balance between energy intake and overall energy consumption, as well as maintaining a stable body weight. Obesity affects adults, teens, and children [11]–[14].

Obesity is caused by several factors, including genetics, metabolic processes, lifestyle choices, eating habits, and physical activity. One of the causes of obesity is an energy imbalance, especially in adolescents who are going through puberty or growing up. Clinically, obesity is generally characterized by a body mass index (BMI) >25 kg/m² in individuals with body obesity [15]–[18]. Obesity has a significant impact on the mentality of adolescents. The bad impacts of mental obesity on adolescents include becoming

anti-social, feeling inferior, less attractive, and less agile. The problem of adolescent body image is closely related to the desire to lose weight and have a small waist circumference. However, most teens eat the wrong foods and don't exercise properly. Physical exercise and weight training are two activities that must be pursued to achieve this goal. Teenagers want to keep their bodies in shape so they can perform well and do sports. Regular exercise can help teenagers achieve the desired body shape by burning fat in their bodies. Fat accumulates in the thighs, buttocks, chest, and most importantly, the area around the stomach [19], [20].

Obesity is caused by several factors, including genetic, environmental, drug, and hormonal factors. Children who have obese parents have a 40-50% chance of being obese. Environmental factors related to diet and physical activity also contribute to obesity. In adolescents, irregular eating patterns and infrequent physical activity, especially since the COVID-19 pandemic, are the main factors that cause obesity [21], [22]. Exercise is a type of physical activity that can help us stay healthy and fit. Many individuals are suffering from heart disease and obesity today, which are diseases that develop as a result of a lack of physical activity in daily life and improper eating habits. Exercise reduces the risk of degenerative diseases, increases heart capacity, prevents hypertension, increases blood lipids, prevents osteoporosis, maintains muscle and joint flexibility, improves the immune system, reduces anxiety and melancholy, and boosts the immune system [23], [24].

Physical activity can be used to help lose weight. Physical activity, such as aerobics, moderate to vigorous-intensity exercise, and walking, can help with weight loss. Fifty minutes of aerobic exercise three times a week, which helps lower blood pressure and blood lipids, is an example of the benefits of physical activity. Physical exercise will help burn fat and maintain the ideal body weight. Cardio (cardiovascular) exercise, often known as aerobic exercise, is the most basic and inexpensive type of exercise with several health benefits, particularly for heart health and fitness. We've all heard of cardio exercises like running, jogging, aerobics, cycling, swimming, and other similar activities. Cardio has the added benefit of increasing fat burning during the weight loss process, in addition to improving fitness. One example of other physical exercise that can be used to lose weight is bodyweight training [25], [26].

Bodyweight training is a type of weight training that can be done without using any equipment and only with your own body weight as a weight. Bodyweight training is a type of weight training that does not require any equipment and only relies on your own body weight as a burden. Then, a study shows that bodyweight training has an effect on losing weight [27], [28]. In this study, there are two types of bodyweight training, namely bodyweight training using a resistance band and bodyweight training without using a resistance band. Both showed that there was weight loss, but bodyweight training using resistance bands showed more weight loss than bodyweight training without using resistance bands. The relationship between physical exercise and body weight showed that there was a weight loss of 0.13 kg in the respondents after doing physical exercise for eight days.

The physical exercises carried out in this study were running, push-ups, sit-ups, and squats. The study showed that physical exercise in the form of running, push-ups, sit-ups, and squats could affect weight loss [23], [25], [26]. Moreover, circuit bodyweight training (CBWT) reduced body fat and subcutaneous fat percentage while increasing skeletal muscle mass. Squats, x-jumps, stationary lunges, burpees, push-ups, mountain climbers, commandos, snap jumps, straight leg lifts, and sit-ups are submaximal CBWT physical activities consisting of 10 movements performed 12 times each. Without rest, the proportions of body fat and subcutaneous fat in the participants decreased after they completed the ten activities [29], [30].

This paper proposes an investigation of a bodyweight training intervention by community nurses towards weight loss in adolescents with obesity problems, as shown in Figure 1. The bodyweight training intervention was given to several obese adolescents, three times a week for four weeks. This research was conducted by community nurses, who can contribute to this growth by conducting studies of current events in the community. Community nurses should review and analyze these issues to correct problems and improve health policies and service delivery. Community nurses also have roles as educators and counselors, providing health education and counseling to the community related to the health problems they are experiencing, such as maintaining weight and overcoming overweight using innovative interventions, namely bodyweight training. The results of observations by researchers in the environment where they live showed several obese teenagers, and interviews conducted by researchers with ten teenagers showed that seven were overweight. Obese adolescents are reluctant to go on a diet and exercise regularly because they feel the exercises are varied and time-consuming. Bodyweight training can be a solution for teenagers to exercise because the number of movements is small and does not take up time.



Figure 1. A body weight training intervention

2. RESEARCH METHOD

The research design employed a body weight training intervention. Specifically, the research instrument utilized bodyweight training standard operating procedures (SOPs), assessment sheets containing height and weight measurements, followed by calculation of adolescent BMI and classification according to WHO guidelines, and evaluation sheets for rhythmic gymnastics activities. Furthermore, the effect of body weight training on weight loss in obese adolescents was monitored in RT 004 RW 010 Cibodas Baru Village, Cibodas District, Tangerang, Indonesia. The collected data were analyzed and grouped according to type, namely subjective and objective data, to obtain nursing diagnoses, develop nursing plans or interventions, and carry out nursing implementation and evaluation on the patients. The body weight training innovation intervention was conducted for four weeks with 12 sessions lasting approximately 55 minutes each. Researchers also monitored the patients' body condition before, during, and after the bodyweight training, and took weight measurements of the children every week, namely at the first and last sessions, resulting in a total of 8 measurements. The study was approved by the ethical committee of the Faculty of Health, Universitas Pembangunan Nasional Veteran Jakarta with (No etik: 320/VI/2022/KEPK).

3. RESULTS AND DISCUSSION

Nursing problems were identified in Mr. W's family, particularly in An M and Mr. T's family, who were both diagnosed with obesity. The main goal of obesity intervention is to achieve weight loss and improve body mass index (BMI). To address this issue, an innovative intervention was introduced in the form of body weight training for adolescents with obesity living in RT 004 RW 010 Cibodas Baru Village, Cibodas District, Tangerang, Indonesia. Two patients, namely An. M (as a managed patient) and An. T (as a resume patient), received the same intervention. The body weight training intervention was followed by health education provided to Mr. W's family and Mr. B's family regarding obesity, including understanding the causes, signs/characteristics, the impact of obesity, and how to calculate BMI in adolescents and their classification. This helped to increase the awareness and understanding of obesity among the patients' families.

The innovative intervention provided in this study is body weight training, which was implemented for both managed and resumed patients. The body weight training intervention began with providing education to patients about the understanding, benefits, and steps for body weight training. Body weight training is a type of weight training that does not require any equipment and relies on the body weight of the individual. According to Mineshita and Baillot *et al.* [25], [26], body weight training is a natural movement exercise that allows individuals to move freely, as the human muscles are designed to work together. These movements are not limited to a specific range of motion, reducing the risk of injury during exercise. Examples of body weight training movements include push-ups, sit-ups, dips, jumping jacks, burpees, high knee running, mountain climbers, and lunges. Each movement is performed in three sets with 10-20 repetitions over a period of 3-4 weeks. The body weight training intervention was carried out for An M and An T for four weeks, with 12 regular meetings held on Mondays, Wednesdays, and Fridays. Table 1 in the study shows the distribution of the body weight training intervention evaluations for managed patients, specifically An M.

Table 1 shows the distribution of body weight training intervention evaluations on managed patient An. M. An. M's weight before the intervention was 75 Kg. During the first week of intervention, An. M's body weight decreased to 74.3 Kg, and to 73.5 Kg at the end of the second week's evaluation. In the third week, An. M's weight decreased to 71.3 Kg. An.M did bodyweight training exercises under the supervision of researchers either directly or through Zoom meetings and WhatsApp video calls. The exercise was done in the morning and evening, based on An. M's time, with the morning being the ideal time for activities and the night for rest. This is because humans go through two distinct phases: the ergotropic phase, where they carry out activities in the morning, and the trophotropic phase, where they rest at night.

Table 1. Distribution of body weight training intervention evaluations on managed clients, namely An.M

Variabel	Week-1	Week-2	Week-3	Week-4
Weight before intervention	75 Kg	74.1 Kg	72.00 Kg	72.00 Kg
Weight after intervention	74.3 Kg	73.5 Kg	71.3 Kg	71.3 Kg

When a person exercises at night, the hormone adrenaline is released, causing an increase in heart rate and body temperature. This situation can interfere with the quality of a person's sleep. This statement is supported by research, which shows that individuals who exercise at night may suffer from sleeplessness. Furthermore, the regression of body weight and weight reduction are demonstrated in Figure 2.

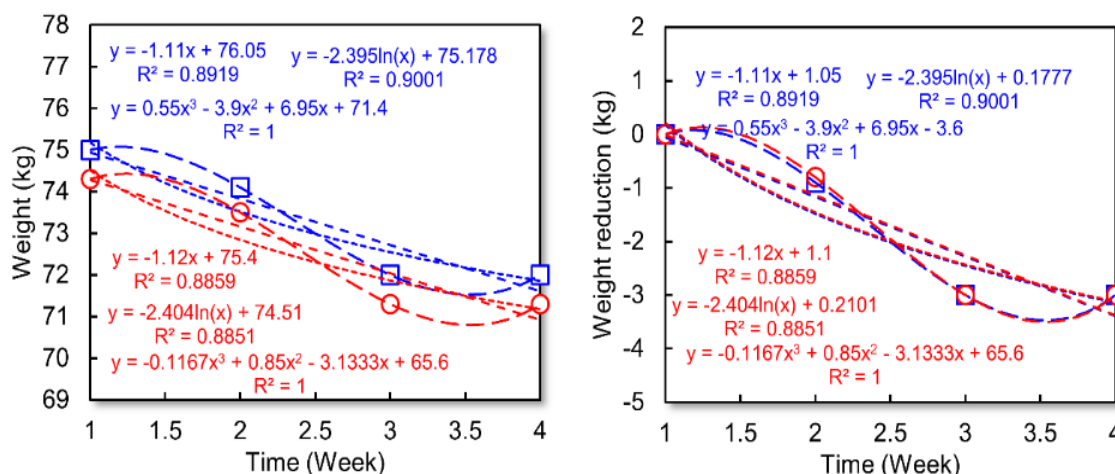


Figure 2. Regression of body weight and weight reduction of An.M family

During the fourth week of the intervention, An.M's body weight decreased from 73.00 Kg to 71.3 Kg, indicating a weight loss of 3.7 Kg after performing bodyweight training interventions 12 times in one month. This weight loss is likely due to the burning of body fat during An.M's exercise regimen, which included 50-60 minutes of bodyweight training per session. An.M also made efforts to reduce snacking intensity on Saturdays and Sundays, opting for drinking water instead. Additionally, An.M increased water intake from just a few glasses to 2 liters a day, leading to the burning of fat stores to fulfill the body's calorie needs during exercise. Biochemical activity is a vital aspect of obtaining energy for every exercise, and burning body fat can occur during low to moderate-intensity exercise for at least 30 minutes [27], [28]

Table 2 presents the bodyweight training intervention evaluation data of An.T. During the first week of intervention, An.T's body weight decreased from 63 Kg to 62.3 Kg, and in the second week, it decreased from 62.5 Kg to 61.8 Kg. An.T's weight loss can be attributed to An.T's commitment to performing the agreed-upon bodyweight training exercises for 30-45 minutes on a predetermined schedule. Regular physical activity with low intensity for 30 minutes can burn 64.9 Kcal of fat and aid in weight loss. The optimal duration of physical activity for weight loss is 30 minutes per session, three times per week which is proposed [25], [26].

Table 2. Distribution of body weight training intervention evaluations on managed clients, namely An.T

Variabel	Week-1	Week-2	Week-3	Week-4
Weight before intervention	63 Kg	62.5 Kg	61.5 Kg	60.9 Kg
Weight after intervention	62.3 Kg	61.8 Kg	60.7 Kg	59.2 Kg

During the third week, An.T's weight decreased from 61.5 Kg at the beginning of the week to 60.7 Kg by the end of the week. By the beginning of the fourth week, An.T's weight was 60.9 Kg, and by the end of the week, it had decreased to 59.2 Kg. Similar to An.M, An.T performed bodyweight training in the morning and evening by adjusting their activity schedule. To reap maximum benefits from physical activity, it is crucial to exercise at the appropriate intensity and time. Generally, the best time to engage in physical activity is in the morning, while it is best to rest at night. Performing high-intensity exercise before bedtime can lead to physiological arousal, characterized by increased heart rate and breathing, which can interfere with sleep. Figure 3 illustrates the regression of body weight and weight reduction.

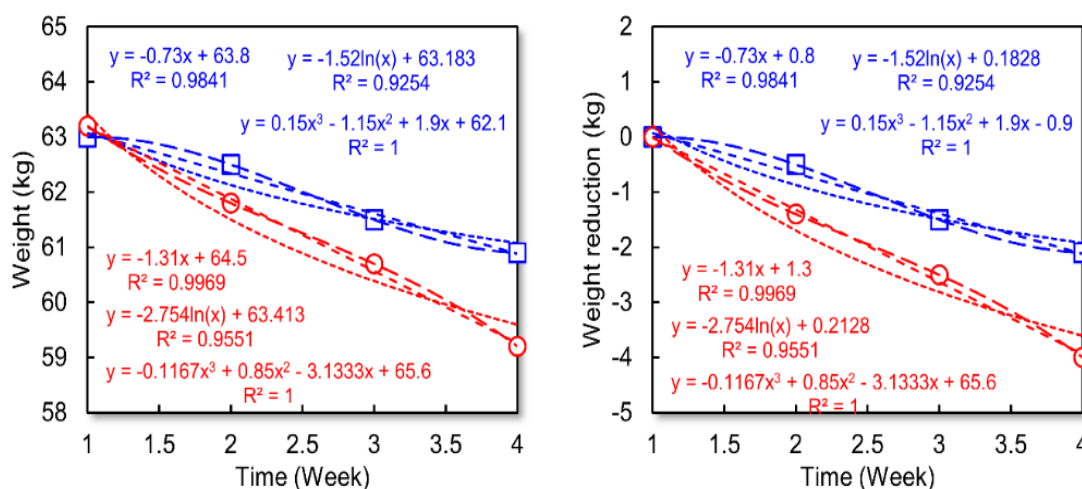


Figure 3. Regression of body weight and weight reduction of An.T family

An.M experienced a weight loss of 3.8 Kg after performing bodyweight training interventions 12 times in a month, indicating a change in body weight. Similarly, An.T's weight loss occurred due to bodyweight training, which he performed for 55-60 minutes, 12 times in a month, and with motivation from his family. Table 3 presents the effect of bodyweight training on weight loss in managed clients, specifically An.M. The table indicates that the average weight of An.M before the intervention was 73.57 Kg and after the intervention was 72.87 Kg. The paired T-test results revealed a p-value of 0.000, signifying the effect of bodyweight training on weight loss in managed clients.

Table 3. Analysis of the effect of body weight training on weight loss in managed clients of An.M family

Variabel	Mean	Std.deviasi	Std.error mean	t	p-value
Weight before intervention	73.57	1.28	0.64	17.146	0.000
Weight after intervention	72.87	1.31	0.65		

Table 4 presents the effect of bodyweight training on weight loss in resume clients, specifically An.T. The table reveals that the average weight of An.T before the intervention was 61.97 Kg and after the intervention was 61.00 Kg. The paired T-test results indicated a p-value of 0.028, signifying the effect of bodyweight training on weight loss in resume clients.

Table 4. Analysis of the effect of body weight training on weight loss in managed clients of An.T family

Variabel	Mean	Std.deviasi	Std.error mean	t	p-value
Weight before intervention	61.97	0.95	0.47	4.01	0.028
Weight after intervention	61.00	1.37	0.69		

Based on the description of the results above, it can be concluded that bodyweight training interventions can affect weight loss in adolescents with excess body weight. Managed clients lost 3.8 kg in weight while resume clients lost 3.7 kg in weight. The difference in the amount of weight between managed clients and resume clients may be due to several other factors such as eating patterns and other activity patterns carried out by each client during the intervention process. In this case, the bodyweight training intervention was carried out 12 times in one month, with each exercise lasting 55 minutes. There were eight types of exercises in the body weight training intervention, namely push-ups, burpees, mountain climbers, lunges, dips, jumping jacks, high knee ups, and sit-ups. Each movement in the body weight training was performed 10-20 times with three repetitions.

Physical exercise given to clients to reduce excess body weight is bodyweight training. Body weight training was carried out for 55 minutes with the division of activities, namely warming up, body weight training movements, and cooling down. The body weight training movement in this intervention has been adapted to previous research conducted [23]–[25]. There are eight bodyweight training movements: push-ups, burpees, mountain climbers, lunges, dips, jumping jacks, high knee ups, and sit-ups. Each movement is performed 10-20 times for three repetitions during the 55-minute bodyweight training intervention. The intervention was conducted three times a week for one month, resulting in 12 sessions. The effectiveness of bodyweight training exercises with and without resistance bands on weight loss and fat percentage was assessed in the study. The respondents who performed bodyweight training without resistance bands experienced a weight loss of 3.52%. This type of exercise uses the opposing muscle to the target muscle, helping to burn body fat while also optimizing the target muscle. To achieve the training goals, the exercise intensity must be appropriate according to the weight loss program and fat percentage. Therefore, bodyweight training activities can be beneficial for weight loss.

Weight training can be used as a supporting activity for weight loss if certain conditions are met, such as utilizing the circuit system, maintaining a heart rate of 65% to 75% of the maximum heart rate for more than 20 minutes, and using a circuit system. Yuksel *et al.* [24] shows that a 10-week body weight training program caused a slight increase in body mass (1.16%) and body fat percentage (2.43%), while muscle mass and body water percentage remained unchanged. In terms of physical fitness, body weight training had a positive impact on all measured elements of physical fitness, including statistically significant improvements in lower extremity explosive strength (5.6%; $p < 0.01$), endurance strength (10.7%; $p < 0.01$), and aerobic capacity (33.3%; $p < 0.05$).

Research from Baillot *et al.* [26] shows that physical exercise carried out for four weeks can help lose weight and abdominal circumference. The physical exercises used in this study were running, push-ups, sit-ups, and squats. There was a significant increase in the average number of running laps, push-up repetitions, sit-up repetitions, and squats repetitions from the beginning to the end of the exercise program. Additionally, a decrease in body weight and waistline was observed in the measurements taken before and after the program, and a significant decrease in the average number of running laps was also observed. Although the average weight of the respondents only changed in the third week, there was no clear relationship between the activities they did and changes in body weight or waistline. Research conducted by Kim *et al.* [30] also shows the effects of circuit body weight training on weight loss, indicating that this exercise has a significant effect on weight loss, resulting in a weight loss of 7.10% and a decrease in body fat percentage of 6.80%. The circuit bodyweight training program in this study was conducted three times a week on Mondays, Thursdays, and Saturdays, starting from July to September. The increase in physical activity from once a week during sports lessons at school to three times a week with low intensity helped burn body fat reserves, leading to a decrease in body fat percentage, body weight, and blood cholesterol levels.

4. CONCLUSION

The results of the intervention carried out on managed patients for four weeks with 12 sessions showed a significant weight loss of 3.7 kg in An. M, whose body weight before the intervention was 75 kg and after the intervention was 71.3 kg. Similarly, the results of the intervention carried out on resumes patients for four weeks with 12 sessions showed a significant weight loss of 3.8 kg in An. T, whose body weight before the intervention was 63 kg and after the intervention was 59.2 kg. It is recommended that adolescents with obesity use bodyweight training as a way to lose weight and as a physical activity to control body weight. Families with obese adolescents can also use bodyweight training exercises to help these family members lose weight. Educational institutions can use the results of the application of evidence-based nursing as a reference for students and the academic community in conducting research related to this topic. For future researchers, they can develop bodyweight training exercises by increasing or decreasing the number of movements and duration while still maintaining effectiveness. Moreover, further researchers can

also develop standard operating procedures or video tutorials for the implementation of body weight training to make them easily understood and implemented by clients.

ACKNOWLEDGEMENT

The authors would like to thank the Higher Education Commission of the Indonesian Ministry of Research, Technology, and Higher Education, for their financial support for this community nursing study 2023.




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