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THE EFFECT OF SINGLE LEG EXERCISE ON THE BALANCE LEVEL OF BASKETBALL EXTRACURRICULAR MEMBERS IN HIGH SCHOOL OF SMAN 1 MAROS

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Abstract : *Basketball players need good physical conditions, one of which is the balance component, both static and dynamic balance. Balance is needed in basketball techniques to improve performance and reduce the risk of injury. Single leg exercise is one of the exercises whose aim is to increase muscle strength and balance. The purpose of this study is to determine the effect of single leg exercise on the level of static and dynamic balance in extracurricular members of basketball. The study type is pre-experimental design, with the study approach of one group pre-posttest design. The study population is all students of State 1 High School Maros who take extracurricular basketball. The sampling technique used was purposive sampling technique with the number of samples of 23 people. This study used Wilcoxon statistical test for static balance level and found that single leg exercise can improve the level of static balance after 15 treatments. As for dynamic balance level, this study used paired t-test and obtained the result that single leg exercise can improve the level of dynamic balance after 15 treatments. There is influence of giving single leg exercise to level of balance in extracurriculer members of basketball after given 15 times* ($p< 0,001$, $p<0,05$) *treatments.*

Keywords: *Dynamic balance, Single leg exercise, static balance,*

I. INTRODUCTION

Basketball is a type of body contact sport[1] where players often make body contact with other players to carry out attacks or defenses. Therefore, players must have good physical conditions, such as aerobic endurance, speed, agility, balance, muscle strength, power and flexibility of shoulders and wrists[2].

One component of the physical condition that is very important during the competition is balance[1]. Static balance refers to a balance that is maintained for a certain period of time[1]. The basic stance is a position to defend against enemy attacks in basketball games, where a good static balance can strengthen the legs of the limbs so that the body remains well controlled[3]. In addition, in shooting techniques, players who maintain stable balance and posture will achieve accuracy on shots[4].

Dynamic balance is needed in sports that refers to stability when the athlete moves[4] like when doing locomotor movements such as walking, jumping and running[5]. In basketball games, dribbling ball is one of the most basic techniques that requires balancing[3]. Balance is also needed in the pivot technique where the technique uses the principle of turning the body with one leg into a shaft (after receiving the ball) to avoid the opponent[6].

Balance also has a function to reduce the chance of injury, improve muscle work and is also needed in the implementation of rapid movements. A good dynamic balance will prevent someone from falling, if the pattern

of movement changes unexpectedly[7]. Increasing the ability of balance in athletes can help reduce the risk of injury[9]Therefore we need an exercise to improve balance in basketball players. One exercise that can improve balance is a single leg exercise.

Single leg exercise is one type of proprioceptive exercise that can be given to improve balance ability[9]. By improving proprioceptive capabilities, one can obtain the balance needed to maintain stability and can quickly change direction if needed[5].

Research conducted by Lee & Kuang (2016) stated that there was an increase in balance for basketball players for four weeks following the specific balance traning program. Another study showed that proprioceptive training was effective in improving dynamic balance, with a percentage increase of 58% over six weeks of training[5].

II. METHODS

2.1 Location dan Research Design

This research was conducted at SMAN 1 Maros. This research is a pre-experimental research with the method of one group pretest-posttest design.

2.2 Population and Sample

The population in this study were students of SMAN 1 Maros who participated in basketball extracurricular activities. Sampling was in accordance with the inclusion and exclusion criteria, amounting to 23 people.

2.3 Method of Collecting Data

Data collection was carried out directly by the researcher with socialization and filling out the research sample identity form, measuring static balance and balance as a pretest, before being given a single leg exercise. After that, a single leg exercise was done three times a week for 15 treatments, then after the 15th treatment the posttest will be carried out.

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2.4 Data Analysis

Data collected, processed using SPSS version 23 and carried out by normality test to determine the distribution of data. After it is known that the distribution of data is not normal for the static balance level, a hypothesis test is carried out through the Wilcoxon test, while the level of dynamic balance has a normal distribution of data, then hypothesis testing is done using paired t-test. Hypothesis testing was conducted to determine the effect of single leg exercise on the level of static and dynamic balance.

III. RESULTS

The results of this study indicate the characteristics of the study sample, namely age, gender, and body mass index. The age of the study sample included the age of adolescents with high school educator levels, aged 15-16 years. The number of research samples which were male were 11 people (47.8%) and the number of female research samples was 12 people (52.2%). So that the entire sample was 23 people. The sample distribution based on BMI is a sample of people who have underweight IMT is 10 people (43.5%), normal BMI is 11 people (47.8%) and overweight BMI is 2 people (8.7%).

Table 1. Characteristics of Research Samples

Sample Characteristics		Number of Respondents (N)	Percentage (%)
Gender	Male	11	47.8
	Female	12	52.2
Total		23	100
Age	15	11	47.8
	16	12	52.2
Total		23	100
BMI	<18,5 (*under weight)*	10	43,5
	18,5-22,9 (*normal)*	11	47,8
	23,0-24,9 (*over weight)*	2	8,7
Total		23	100

At the pretest the sample had a static balance in the fair category of 1 person (4.3%), the poor category was 13 people (56.5%) and the very poor category was 9 people (39.1%). In the post-test, the sample that had a level of static balance in the very good category was 2 people (8.7%), the fair category was 11 people (47.8%), and the poor category was 10 people (43.5%). The results showed that there was a change in the level of static balance between before and after giving a single leg exercsise 15 times. So it can be concluded that there is an effect of single leg exercise on the level of static balance in members of basketball extracurricular.

Table 2. Distribution of Research Samples based on Static Balance Levels

Category	*Pre-test*		*Post-test*	
	N	**%**	**N**	**%**
Very good	0	0	2	8.7
Good	0	0	0	0
Fair	1	4.3	11	47.8
Poor	13	56.5	10	43.5
Very poor	9	39.1	0	0
Total	23	100	23	100

At the pretest, the sample that had a dynamic balance level in the fair category was 9 people (39.1%), the poor category was 12 people (52.2%) and the very poor category was 2 people (8.7%). In the post-test, the sample that had a level of dynamic balance in the very good category was 11 people (47.8%), the category of food was 10 people (43.5%), and the fair category was 2 people (8.7%). The results showed that there was a change in the level of dynamic balance between before and after giving a single leg exercsise 15 times. So that it

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Table 3. Distribution of Research Samples based on Dynamic Balance Levels

Category	*Pre-test*		*Post-test*	
	N	%	N	%
Vey Good	0	0	11	47.8
Good	0	0	10	43.5
Fair	9	39.1	2	8.7
Poor	12	52.2	0	0
Very Poor	2	8.7	0	0
Total	23	100	23	100

Table 4. Effect of Single Leg Exercise on Static Balance Levels

		N	Min	Median	Max	P*
Static Balance	*Pretest*	23	1	4	15	0,000
	Posttest	23	3	10	67	

Table 5. Effect of Single Leg Exercise on Dynamic Balance Levels

		N	Mean	SD	P*
Dynamic Balance	*Pretest*	23	4,91	2,275	0,000
	Posttest	23	15,91	4,451	

IV. DISCUSSION

Balance is influenced by several factors, namely age, gender, physical activity, and body mass index. In addition, factors such as vestibular disorders, visual disturbances, proprioceptive disorders, and weakness of leg muscles also affect balance. The research sample did not experience these disorders so that it did not affect the level of balance during the single leg exercise given.

From the results of the study it can be concluded that there is an effect of single leg exercise on the level of balance both static and dynamic in members of basketball extracurricular for 15 treatments (3 times a week). The results of this study are in accordance with previous studies conducted by Lee and Kuang (2016) stating that there was an increase in static and dynamic balance and a reduced risk of ankle sprain in basketball players for four weeks following specific balance traning exercises, where the training consisted of a combination of single leg stance training, single leg swing, single leg squats, and tandem stance. Other studies also show that proprioceptive exercise is effective in improving dynamic balance, with a percentage increase of 58% over six weeks of training[5].

Single leg exercise can increase motor unit recruitment so that it activates the organ tendon Golgi and improves coordination of intrafusal fibers and extrafusal nerve fibers with the efferent nerve in muscle spindles thereby enhancing proprioceptive function. Propioceptor contained in the muscles, tendons, and joints in the form of peripheral sensory will capture stimuli that come from a movement that can be in the form of pressure, stretch, muscle length, and muscle tension[10].

These sensory stimuli will be combined with visual and vestibular interactions, thus forming a sensory input. Sensory input received in intra and extrafusal fibers will increase motor gamma activity, causing an increase in sensitivity of muscle spindles, which will increase "readiness" or muscle readiness, in addition proprioceptive input will also increase representation of joints as a form of "sense of joint" to respond to changes in force that occur while moving[10].

In this study the administration of single leg exercise doses was in accordance with the principle of exercise that is overload and progressive where the exercise is carried out increasing repetitions every week and eliminating visual factors. Visual factors are one of the sensory inputs needed to form a balance, so that when these factors are removed the body will be more difficult to maintain balance because sensory input is only from vestibular and somatosensory (tactile and proprioceptive). This will stimulate so that the information from proprioceptive is increased, it will increase the activity of the unit motor reciters which will activate golgi tendons and in muscle spindles so that it can improve proprioceptive information[5].

When doing a single leg exercise, this can lead to muscle contraction in the hip, knee, ankle and core muscles, because all parts of the body are connected to each other from the distal area to proximal, both directly and indirectly. When the muscle is contracting, the synthesis of muscle contractile proteins takes place much faster than the destroyer resulting in more active actin and myosin filaments in myofibrils[11]. Then the miofibrils will break down in each muscle fiber to form new miofibrils. Increased myofibrils will cause muscle fibers to become hypertrophy. In hypertrophic muscle fibers there is an increase in the phosphagen metabolic system components, including ATP and phosphokeratin. This results in an increase in the ability of aerobic and anaerobic metabolic systems which can increase energy and muscle strength[12].

Single leg exercise is one of the exercises that uses the principle of narrowing BOS, which is standing on one leg. The legs or sides of the body that are used as pedestal will increase anticipatory postural adjustments to strengthen postural muscles that are used in maintaining dynamic balance[13]. Increased activation of limb muscles to form stability in the limbs as a support increases the strength of hip and pelvic extensor muscles. Muscle strength is directly related to the ability of the muscles to fight gravity and other external burdens that continuously affect body position [14].

The other thing is the relationship between balance and core strength of the core. Core muscles are responsible for maintaining stability of the spine and pelvis. Good stability of the spine that allows COG not to shift and move from its place[15]. Core muscle strength will maintain spinal alignment in accordance with the symmetry and becomes more stable whose main function generates APAS. APAs create proximal stabilization for distal mobilization which makes it easier for the body to move effectively and efficiently [14].

Based on the results of the research conducted, there is the effect of single leg exercise on the level of static balance and dynamic balance. Exercises that aim to increase the ability of static balance must focus on the alignment of the balance's biomechanical component itself, which means controlling the body against the center of mass, the center of gravity and the base of support, with how to maintain the position of the exercise by standing static either on one leg or both, accompanied by changes in the fulcrum, or by involving visual factors. Whereas the exercises aimed at increasing dynamic balance must prioritize components in terms of muscle ability, which requires trained muscle contractions, because in the dynamic balance the contribution of needed muscles is greater and proprioceptive input to changes in body position must be more than static balance[16]

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