https://doi.org/10.48047/AFJBS.6.8.2024.2008-2020

AfricanJournalofBiological Sciences

ResearchPaper OpenAccess

Muscular Endurance Training Model for Women Age 18 – 25 Years

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Article Info

Volume 6, Issue 8, 2024

Received: 01 May 2024

Accepted : 25 May 2024

doi:10.48047/AFJBS.6.8.2024.2008-2020

ABSTRACT: The aim of this research is to produce a strength training model for women. The approach used in this research is research and development. This research focuses on developing an endurance training model, so the approach and method used in this research is the R&D method with the Borg and Gall model. The findings of this research are the training models and test instruments that have been developed. This training model is packaged in the form of a printed book, and also a video of the implementation of variations in strength training. Strength training models for women aged 18-25 years can be developed and applied in physical training and to increase strength. The strength training model developed was effective, based on the results of data analysis showing that there was a higher increase in the experimental group than in the control group.

Keywords: Muscle, Women, Endurance

Introduction

In the current millennial era, known as the 5.0 era, technology is increasingly developing and making all human activities easier. With the existence of appropriate technologies, many activities can be done in one click in front of a PC or laptop. Like sending files online which used to be sent to the office but can now be sent via email, ordering food and drinks during work breaks is now easier via online applications, not only food and drinks but anything can be reached from online shopping applications. 80% of private and teaching services in schools and universities are online. This results in minimal movement activity for each individual. The shift in lifestyle from walking to buy daily necessities or working from the office to going online means that the level of strength in individuals decreases, which has an impact on fitness which triggers the emergence of diseases. Diseases that appear start from mild ones such as decreased body immunity, decreased body metabolism, decreased muscle mass, feeling tired more easily, obesity, arthritis, osteoporosis, pinched nerves, early menopause, heart disease, respiratory problems, and other chronic diseases that can causing death.

As we all know, to get fit, the thing that must be done is to maintain a good lifestyle, including eating regularly and healthily, getting enough sleep and exercising. If one of the three above is not done well it will affect our health. In women, strength training can increase strength and strengthen muscles and increase muscle density, but it is still rare for women to want to do strength training. This is because of the wrong mindset and many people still question whether strength training can enlarge muscles like bodybuilders. Apart from that, women still think that the gym is only for men and is dominated by men

so that women feel inferior about strength training in the gym. feel that it reduces the value of women's feminism when strength training, feeling tired after work makes women choose to lie down/rest after work, feel like they don't have time to exercise because they work, don't have friends to exercise with, and don't have uniforms and equipment for strength training. All of these are the reasons that make exercise, especially strength training for women, very difficult to do. Most women choose to spend their free time in cafes or at the mall with co-workers, friends or family rather than using their free time for exercise or strength training.

As a result of being lazy about moving, the risk of diabetes, heart disease and hypertension increases by 20%. 20% to 25% is considered quite high, 25% - 31% is considered high, and a value > 31% is considered very high. Women generally have about 3% more fat thickness than men before puberty and 11% more after puberty. Women themselves have higher body fat thickness than men, due to increased levels of estrogen secretion during puberty and this depends on gender. Optimal body fat for adult women is 15% - 25% with 25% - 30% considered quite high, 30% - 35% considered high, and values > 35% considered very high.

According to data from the Indonesian Ministry of Health, the obesity epidemic is rapidly hitting global public health. Obesity is the third leading cause of chronic health problems in the world. In 2014, it was estimated that the global economic impact of obesity was $2 trillion/year. The obesity rate is associated with people's habit of consuming food/drinks with excess calories without regular exercise, resulting in a buildup of fat and sugar in the body. WHO has set a target of 2025 to maintain the prevalence of obesity back to the level in 2010. Since 1980 the number of obese people has now doubled, in 2014 more than 1.9 billion adults aged 18 years and over were obese. This number is equivalent to 600 million overweight people. 39% of adults aged over 18 years are overweight, 13% are obese. World data shows that obesity is more common in women than men.

In Indonesia, 13.5% of adults aged 18 years and over are overweight, while 28.7% are obese (BMI 25) and based on the 2015-2019 RPJMN as many as 15.4% are obese (BMI 27), while in 18.8% of children aged 5-12 years are overweight and 10.8% are obese. In 2016 the obesity rate increased to 20.7% (BMI 27) to 33.5% (BMI 25). In 2018 it increased to 13.6%. The obesity rate is most often found in adults, the highest being in North Sulawesi, then in DKI Jakarta, East Kalimantan and West Papua. This triggers the death rate due to obesity and diseases caused by being overweight to also increase. Below is an obesity diagram for ages 18 years and over.

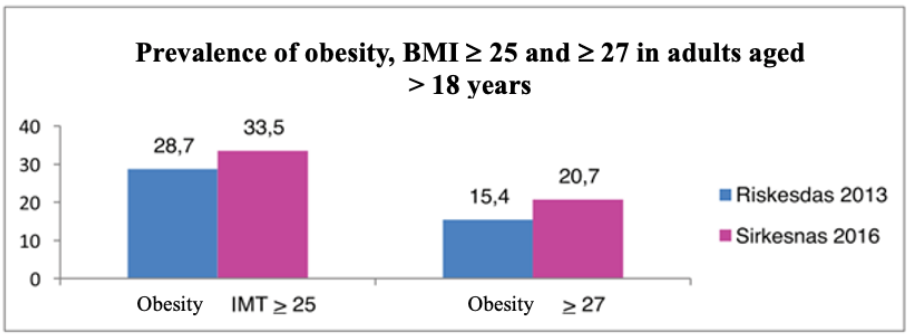

Figure 1. Prevalence of obesity in adults 18 years and over

Biological aging induces a progressive decrease in skeletal muscle mass which is a major factor in decreasing the functional capacity of muscles. In addition, aging also impairs autonomic modulation, especially heart rate variability. Preserving the autonomic function of human muscles, especially nerve function, aims to be the main determining factor in health and longevity because good nerve function makes the muscles and skeleton stronger so that the body becomes stronger in activities.

An exercise program that includes several components such as: such as aerobics, flexibility, proprioception/kinesthesia, balance, speed, and strength not only promotes optimal health but also improves the performance of daily living activities (Lorenz & Morrison, 2015). Specifically, combined training (CT) is a combination of aerobic and muscle strength training in the same session. It has been

investigated for benefits such as decreased adipose tissue, increased muscle mass, aerobic strength, and cardiopulmonary capacity (Rossi et al., 2016).

Exercise training is beneficial for increasing heart rate, but there needs to be evidence of the effects of different periodization models in physically active female populations. Regarding combined exercise programs, previous studies have shown the effects of several periodization strategies (nonperiodized, block periodization, and daily undulating periodization) on physical function in untrained women. It was reported that all three models produced significant improvements in several physical functions and physiological health outcomes, including systolic blood pressure, body composition, maximal strength, and balance confidence, with no differences between groups (J.A. et al., 2016).

Strength training has been shown to improve anaerobic performance among running athletes from a variety of sporting backgrounds, including distance runners, volleyball, soccer, and basketball players (Coburn et al., 2014) (Balabinis et al., 2003). However, research also shows that simultaneous aerobic and strength training can interfere with maximal oxygen consumption (V_O2max), 4 km running test performance (Chtara et al., 2015). It has been suggested that the residual effects of fatigue produced by strength training may repeatedly impair the quality of subsequent endurance training sessions and interfere with endurance adaptation (Chen et al., 2009). So an appropriate training program is needed to regulate the recovery of the body's anatomical and physiological adaptations due to the training load that has been carried out.

Strength training is a physical activity designed to increase muscle strength and fitness. Strength training can increase strength and muscle mass, strengthen joints and increase individual fitness. Strength training can be done with or without equipment or in this case using body weight.

Consequently, simultaneous training that combines strength and endurance requires prescribing training in a strategic manner to minimize fatigue between strength and endurance training sessions (Docherty & Sporer, 2012). Other research reports have shown that sub-maximal cycling performance (Deakin, 2012), sub-maximal running performance (Palmer & Sleivert, 2012) and maximal running performance (Marcora & Bosio, 2017) after strength training can each be debilitating over 3 , 8 and 24 hours. However, other studies have also shown that sub-maximal running performance (Marcora & Bosio, 2017) (Vassilis Paschalis et al., 2018) (Paschalis et al., 2015) (Scott et al., 2013) is not affected after diving strength training 24 and 48 hours.

The most difficult part of the planned exercise program process is often achieving and maintaining the desired training intensity. Although heart rate measurements are usually used to see the effectiveness of the goals of this program. The linear relationship between HR (heart rate) and oxygen consumption is often inaccurate and usually cannot be used with subjects who are taking medications (Chow & Wilmore, 2013) (McArdle et al., 2015). Research that lasted for 6 or 10 weeks, revealed that women were relatively inaccurate in the power used during strength training in regulating exercise intensity (Dunbar & Kalinski, 2014). So the focus of the study was to investigate the effects of strength training for weight loss in physically active women.

The results of a literature review through publish and perish and Vos viewer show data that the strength training model for women is still very lacking, it can be seen from the picture below:

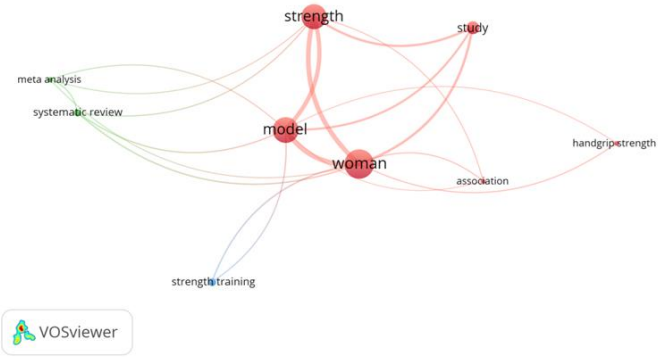

Figure 2. Bibliometric Study of Strength Training in Women

Based on the results of interviews with personal trainers, it is said that muscle endurance training for women aged 18-25 years is very important for several reasons. Firstly, in this age range, the process of bone mass formation is at its peak stage. Muscle endurance training can increase bone density, prevent osteoporosis later in life, and reduce the risk of bone fractures. The more muscle you have, the greater the number of calories your body burns at rest. Muscular endurance training can help build greater muscle mass, increase metabolic rate, and maintain ideal body weight. Muscle endurance training can help improve blood circulation and oxygen flow to the reproductive organs, which can benefit menstrual health and future fertility. A more proportional and stronger body shape as a result of muscle endurance training can increase self-confidence and self-esteem in young women. Strong muscles and good endurance can protect joints and bones from injury, especially when doing heavy physical activity or sports. By starting muscular endurance training early, young women can build a strong foundation for bone health, metabolism, and muscle strength that will benefit them throughout their lives. Therefore, strength training sessions are an alternative to limit the impact of strength training on sub-maximal performance. To understand the mechanisms linking the impact of strength training it is important to systematically examine various strength training variables (e.g., contraction speed, whole-body or lower-body strength training only, and strength training intensity). Such findings will allow the formulation of strength training programs that will minimize adverse effects on individuals.

Muscular endurance training is a form of exercise that aims to increase the muscle's ability to carry out repetitive actions for a long time without fatigue. This type of exercise is especially relevant for women, as it can influence various aspects of fitness and physical health. Muscular endurance strength training in older women increases maximum strength and muscle cross-sectional area but does not increase peak strength or functional capacity such as the ability to climb stairs (Walker et al., 2017). Older women undergoing muscular endurance training show skeletal muscle adaptations, including changes in the distribution of muscle fiber types and increased capillary density, which may contribute to improved cardiovascular fitness (Coggan et al., 2018). Muscular endurance training in women can increase muscle strength and size, and in some cases, improve functional performance and symptoms associated with conditions such as fibromyalgia. However, its impact on peak strength, functional capacity, and cardiovascular fitness may be limited or vary depending on the individual's age and health status.

Based on several previous studies, it is known that combining several strength training programs can contribute to increasing VO2max and increasing muscle endurance in the upper and lower body. However, several studies have not found the right frequency and intensity so that participants can choose the right strength training time.

Researchers took advantage of this deficiency to create an appropriate strength training model that would be beneficial for female participants. In this way, the process of strength training in women will be easy to find because they will not lose their feminine characteristics after weight training. Based on

this background, research will be prepared with the title: Strength training model for women aged 18-25 years.

Methods

The approach used in this research is research and development, which is research that seeks to develop certain products according to community needs. This research focuses on developing an endurance training model, so the approach and method used in this research is the R&D method with the Borg and Gall model. The Borg and Gall development research model was chosen with the consideration that the research stages described were quite clear and detailed, making it easier to understand. This research was carried out at several universities in North Sumatra Province and at several physical fitness centers. Research targets or subjects who use the muscle endurance training model in women. In this regard, the training model that will be prepared is the result of the researcher's thoughts and is adapted to the characteristics of the research subjects. In this research, researchers used the Research & Development (R&D) development model from Borg and Gall as a reference. The choice of the Borg & Gall model was based on the fact that this model has more detailed and clear stages. After the design of the model to be developed is created, the design is then subjected to expert validation. The model development design will be validated by 3 experts, namely 1) sports coaching expert, 2) training method development expert and, 3) strength and conditioning expert. Expert validation aims to determine the shortcomings of the training model being developed. The data collection instrument used in developing the strength training model is for experts in the form of a questionnaire or questionnaire. There are two research data analysis techniques used, namely: qualitative analysis and quantitative analysis. In this research, the characteristic of the model developed is a strength training model for women which consists of upper body and lower body exercises.

Results and Discussion

Model Development Results

The development of this strength training model aims to produce a strength training model to increase the biomotor component of strength (arm muscle strength, abdominal muscle strength, back muscle strength and leg muscle strength) in women aged 18-25 years. The results of the development of this strength training model are written in the form of a script or implementation guide that can be presented and read to increase strength and reduce weight in women. Before producing a model, a series of activities are carried out which will be described below.

Needs Analysis

In model development research, there are stages that must be carried out in accordance with existing theoretical studies. The first step that must be taken is to carry out a needs analysis of the model to be developed. Overall, there are two general objectives to be revealed in a preliminary study or needs analysis, namely; (1) How important is the development of a strength training model for women aged 18-25 years; (2) What obstacles and support are encountered in developing a strength training model for women aged 18-25 years.

The training model that will be developed is the result of a preliminary study in the form of literature study and problems found in the field through observations and interviews as well as the researcher's personal experience. Based on literature studies as well as observations and interviews conducted by researchers, the objectives to be achieved from developing a strength training model for women aged 18-25 years were obtained. Apart from that, researchers can also find out several characteristics of the subject from the model that will be developed.

The results of the data that researchers have collected through interviews and observations in the field are then processed and analyzed. Several conclusions have been drawn that the training carried out so far has not used varied forms of strength training. The training carried out is mostly done conventionally, without using training media. This often makes women feel bored and bored because there is a lack of variety. The following will describe the results of the needs analysis and field findings.

Table 1. Preliminary Study Results Data

No	Component	Findings
1.	Literature Study	• "Strength is one of the main physical characteristics, which determines success in various types of sports (Podrigalo et al., 2015)." • Physiological factors play a very important role in supporting athletes' skills, one of the exercises that can be given is strength training (Giovanelli et al., 2017) • Resistance training is exercise specifically designed to increase muscle strength and endurance which is carried out with free weights, machine weights, elastic bands, hydraulic machines, body weight, for example: push ups, chin-ups, sit ups, back tension. (Lubans et al., 2015) • Dhahbi et al., (2017) that "push-ups • It is very popular to use as a training method to obtain various levels of physical training, because there are many variations of exercises that can be done." • Resistance training includes strength training which contributes not only to health in adolescents, but can improve physical fitness, including body composition, risk of sports injury and sports performance. (Smith et al., 2020) • The period of strength development can be done with the age of 18-25 years, however, that does not mean that strength will not be developed at an age below that. It is important to use an individual approach to its development, as one training group, with varying levels of physical fitness with its training experience (Sagiev et al., 2020)
2.	Needs Analysis (Observation, Interview)	• The strength training provided is combined with other biomotor components such as agility, speed and endurance training. Which is often called physical exercise. • Strength training, in particular, is still done conventionally, such as push ups, sit ups and back up exercises, so women are not enthusiastic about participating in these training sessions. • The strength training provided does not vary in movement, whether using one's own body weight, or using training media so that women easily get bored during this training session. • There are no specific exercises for the bimotor component of strength

Implementation of Model Development

After conducting a preliminary study in the form of a literature study and needs analysis, a draft model was created to be developed. The forms of exercise developed are strength training consisting of arm muscle strength training, abdominal muscle strength training, back muscle strength training and leg muscle strength training. Movement variations, training media variations and formation variations are made differently for each strength training exercise.

The characteristics of the form of exercise developed in this research have led to the need for strength training for women aged 18-25 years. The stages of implementing the training model developed are arranged in detail and systematically starting from the objectives, equipment, training implementation procedures. Based on preliminary studies and needs analysis and product design, 15 variations of strength training for women aged 18-25 years were produced in the first draft.

Table 2. Draft Model Developed

No	Model Name	Movement Description

1	*Slider Modifiet Push up front*	This is done by taking a test position with the body facing downwards, then lifting the knees, moving one hand forward and vice versa.
2	*Slider Side Modifiet Push up*	This is done by taking a test position with the body facing downwards, then lifting the knees, one hand is shifted to the side, pointing out/away from the body and vice versa.
3	*Slider Outs Modifiet Push up*	This is done by taking a test position with the body facing downwards, then lifting the knees, moving one hand to the side, crossing out and vice versa using the arm.
4	*Slider Side Modifiet Push up*	This is done by taking a test position with the body facing downwards, then lifting the knees, one hand is shifted to the side, pointing inward/cross pointing into the body and vice versa.
5	*Slider Side Modifiet Leg in*	This is done by taking the test, taking the position of the body facing downwards, then lifting the knees, bending the elbows. When moving the legs to the side towards the inside and one of the legs is shifted to the side, pointing in/cross towards the inside of the body and vice versa.
6	*Slider Side Modifiet Leg out*	This is done by taking a test position with the body facing downwards, then lifting the knees, one leg is shifted to the side, pointing out/cross, pointing to the outside of the body and vice versa.
7	*Slider Knee Tucks Crunch*	This is done by taking a test position with the body facing downwards, then lifting the knees, pushing both legs together forward towards the hands and doing this repeatedly by pulling the legs back.
8	*Slider 90^0 Degree*	This is done by taking a test position with your body facing downwards, then lifting your knees, pushing one leg forward parallel to your shoulders
9	*Slider Side Knee Tuck*	This is done by taking a test position with the body facing downwards, then lifting the knees, pushing both feet to the side.
10	*Slider Modification Push up*	This is done by taking a test position with the body facing downwards, then positioning the knees below touching the floor, one hand pushing up and the other hand pushing forward.
11	*Slider Riverse Lunges*	This is done by taking a standing position and then bending one leg backwards at a 900 angle.
12	*Slider Side Lunges*	This is done by taking the test in a standing position and then bending one leg to the side.
13	*Slider Front Back*	This is done by taking the teste in a prone position with the body bent, then positioning the knees below then pushing both hands forward with the slider and doing the opposite.
14	*Slider Frone*	do the teste by taking the position of turning the body upside down / like a bench and one of the legs bent crosswise. Then move one hand to the side and vice versa.
15	*Modification Push-Up*	This is done by taking a prone position with your body straight, placing your hands parallel to the floor shoulder width apart. Tighten the abdominal muscles and ensure that the body remains straight and begin to alternately straighten the arms from a position where the arms are bent and then straightened again. When doing the movement, the knees are straight and the body follows the movement of the arms.
16	*Sofa Chest Press*	This is done by lying on the edge of the sofa/bed with the testicles positioned, feet shoulder-width apart with the buttocks tightened and knees bent 90 degrees, hands in front of the chest horizontally holding a 3kg dumbbell. Do a press movement towards the sky.
17	*Tumbler bicep curl*	This is done by holding the testicles in a 2 liter water tumbler and holding the body in a straight position while tightening the abdominal muscles. The elbow from below holding the tumbler is raised up to the maximum.

18	*Seated Tumbler Shoulder Press*	Done in a sitting position while both hands hold 2 tumblers (which contain 2 liters of water) with the hands at the sides of the body. Push the weight overhead slowly back to the starting position.
19	*Floor tricep kickback*	Lean your body forward, lift your elbows until they are parallel to your body, forming a 90° angle at the elbows. Hold the weights in both hands, swing the dumbbells/weights backwards while maintaining a straight movement, elbows remain stationary.
20	*Plank to tap knee*	The initial position is plank, but while doing the movement, the hands alternately touch the knees or toes.
21	*In outs*	The body position is lying down with the head raised slightly so that it does not touch the floor and the legs straight but not touching the floor.
22	*Bycicle tumbler*	The body lies down with the hands in front of the chest holding the tumbler while the legs pedal like cycling.
23	*Pillow Leg raises*	The body lies down, hands are on the buttocks, the pillow is clamped by the inside of the legs. The movement of the legs is lifted from the floor up to form a 90 degree angle (up and down repeatedly).
24	*Pillow Rusian Twist*	Sitting body position, feet together on the floor and knees bent, both hands holding the pillow and moving left and right.
25	*Squat Twist Knee Up*	Open your feet shoulder-width apart, place your hands behind your head, squat at around 90°, then stand with one leg raised and do a twist movement
26	*Tumbler walking lunges*	The movement is like doing lunges in general, but in this case the movement is done with dumbbell weights
27	*Gallon deadlift*	Body position upright, legs open 2 times shoulder width, knees facing out and lift a weight (gallon).
28	*Back Exercise*	Hold two weights (mineral water bottles) in front of your body, lean your body forward, look straight ahead, pull both weights to your sides until the weights are parallel to your hips, pull them to form a 45° angle, then repeat and return to the starting position.
29	*Standing Lateral Raise*	Stand up straight, starting position with both dumbbells at the bottom (beside your thighs), lift both weights to the side forming a 90° angle, when lifting the weights, the body remains stable, only the shoulders are allowed to move, then repeat the movement.

Model Feasibility

The model design prepared by Borg and Gall contains 10 stages that researchers must go through in creating and developing a model. The first stage that the researcher has gone through is conducting a preliminary study, planning the research and developing the design. The next step is to validate the model by experts. This validation is carried out to find out whether the model that has been designed meets the eligibility criteria to be used as a training model later.

After expert validation, phase I revisions were carried out regarding the input and suggestions provided. After revision, it continued with a small group trial, the trial was carried out on 20 women. Based on this trial, results were obtained, then stage II revision was carried out. The next stage was a large group trial, where researchers conducted this trial on 55 women. From this large group trial, suggestions and input were obtained from the subjects and also the research team, then the researchers carried out stage III revisions to perfect this model. The following are the stages carried out to produce the final model:

Expert Validation

Phase I revision was carried out based on the results of expert validation of the model that had been prepared. Validation is carried out by expert judgment. The experts chosen to validate the model that has been prepared are people who are competent in their fields and have knowledge both academically

and in terms of coaching. The following are the experts selected to validate the model that has been prepared:

Prof. Dr. Johansyah Lubis, M. Pd he is a Professor at the Faculty of Sports Science, Jakarta State University as an expert on training programs

Prof. Dr. Widiastuti, M.Pd, he is a Professor at the Faculty of Sports Science, Jakarta State University, a test and measurement expert.

Dr. Fahmy Fachrezzy, M.Pd, he is a lecturer in the Physical Education and Health Study Program at the Faculty of Sports Science, Jakarta State University, a strength and conditioning expert.

From the results of expert validation carried out on strength training models, there are several forms of training that are recommended to be dropped or are not suitable to be continued. The following is a recapitulation of expert validation results:

Table 3. Summary of Training Models After Expert Validation

No	Model Name	Information
1	*Slider Modifiet Push up front*	Worthy
2	*Slider Side Modifiet Push up*	Worthy
3	*Slider Outs Modifiet Push up*	Worthy
4	*Slider Side Modifiet Push up*	Worthy
5	*Slider Side Modifiet Leg in*	Worthy
6	*Slider Side Modifiet Leg out*	Worthy
7	*Slider Knee Tucks Crunch*	Not feasible
8	*Slider 90^0 Degree*	Worthy
9	*Slider Side Knee Tuck*	Not feasible
10	*Slider Modification Push up*	Worthy
11	*Slider Riverse Lunges*	Worthy
12	*Slider Side Lunges*	Worthy
13	*Slider Front Back*	Worthy
14	*Slider Frone*	Not feasible
15	*Modification Push-Up*	Worthy
16	*Sofa Chest Press*	Worthy
17	*Tumbler bicep curl*	Worthy
18	*Seated Tumbler Shoulder Press*	Worthy
19	*Floor tricep kickback*	Worthy
20	*Plank to tap knee*	Worthy
21	2. *In outs*	Worthy
22	*Bycicle tumbler*	Worthy
23	*Pillow Leg raises*	Worthy
24	*Pillow Rusian Twist*	Worthy
25	*Squat Twist Knee Up*	Worthy
26	*Tumbler walking lunges*	Worthy
27	*Gallon deadlift*	Not feasible
28	*Back Exercise*	Worthy
29	*Standing Lateral Raise*	Worthy

Based on validation results, experts stated that there were 4 models of strength training for women which were said to be inappropriate, namely: Slider Knee Tucks Crunch, Slider Side Knee Tuck, Slider

Frone, Gallon deadlift because according to experts this item was too difficult to practice on people who were less trained, and which are said to be suitable for testing are 25 model items. The results of the expert validation illustrate that there are several exercise variations that are quite difficult to practice so improvements are needed. Some suggestions and input given by experts regarding the advantages and disadvantages of strength training programs are as follows:

Excess:

Push Ups: Strengthens chest, shoulder and arm muscles. Increases muscle endurance.

Couch Chest Press: Strengthen chest muscles without equipment. Easy to do.

Tumbler Bicep Curl: Strengthens the upper arms. Easy to do using a bottle.

Seated Shoulder Press: Strengthens shoulders without equipment. Easy to do.

Floor Tricep Extension: Strengthens the back of the arms. Can increase muscle mass.

Plank to Tap Knee: Works the core and balance. No equipment required.

In Outs: Strengthens the waist and pelvis. Can be done anywhere.

Bicycle Tumbler: Strengthens the abs while flexing the body.

Lack:

1. Lack of movement variations for certain body parts such as the thighs and calves.

2. Some movements require the help of tools such as bottles or pillows.

3. No significant cardiovascular elements.

4. It may be difficult for beginners to do some movements such as push ups.

So researchers will add other exercise variations such as squats, lunges, calf raises, mountain climbers and burpees to provide a more comprehensive workout. Researchers will also provide easier movement modifications for novice participants while gradually increasing the intensity. With the right combination of strength training and cardio, this program can be very effective for overall fitness.

Small Group Trials

The model has been justified by experts (expert judgment). The researchers then tested this model in small groups. A small group trial was conducted on 20 women at Quality Medan and Brastagi Universities. The trial was carried out in the university hall and assisted by several lecturers during 8 meetings. During implementation in the field, researchers received input from the research team to improve this model.

Table 4. Results of Small Group Trial Data Analysis

Question Items	Subject	Results Score	Maximum Score	%
1-44	12	1880	2160	87,04%

Based on the table above, the results of the data analysis of filling out the small group trial questionnaire showed that the percentage was 87.04%, indicating the good category. So the results of the analysis of small group trial data can be concluded that the muscle endurance training model for women can be continued into large group trials by providing slight revisions and field notes as well as input from trial subjects. Apart from that, the researcher has several notes for improving this model in the future. The following are some input, suggestions as well as notes found in the field; (1) Make sure all participants fill out the informed consent and health questionnaire first to ensure they do not have a medical condition that would prevent participation; (2) Warm up sufficiently for about 10 minutes with joint mobilization and light stretching before starting the core program. This is to prevent muscle or joint injury; (3) Show examples and explain how to do each movement correctly. Give participants the opportunity to ask questions if there is something they don't understand. Avoid wrong movements

because they can risk injury; (4) Supervise the execution of movements by all participants. Give corrections if there are wrong movements. Make sure they do the prescribed repetitions and sets without overtraining; (5) Give sufficient rest between each movement, approximately 1-2 minutes. This is to restore energy and prevent excessive fatigue; (6) Look at participants' responses and feedback after the session is over whether the exercise was effective or too easy/difficult. This information is important for further program development; (7) Make sure no injuries are reported during or after the session ends. Injuries can be managed with proper management.

From the small group trials that have been carried out, all forms of training that have been prepared are suitable to be continued. After collecting input and suggestions as well as notes in the field, the researcher revised and improved the model developed. This improvement aims to perfect the design of the training model that has been prepared. After these revisions and improvements were made, it was then continued to large group trials.

Large Group Trials

The next phase of model testing that the researchers carried out was a large group trial conducted on 55 women. The number should be greater than small group trials. In this large group trial, researchers held 8 meetings with an average training time of 100 minutes. All participants practiced the training model that had been created for further observation and research and implementation. The following is a recapitulation of the results of large group trials that have been carried out.

Table 5. Results of Large Group Trial Analysis

Question Items	Subject	Results Score	Maximum Score	%
1-29	55	6573	8140	80,75%

Based on the table above, the results of data analysis for filling out large group trial questionnaires show a percentage of 80.75% with good classification. So the results of the analysis of large group trial data can be concluded that the muscle endurance training model for women is suitable for use. Apart from that, researchers also received input and suggestions from the research team and test subjects. Some of the input and notes provided are as follows; (a) Vary the movements at each meeting so that participants don't get bored following the same movements. But still maintain the push-pull-legs pattern in each session; (b) Provide a longer warm-up and cool-down considering the large number of participants. Warm up is around 15 minutes and cool down is 10 minutes; (c) Demonstrate each movement correctly before starting the set. Make sure all participants understand how to do it well; (d) Get more assistants/instructors to monitor the progress of the training. Minimum 1 instructor for 5-7 participants. This is to ensure the quality and safety of the movement; (e) Add variations of up to 20 different movements for plenty of options to target specific muscles. Stay focused on strength training using body weight; (f) Control the rest duration of 1-2 minutes between each movement. Don't take too long so that the training session does not exceed 100 minutes; (g) Document which movements were most preferred and felt most effective by the majority of participants. This information is useful for further program improvements.

Based on input and suggestions from the coaching team, it was tested in large groups, the researchers made final revisions and improvements. This revision is to improve the model that has been prepared so that it becomes the final model. This final model was then tested for effectiveness to see whether this model was more effective than other models in increasing muscle endurance in women aged 18-25 years.

Final Model

After carrying out a series of trials and revisions and improvements to the draft model, a strength training model for women aged 18-25 years was compiled with a total of 25 model items. The model

that has been prepared includes components of upper body strength: arm and chest muscle strength (Arm and Chest) consisting of 11 model items, abdominal muscle strength (core) consisting of 5 exercise variations and leg muscle strength (lower body) 9 exercise variations. There are a total of 25 variations of this exercise and is the final model of the muscle endurance training model for women aged 18-25 years.

Conclusion

The findings of this research are the training models and test instruments that have been developed. This training model is packaged in the form of a printed book, and also a video of the implementation of variations in strength training. Test instruments are used to measure three types of strength starting from the abdominal arms and lower extremity muscles. For training models, based on the results of needs analysis, expert validation, field trials and discussion of research and development results on product development of strength training models for women aged 18-25 years, the following conclusions can be drawn; (1) A strength training model for women aged 18-25 years can be developed and applied in physical training and to increase strength; (2) The strength training model developed is effective, based on the results of data analysis showing that there was a higher increase in the experimental group than in the control group.

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