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The development of educability motor-based warming model for long jump sports

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Abstract*:* Stretching and warming up are crucial in every training session or competition in long jump athletics. This study was aimed at developing a warm-up model based on motor educability for the long jump sport. This research is a type of development with a research model procedure using Borg & Gall's five steps of the adaptation of the IOWA Brace Test to motor educability. The samples used in this research were media experts and material experts, each consisting of one person. For small group trials, there were 9 (nine) students from the Sports Science Study Program and for large group trials, there were 39 (thirty-nine) students from the Sports Coaching Education Study Program who took athletics courses. The instruments used were the 11 IOWA Brace Test motor educability items and the Standing Broad Jump test to examine effectiveness using the paired sample t test. As a result, in the expert validation step, revision, the design product has been declared feasible by the expert as well as during large and small group trials. The effectiveness test also revealed that there was a significant difference in the mean of paired samples. The results of this development also recommend several movements, namely: side learning rest, one knee balance, stroke stand, double heel kick, hop forward, forward hand kick, half squat-arm circle, side kick, russian dance, single squat balance, and jump foot. The conclusion is that of the eleven movements it is feasible to use in warm-up for the long jump sport. Future research needs to examine how this model supports athletes in improving physical fitness components.

Keywords: development; warm up; motor educability; long jump

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INTRODUCTION

Warming up and stretching is a crucial movement before people do sports. The importance of warming up and stretching is not only to reduce the risk of injury, namely to mentally prepare a person for sports or physical training (Handoko et al., 2019; Nurcahyo, 2015; Nurkadri, 2017; Permana et al., 2018). Warming up and stretching should not be underestimated; this is because most of people tend to miss warming up and stretching. As the result, there are many injuries that can even have serious consequences (González-Devesa et al., 2023; Khan et al., 2023; Liu et al., 2012; Som et al., 2022; Zhao et al., 2022), including sports in the long jump (Bigouette et al., 2018; Enoki et al., 2021; Lundberg Zachrisson et al., 2021). In fact, in the case of athletics, among athletes aged 7-15 years, 54% of athletes experienced injuries, one of which, 30%, was caused by inadequate warm-up (Seyedahmadi et al., 2023). Therefore, it is very necessary to warm up and stretch because this sport requires leg muscle explosive power in its application.

Long jump is an athletic sport that requires running speed, explosive power in the leg muscles and balance (Anwar et al., 2020; Haryanto & Fataha, 2021; Hasbunallah, 2018; Ismadraga & Lumintuarso, 2015; Syarif, 2017). This sport is often contested and even taught into compulsory lecture material for sports students. This type of sport emphasizes the lower extremity muscles as the front axis in achieving the farthest jump. Broadly speaking, there are three stages namely running, jumping, and landing.

Long jump athletics is a branch of athletics that involves competition in jumping as far as possible from a specified starting point (Başkaya et al., 2023; Cronin et al., 2023; El-Ashker et al., 2019; Ganse et al., 2021; Syarif, 2017; Taha & Roach, 2023). Here, the athlete runs towards the jump point at maximum speed, then performs a series of complex technical movements to jump as far forward as possible.

Previous research with the title of developing a warm-up model based on motorbike educability has been carried out, but this research was limited to research carried out in the Futsal sport branch (Gultom, 2021). Of course, this is a differentiator from the research that will be carried out, because of the different sports, namely long jump athletics. There are many advantages that can be obtained with this method, namely efficiency in motor learning, emphasis on technique, increased brain-body responsiveness, increased learning experience, adaptation to individual needs, and most importantly injury prevention (Edouard et al., 2023; Gultom, 2021). This is the reason that research into the development of a warm-up model based on motor educability for the long jump sport is considered very important to research.

The results of initial observations held by researchers specializing in athletics show that this sport are very prone to injury. This can be attributed to several factors, namely: facilities and infrastructure, wrong techniques, even warming up and stretching that are not quite optimal. The researcher then focused on the third problem, namely heating and stretching that were not optimal. This is based on several problems, namely the problem of incorrectly warming up and stretching the dominant muscles, the problem of often not being serious in warming up and stretching, then the problem of warm-up and stretching techniques that are not varied, which only warm up jogging and also static. To find out whether a warm-up model based on motor educability is effective in improving motor educability skills in futsal players. This hypothesis test calculation uses the help of IBM SPSS Statistics ver.26.0 for Windows.

METHODS

This study type was research and development. The results of this development were in the form of a Motor Educability-based warm-up manual adapted from the IOWA Brace Test motor educability (Gultom, 2021) which consists of 21 items, for the long jump developed in this research using 11 items, as follows: Side learning rest, One knee balance, Stroke stand, Double heel kick, Hop backwards, Forward hand kick, Full squat-arm circle, Side kick, Russian dance, Single squat balance, Jump foot

This development used was a research model procedure using five steps, namely: preliminary study, expert validation, revision, product design, and effectiveness testing. The research instrument was using a questionnaire and also a test. Expert validation used two validators, namely material experts and media experts, while the small group test and large group test as well as effectiveness test subjects were sports students in Gorontalo Province using a purposive sampling technique with the criteria: male, sports student, active student who wanted to be a research subject. The small group trial was obtained by nine students from the Sports Science Study Program and the large group trial was from students from the Sports Coaching Education Study Program totaling 39 (thirty nine) students taking athletics courses. The questionnaire instrument was adapted from previous research in developing a warm-up model based on motor educability (see table 1-2).

Table 1. Expert Instrument Grid

No	Aspect Rated Choice
1.	Book size
2.	Book thickness
3.	Paper material
4.	Size of the image in the content
5.	Arrangement of images in the content
6.	Size of the image on the cover
7.	Size of the text on the content
8.	Arrangement of the writing on the cover
9.	Arrangement of writing in the content
10.	Book cover color
11.	Color in the content
12.	Color in the picture

Table 2. Grid of Trainer and Student Assessment Instruments

No	Statement
1.	Book size
2.	The thickness of the book
3.	Paper material
4.	Image size
5.	Image arrangement
6.	Writing size
7.	Arrangement of writing
8.	Color on the book
9.	Books attract attention
10.	Books are easy to understand
11.	Exercise is fun

The data analysis techniques in this development were quantitative descriptive analysis and qualitative descriptive analysis. Analysis of product eligibility criteria, using the norms on table 3. Once it is declared feasible, it would be tested using a t-test to determine the effectiveness of this development using SPSS which uses the Standing Broad Jump instrument to measure the distance of horizontal muscle explosive power.

Table 3. Eligibility Criteria Norms

No	Percentage (%)	Score	Category
1	81%-100%	A	Very Good
2	61%-80%	B	Good
3	41%-60%	C	Fairly Good
4	21%-40%	D	Not Good
5	0%-20%	E	Not Feasible

RESULT AND DISCUSSION

Results

According to the first stage in this development research, a preliminary study. Researchers found that when it comes to warming up for athletic training and lectures in long jump numbers, they tend to use a running warm-up, dynamic static stretching, or using the dynamic warming up method. There is nothing wrong with that, but in the science of coaching itself, the parties involved should use the principle of variation in the use of their methods. The researchers decided to modify the motor educability concept which could be used as a warm-up for the long jump sport. So, it was decided that 11 items out of 21 items were suitable for development, consisting of side learning rest, one knee balance, stroke stand, double heel kick, hop backwards, forward hand kick, full squat-arm circle, side kick, russian dance, single squat balance, jump foot. The other 10 items consist of one foot-touch head, grapevine, cross - leg squat, full left turn, one knee – head to floor, half - turn jump – left, three dips, knee, jump to feet, full right turn. The top was not used in development procedures for several reasons. For example, one foot-touch head, this movement is oriented towards stretching the waist and the same muscle endurance as the movement in the side learning rest. Likewise with Grapevine, as another example, the movements and the dominant muscles used are almost the same.

In the validation phase, media expert employed to validate material aspect in its application. After being validated by material experts, the validation result was calculated and was declared very feasible with a total of 87.5%. Media experts' validation result also calculated and showed that the results were very feasible with a total of 83.3%. The results obtained that the application was not need any revision. Thus, the results of these experts could be used as a basis for the group trial. The results of a small group trial consisting of nine subjects showed that there were 80.1% scores which could be concluded that the development of this warm-up was good/ feasible. The results of the small group trial are showed in Table 4.

Table 4. Small Scale Trials

No	Aspect Category	Score	Max Score	%	Category
1.	Book size	28	36	78	Good
2.	The thickness of the book	28	36	78	Good
3.	Paper material	27	36	75	Good
4.	Image size	29	36	81	Very Good
5.	Image arrangement	27	36	75	Good
6.	Writing size	32	36	89	Very Good
7.	Arrangement of writing	29	36	81	Very Good
8.	Color on the book	27	36	75	Good
9.	Books attract attention	28	36	78	Good
10.	Books are easy to understand	27	36	75	Good
11.	Exercise is fun	35	36	97	Very Good
	Total	317	296	80.1	Good

The results of a large group trial consisting of thirty subjects showed that there were 77.6% scores which could be concluded that the development of this warm-up was good/ feasible. The results of the large group trial are showed in table 5.

Table 5. Large Scale Trials

No	Aspect Category	Score	Max Score	%	Category
1.	Book size	99	120	82.5	Very Good
2.	The thickness of the book	87	120	72.5	Good
3.	Paper material	92	120	76.7	Good
4.	Image size	93	120	77.5	Good
5.	Image arrangement	89	120	74.2	Good
6.	Writing size	95	120	79.2	Good
7.	Arrangement of writing	98	120	81.7	Very Good
8.	Color on the book	85	120	71	Good
9.	Books attract attention	92	120	76.7	Good
10.	Books are easy to understand	88	120	73.3	Good
11.	Exercise is fun	106	120	88.3	Very Good
	Total	1024	1320	77.6	Good

As for the trials, it is known that this development is declared good/feasible. Thus, it is necessary to test the effectiveness conducted by 39 subjects. This effectiveness test is carried out using a standing board instrument whose movement is the same as the long jump. The descriptive statistics of the effectiveness test are showed in table 6.

Table 6. Descriptive statistics

	Before	After
N	39	39
Minimum	2.0	2.2
Maximum	3.0	3.9
Mean	2.479	3.054
Std. Deviation	0.2993	0.4729

This study used was a paired sample t test in testing product effectiveness. Then the main requirement in this test is the normality test. The normality test was carried out with SPSS version 25 which found that the value of Sig 0.124 > 0.05 so that it can be concluded that it is normal. After that, a paired sample t test was carried out. Based on the paired sample t test it is known that the value of Sig. 0.000 < 0.05, which indicates that it exists differences in paired sample means with significant differences.

Discussion

One of the principles in training is the principle of variation. A previous research revealed that the principle of good exercise variation will be able to produce good movements, this is because motor coordination in general is very important for all sports, even body posture balance will be formed along with the variety of exercises given to a person (Olajos et al., 2020; Zemková, 2022). Likewise, with warming up during training, to maximize warm-up during training so that it runs efficiently, it is also necessary to apply the principle of variation. Side learning rest is a movement that uses one arm with the support at an angle, then the leg at a straight angle. Previous research revealed that one form of static exercise would be dynamic balance for muscle strength and dynamic balance increased by 33% –35% and 1.5% (Lee et al., 2018). This exercise is an exercise with static movements that can be used as a warm-up. The muscles that contract include the flexor carpi, trapezius, lastimus dorsi, external oblique, quadriceps, peroneus longus, tibialis and extensor digitorum longus. This will of course better prepare you for long jump practice. This movement can be applied for five counts on the right side and also five times on the left side.

One knee balance is almost the same as the Side learning rest movement which is a static movement, but this movement also requires balance so you don't fall easily. This movement is the same as the airplane posture in the basic sport of gymnastics. It is also different from the Stroke stand movement which only stands upright on one leg to balance the body. However, specifically for this development, it is not balance that needs to be emphasized, but rather the performance of the trapezius muscles and also the entire leg muscles. Previous research has revealed that balance training applied during warm-up will reduce the risk of injury to the lower extremities (Han et al., 2015). This is suitable for warming up and stretching for long jump athletes because it really emphasizes lower extremity power. This warm-up can be done alternately using the right foot as support and then changing to the left foot as support in a matter of five seconds each.

Double heel kick, hop backward, and forward hand kick, have the characteristics of using explosive leg power. The double heel kick maximizes its use to maximize power or kick upwards with a minimum of two claps on the soles of the feet. Hop backwards is modified to hop forward so that the movement is not backwards, but forwards. Foreyard hand kick uses both feet to kick the palms of the hands. These three types of heating allow users to maximize heating for the lower extremities. This type of movement includes plyometric which can also be an effort by coaches to prepare athletes to perform explosive lower extremity movements (Amrizal & Siska, 2020; Budhiarta, 2015; Hammami et al., 2022; Kumar et al., 2023). This movement can be held by repeating five times in each set. Full squat-arm circle is a type of squat development that also combines elements of balance in it. In this development, the half squat-arm circle movement is carried out. This is done to make the lower extremity muscles strong. Movements like this in previous studies have proven to be beneficial in strengthening the leg muscles, especially the quadriceps femoris, glutemus maximus and tibialis anterior (Freiberger et al., 2023; Lindberg et al., 2023; Papla et al., 2023). This movement can be done in four turns from right to left each.

Side kick has almost the same movement as a double heel kick. This movement allows the user to kick sideways with the body tilted to the right or left. Previous research revealed that exercises such as jumping rope which are related to this movement development will influence effectiveness in horizontal jumping (Makaruk, 2013). Even if done quickly, it can also affect running speed by up to 10-30 seconds (Roepadjadi et al., 2019). This warm-up is significantly useful because the long jump also requires maximum acceleration before starting the jumping process. Do this movement four times each from the right side to the left. Russian dance and Single squat balance are purely for the balance process. This is because in this movement not many muscles contract. Good balance will reduce a person's risk of injury (Anjasmara et al., 2021; Dewi & Palgunadi, 2021). This is absolutely important to have who wants to do the long jump. The landing stage after the jumping stage allows a person to fall not in a favorable position. By practicing balance, a person will of course have a small risk of injury when landing.

This jump foot if done carelessly will actually cause injury. However, in this development, the jump foot warm-up is carried out with the foot used as a support barrier replaced with another object such as a broom or rope. However, the essence of this jump foot is still using one foot as the foundation for the jump. This movement is almost the same as a squat jump or skipping jump, but uses one leg and the other leg, especially the knee, is attached to the body. Exercises like this are proven to increase the

explosive power of the leg muscles (Wiratama, 2021). This warm-up can be held with four repetitions for one set.

Opportunities for further research are very open, especially regarding the effectiveness of this warm-up model in reducing the risk of injury or can even be used as a model for increasing physical fitness components such as muscle strength and endurance, respiratory-cardiovascular endurance, muscle power, flexibility, speed, agility, coordination, balance, and accuracy. Just adjust it to the needs of the repetitions and sets that will be used.

CONCLUSSION

This development can be concluded to have met the appropriate criteria after a series of expert tests and trials which were also added with effectiveness tests in accordance with the objectives of this development research. However, it still requires caution for those who will take advantage of this development. This research can also be used by coaches who want to apply the principle of variation in training. Furthermore, researchers recommend that this warm-up be done sequentially to get maximum results with supervision and also done in the right place to avoid injury. The researcher also recommends that further research be used to try out this method in other sports to create a variety of warm-up variations for the trainer's choice.

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