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Development of an External Load Physical Training Model to Increase Strength in Shotokan Karate

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Abstract: *This research aims to determine the effect of the developed external load physical training model on efforts to increase strength in the sport of shotokan karate. The participants in this study were 20 shotokan karate athletes and students at Universitas Negeri Makassar. This research was conducted on the Universitas Negeri Makassar campus for three months. The research design used was research and development (R & D) with a purposive sampling technique. We also conducted experiments to measure the effectiveness of the external weight training model we developed. Participants were given treatment in ten meetings. To measure the level of improvement in the treatment given, we conducted a pre-test and post-test in the experimental group. The results showed that the external load physical training model proved effective in increasing strength in shotokan karate athletes. Of course, after going through the revision stages to perfect the training model. Therefore, we recommend that future researchers re-test the effectiveness of the external load physical training model that we developed with other research methods to test the validity and reliability of this training model.*
Key Words: *External weights, Karate shotokan, Model training.*

Introduction

One of the sports that improves and maintains balanced physical and spiritual growth and then develops rapidly in Indonesia is the sport of karate. This is because the sport of karate not only focuses on the physical but also the spiritual to form a balanced mental and psychological state. In general, people understand that martial arts, apart from sport, is also a way that can be used to respond and anticipate enemy attacks. Understanding self-defense is very important in avoiding and preventing the risk of harm from physical attacks that attack suddenly and can occur at any time. The sport of karate is a martial art that is used by a person to defend themselves without using sharp and deadly tools or objects. Chaabène et al. (2012) revealed that karate athletes need an optimal combination of muscle strength, speed and endurance to be able to compete in high-level championships. This is in line with a study conducted by Wahyudi et al (2019) which explains that karate martial arts is indeed a type of sport that does not use weapons. The word karate martial arts uses all parts of the body as natural weapons that are effective and powerful, and practical, such as hands, knees. , feet and so on.

Historically, the sport of karate as a martial art is known to have been born in the 19th century, with Matsumara Shukon (1797-1896), a samurai warrior and protector of King Sokookinawa. In the sport of karate there are very systematic and well-patterned regularities relating to the rules of ethical-aesthetic values in social life. Susanto (2021) suggests that there are three regularities that must be distinguished in people's lives, the first is the natural order, the order of social life in society, and the order of technological engineering. Likewise, in the sport of karate, order and discipline are absolute. The sport of karate is a cultural heritage from Far East Asia that is very close to Indonesian society. So that in the sport of karate we are empirically confronted with two facts, namely the first is the reality about form, whether it is an object or creature, and the second is the reality about the soul or spirit. These two facts unite the character of the sport of karate, namely the combination of body and soul in martial arts.

These basic karate movements require consistent and well-planned practice to form a physique that supports training activities for several things such as mental formation, sporting values, and the value of martial arts itself. One thing that is no less important than the sport of karate which has become a culture is the implementation of evaluations in all dimensions, both physical, mental and technical. This evaluation activity is exactly the same as expressed

by (Nusufi Maimun, Rinaldy Alfian, 2019) who said that physical condition for karateka is something that is absolute and must be possessed by a katareka, even including in other sports, physical condition is the basic foundation in efforts to perfect karate movement techniques to achieve sustainable peak performance, so that every athlete has an obligation to improve their prime physical condition. Soriano, Jiménez-Reyes, Rhea, and Marín (2015) showed that the use of external loads with appropriate intensity can maximize power production in lower body movements, which is very relevant in the discipline of karate.

One component of physical condition that is very important for a karate athlete is strength. Strength is a very meaningful word, especially in the world of sports. Where strength has very important uses, including helping to strengthen the stability of joints, the driving force of every physical activity and strength plays a role in protecting against the possibility of injury (Harsono, 2016). Physical aspects function as a driver or director of athlete performance, such as strength when performing punches or kicks. Every basic karate technique requires strength to support the movement. Apart from strength, no less important is endurance, this endurance can be obtained through regular training and modifying various kinds of physical activities (Susanto et al., 2021), (Susanto et al., 2024). Variation of exercise with various forms of physical games can also help in physical fitness (Susanto et al., 2022).

The training method to increase strength is with an external load physical training model. This training medium with added weights is considered very effective. Weight training can be done on muscles that have special functionality or are specific to movement needs. Behm et al. (2017) explained that strength training with a progressive and biomechanics-based approach can improve athlete performance without increasing the risk of overtraining. If we talk about weight training given to athletes, of course there will be positive and negative impacts. If the load and training program are given effectively and efficiently, it will be very beneficial for the athlete's muscle strength, however, if the load given is inappropriate and not based on a clear theory, it will cause a very fatal impact on the athlete, namely overuse injuries. As stated (Sidik, 2019. pp: 49-51) that if the training is too light, the level of fatigue is low, the recovery time is short and the effect of the training is small and too early, but if the training is too heavy then the level of fatigue is high requiring a long recovery so the effect exercise is low and new stimulus becomes late. If training is given adequately (appropriately) according to needs and portions, there will be a good training effect. Therefore, the author wants to elaborate on a training model that uses external loads to increase strength in the sport of Shotokan karate.

Literature Review

The essence of the basic movements of Shotokan Karate

Karate is an empty-handed martial art that is rich in basic movements or basic techniques and makes all body components into deadly weapons. The basic techniques of karate are kihon, kata, and committee kihon. Kumashiro (2004) explains in his book, Karate-Do: My Way of Life, that basic techniques in karate such as kihon, kata, and waza are not only to increase physical strength, but also to form deep mental control and concentration. Kihon dachi waza or basic stance techniques include haiko dachi, musubi dachi, hachinoci dachi, uchi hacinochi dachi, haiko dachi, teiji dachi, renoji dachi, zenkutsu dachi, kokutsu dachi, kiba dachi, sanchin dachi, shocin dachi, hangetsu dachi, shiko dachi, sagi ashi dachi, neko ashi dachi, tsuru ashi dachi, fudo dachi, and kosa dachi. The things that are mandatory and dominant in practice are haiku dachi, musubi dachi, hachinoci dachi, haiko dachi, zenkutsu dachi, kokutsu dachi. Then kihon uke or parrying techniques include gedan barai, ude uke, uchi uke, age uke, and shuto uke. Next are the tsuki techniques, namely cudan tsuki, yodan tsuki, geaku tsuki, kisame tsuki, uraken tsuki, ura tsuki, and mawashi tsuki.

Types of Basic Movements required in Shotokan Karate

1. Parry movements include: gedan barai, age uke, uchi uke, ude uke, shuto uke.
2. Tzuki punching movements include: chudan tzuki, jodan tzuki, geaku tzuki, qhisami tzuki.
3. Kick movements include: maegeri cudang, maegeri jodan, mawashi geri, kekomi geri, keange geri, ushiro geri.

External Load Physical Training Model in Shotokan Karate

In various literature, physical condition in each sport is a primary aspect that is mandatory to support training activities in sports. according to (Wibisana et al., 2016) that for every athlete who is coached in a sport, physical

condition is absolute, because to achieve maximum performance for every athlete the physical condition must be good. Maifitri (2012) emphasized that four components are considered to support the achievements of karate athletes, including physical elements, technical elements, tactical elements and mental elements. Nakayama (1978) explains that karate training not only focuses on improving physical skills, but also involves character building and discipline. However, the first thing that coaches must pay attention to is the physical element, because physicality is the basic foundation in order to achieve maximum breakthrough.

Therefore, physical and technical are a complete unity of all basic components and cannot be separated in an effort to achieve sustainable achievements for every athlete in a sport. The physical training model in question is the model or form of physical training that will be applied in the research, namely the external weight training model. External load is a physical training method that utilizes additional load outside of body weight, such as machine weight training which is used with certain movement patterns to develop and improve the physical elements in sports.

Strength Aspects of Basic Shotokan Karate Movements

Karate is also known as part of the sports achievements that are recognized and competed in Indonesia. Therefore, karate can be said to be a self-defense martial art with its own method of utilizing body parts as weapons which are trained naturally in accordance with eastern cultural values. To achieve achievements as indoctrinated in the traditional karate rituals at the opening and closing ceremonies of training, namely being able to increase performance, the physical components must continue to be studied. The aim is to accelerate physical and technical aspects as very basic factors in order to produce good quality movement techniques and character.

The physical elements in the sport of karate martial arts (Asnaldi, 2015) are: "strength, speed, agility, power, coordination, reaction time, and flexibility, as well as endurance. This research will focus on the physical elements of strength, because the physical elements of strength play a very important role for elite karate athletes to perform optimally.

Method

This study uses research methods to develop a shotokan training model. This research emphasizes efforts to produce something, test it in the field, revise it until the results obtained are certain to be satisfactory. Development research always begins with a needs analysis, a problem that requires solving using a particular product. The development model used by researchers is the Borg and Gall (2017) research and development model.

Development Procedure

The steps are: a). Information gathering, b) planning, c). Product draft development, d). Initial field trials, e) revision of trial results, f). Field trials, g). Product refinement and revision, h). Field implementation test, i). Product refinement and final revision, j). Dissemination. The research design developed in the research is the development of an external load physical training model to increase strength in the Shotokan karate sport. The steps taken in this trial include; (1) determine the research subject group; (2) carry out the pre-test (O1); (3) try the model that has been developed; (4) carry out post-test (O2); (5) look for the average score of the pre-test and post-test and compare the two; (6) look for the difference between the two averages using statistical methods (t-test) to determine whether there is a significant effect from using the training model. The research subjects in this study were karate athletes who were divided into 20 people.

Data Collection

The data collection method for needs analysis uses interviews with shotokan karate athletes to distribute surveys to research participants. Data collection techniques for efficacy testing use quantitative experimental methods. The instrument used is a Likert Scale: (1) very unsuitable, (2) not suitable, (3) quite suitable, (4) suitable, (5) very suitable, while the instrument for the ability to perform basic Shotokan karate techniques points is calculated from the total valid value. Including to measure the level of strength when performing basic Shotokan techniques.

Data Analysis

The effectiveness test used was an experiment with a one group pretest-posttest research design. Hypothesis

testing using the nonparametric Wilcoxon test compares the pretest and posttest results of paired groups. Then the collected data was analyzed using the SPSS version 21 application.

Result

The research was conducted for three months and found empirical data in the form of the influence of external load physical training models to increase strength in Shotokan karate athletes. The following is a summary of the analysis of the influence of the external load physical training model that has been developed.

Descriptive Statistics

Table 1. *Data on physical training with external loads to increase strength in Shotokan karate*

	N	Range	Minimum	Maximum	Sum	Mean	Std. Deviation
Pre Test Arm Muscle Strength	20	17.50	29.50	47.00	778.50	38.9250	4.12079
Pre Test Leg Muscle Strength	20	77.00	154.00	231.00	3668.50	1.83422	28.18747
Post Tes Arm Muscle Strength	20	7.50	41.00	48.50	876.00	43.8000	2.30788
Post Test Leg Muscle Strength	20	49.00	181.00	230.00	4049.50	2.02482	18.01715
Pre Test Control Group Arm Muscle Strength	20	9.50	19.00	28.50	470.50	23.5250	3.25445
Pre Test Control Group Leg Muscle Strength	20	50.00	104.00	154.00	2764.00	1.38202	14.31084
Post Test Control Group Arm Muscle Strength	20	14.00	21.50	35.50	522.50	26.1250	5.16026
Post Test Control Group Leg Muscle Strength	20	42.50	113.00	155.50	2856.00	1.42802	12.53248

From table 1, the data obtained on the influence of external load physical training to increase strength in the sport of shotokan karate are as follows:

1. For the Pre Test data on Arm Muscle Strength, the N value was 20, range 17.50, minimum 29.50, maximum 47.00, Sum 778.50, mean 38.9250, Standard Deviation 4.224.
2. For the Pre Test data on leg muscle strength, the N value was 20, range 77.00, minimum 154.00, maximum 231.00, Sum 3668.50, mean 1.83422, Standard Deviation 28.18747.
3. For Post Test data on Arm Muscle Strength, the N value was 20, range 7.50, minimum 41.00, maximum 48.50, Sum 876.00, mean 43.8000, Standard Deviation 2.30788.
4. For Post Test data on leg muscle strength, the N value was 20, range 49.00, minimum 181.00, maximum 230.00, Sum 4049.50, mean 2.02482, Standard Deviation 18.01715
5. For the Control Group Arm Muscle Strength Pre Test data, the N value was 20, range 9.50, minimum 19.00, maximum 28.50, Sum 470.50, mean 23.5250, Standard Deviation 3.25445.
6. For the Pre Test data on leg muscle strength for the control group, the N value was 20, range 50.00, minimum 104.00, maximum 154.00, Sum 2764.00, mean 1.18202, Standard Deviation 14.31084.
7. For the control group Arm Muscle Strength Post Test data, the N value was 20, range 14.00, minimum 21.50, maximum 35.50, Sum 522.50, mean 26.1250, Standard Deviation 5.16026.
8. For post test data on leg muscle strength for the control group, the N value was 20, range 42.50, minimum 113.00, maximum 155.50, Sum 2856.00, mean 1.42802, standard deviation 12.53248.

Table 2. *T test data External load physical training to increase strength in the Shotokan karate sport*

Variabel		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre Test Arm Muscle Strength	38.9250	20	4.12079	.92144
	Post Tes Arm Muscle Strength	43.8000	20	2.30788	.51606
Pair 2	Pre Test Leg Muscle Strength	1.83422	20	28.18747	6.30291
	Post Test Leg Muscle Strength	2.02482	20	18.01715	4.02876
Pair 3	Pre Test Control Group Arm Muscle Strength	23.5250	20	3.25445	.72772
	Post Test Control Group Arm Muscle Strength	26.1250	20	5.16026	1.15387
Pair 4	Pre Test Control Group Leg Muscle Strength	1.38202	20	14.31084	3.20000
	Post Test Control Group Leg Muscle Strength	1.42802	20	12.53248	2.80235

Based on table 2 above, it can be seen that the T test results of the external load physical training data variables to increase strength in the Shotokan karate sport are as follows:

1. Pre test data on arm muscle strength obtained an N value (sample) of 20 people, the mean pre test value for arm muscle strength was 38.9250 and the post test value for arm muscle strength was 43.8000, with a sig value of 0.000. and obtained a difference of 48,750. So this difference is an influence or improvement in the external load physical training program to increase strength in the sport of shotokan karate.
2. Pre-test data on leg muscle strength obtained an N value (sample) from 20 people, the mean pre-test value for leg muscle strength was 1.83422 and the post-test value for leg muscle strength was 2.02482, with a sig value of 0.000. and obtained a difference of 19,060. So this difference is an influence or improvement in the external load physical training program to increase strength in the sport of shotokan karate.
3. Pre test data on control arm muscle strength obtained an N value (sample) of 20 people, the mean pre test arm muscle strength value was 23.5250 and the post control arm muscle strength test value was 26.1250, with a sig value of 0.000. and obtained a difference of 26,000. So this difference becomes an influence or increased control in the external load physical training program to increase strength in the sport of shotokan karate.
4. Pre test data on muscle strength of the control leg obtained an N value (sample) of 20 people, the mean pre test value of leg muscle strength was 1.38202 and the post test value of muscle strength of the control leg was 1.42802, with a sig value of 0.000. and obtained a difference of 4,600. So this difference becomes an influence or increased control in the external load physical training program to increase strength in the sport of shotokan karate.

Discussion

This research began by taking pretest data, this was done to describe the initial condition of the sample before being given treatment in the form of an external load physical training program to increase strength in the sport of shotokan karate. For the data collection process, the author measured arm and leg muscle strength tests, this was done to place greater emphasis on the objectivity of the research results. In this study, the sample consisted of 20 shotokan karate athletes from South Sulawesi Province.

Based on data from previous research, it shows that there has been an escalation. This study also uses the interview method to validate research results in the form of quantitative data. The purpose of holding interviews is to find out in depth each process carried out during the treatment provided. At the first and second meetings, several athletes still seemed unfamiliar with following the external load physical training program to increase strength in the sport of shotokan karate. This is in accordance with what the sample said.

This special strength training program is something new that I discovered, but it is very good for increasing strength in karate because it is very detailed. Sample #1, in-depth interview, January 17, 2023).

The findings are in line with the theory explained by Haff and Triplett (2016), which states that strength training that focuses on developing large muscles through external loads can increase athlete strength and power. From our observations, it was found that at the fourth meeting the athletes had started to get used to it and the author provided knowledge on how to quickly adapt to the strength training program in the karate training session. The author also observed athletes who followed this training program to check whether it was correct or not. This is done because there are three aims of experimental research, namely changing conditions, changing thought patterns and changing behavior. However, in this study the author only took data on the aspect of changing conditions, which in the context of this research is strength. For the other two aspects, the author still focuses on providing knowledge of the biomechanics of strength and informing you that when you want to improve your karate performance skills you can use this type of training program. This is in line with the training principle put forward by Bompa and Buzzichelli (2019) that training is a systematic sports activity over a long period of time, increased progressively and individually which leads to the characteristics of human psychological and physiological functions to achieve specified targets.

At the fifth meeting, progress began to be seen, therefore the author took the initiative to carry out the posttest again and it turned out that the results had improved. This can be seen from the movement patterns displayed by athletes, the strength when performing basic karate techniques when playing. In this case, the posttest is to measure the escalation caused by the treatment given. The author synthesizes that there has been an increase, although it is still in the not significant category. Therefore, the author continued the treatment given until the improvement was

considered statistically significant.

At the sixth meeting, the athletes were very used to and felt comfortable doing a special training program that emphasized the strength of each movement. This is illustrated from the results of interviews with the following samples:

I have become accustomed to doing this exercise, and I also feel the positive impact directly. When playing I feel my movements increase or have power (Sample #3, in-depth interview, January 23 2023).

From the narrative of this sample, the effectiveness of this training program is clearly illustrated. This effectiveness is because this training program specifically focuses on strength in basic karate techniques, so the sample only focuses on that aspect. This emphasizes the explanation that in principle, training is a process of change for the better, namely to improve the physical quality, functional abilities of the body's equipment and the psychological quality of the training child. When the sample's attention is not divided between other exercises, concentration and focus can be used optimally. This was also validated through interviews with the following samples:

This training program is very simple, as it focuses only on strength. I enjoyed doing this exercise because it was new to me (Sample #6, in-depth interview, January 26, 2023).

This effectiveness is not only due to the fact that the training program is very detailed and specific, the program being carried out repeatedly is also a factor in the effectiveness and efficiency of the training program. This is explained by Harsono (2016) that training can also be said to be a systematic training process that is carried out repeatedly and the amount of training load increases day by day.

The treatment in this research was carried out in eight meetings. At the eighth meeting the author found that physical training with external loads to increase strength in the sample sport of shotokan karate had developed and experienced a very significant escalation. Therefore, the treatment was stopped. Another factor that causes the training program to be able to develop basic karate skills is that the sample is motivated to do this training program because it is different from the training they usually do. Of the fifteen samples, the strength when performing basic karate movements has increased. In line with these findings, Bishop et al. (2006) explained that systematic and measured strength training, as applied in this study, can lead to significant strength increases in a relatively short period of time. It is therefore certain that a physical training program with external loads increases strength in the sport of shotokan karate.

Conclusions and Suggestions

From the conclusions of this research, recommendations will be put forward in the form of suggestions for the application and development of research results. With the title of the research, namely Development of an external load physical training program to increase strength in the sport of shotokan karate for male athletes in South Sulawesi.

Conclusion

Based on the results of the data and discussion from this research, it can be concluded that the development of an external load physical training program to increase strength in the sport of Shotokan Karate for South Sulawesi athletes obtained variable values for the influence of external load physical training to increase strength in the sport of Shotokan Karate. The pre-test for arm muscle strength obtained an N value (sample) of 20 people, the mean pre-test value for arm muscle strength was 38.9250 and the post-test value for arm muscle strength was 43.8000, with a sig value of 0.000. and obtained a difference of 48,750. So this difference is an influence or improvement in the external load physical training program to increase strength in the sport of shotokan karate and the pre-test data on leg muscle strength obtained an N value (sample) of 20 people, the mean pre-test value of leg muscle strength was 1.83422 and the post-test value for leg muscle strength was 2.02482, with a sig value of 0.000. and obtained a difference of 19,060. So this difference is an influence or improvement in the external load physical training program to increase strength in the sport of shotokan karate.

Suggestions

The recommended suggestions are as follows:

1. It is recommended that coaches and sports coaches pay attention to the training program and body structure of each prospective athlete

2. It is recommended that athletes do more individual training so that stamina and basic karate techniques are maintained so that performance can be maximized.
3. Researchers who are interested in researching strength variables are advised to look for other variables that can improve basic techniques in karate sports.

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