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Investigating the Effects of Training Length on Wrestlers' Musculoskeletal Strength

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Abstract. This study aimed to determine the relationship between the length of wrestling training on the strength of the arm muscles, leg muscles, and back muscles of wrestling athletes in the Kendal district. This study uses a survey test method conducted at SMK PP Alshariah, Kendal Regency, Central Java Province, using measurements and interviews given to wrestling athletes in Kendal Regency aged 15-20 years to obtain data. The results showed the results of the analysis using the correlation test. The correlation coefficient value of exercise duration with arm muscle strength was r count 0.527> r table 0.514, significance value/p-value was 0.043, and duration of exercise with leg muscle strength was r count 0.5647> r table 0.514. The significance value/p value is 0.009, the length of exercise with the back muscle strength is r count 0.813> r table 0.514, and the significance value/p value is 0.000 because the significance value is p<0.05.

Key words: wrestling sport, exercise, duration, muscle strength

Abstract in Indonesia. Penelitian ini bertujuan untuk mengetahui hubungan antara lamanya latihan gulat terhadap kekuatan otot lengan, otot kaki, dan otot punggung atlet gulat di kabupaten Kendal. Penelitian ini menggunakan metode uji survei yang dilakukan di SMK PP Assyafiyah, Kabupaten Kendal, Provinsi Jawa Tengah, dengan menggunakan pengukuran dan wawancara yang diberikan kepada atlet gulat di Kabupaten Kendal berusia 15-20 tahun untuk mendapatkan data. Hasil penelitian menunjukkan hasil analisis menggunakan uji korelasi. Nilai koefisien korelasi durasi latihan dengan kekuatan otot lengan adalah r hitungan 0,527> r tabel 0,514, nilai signifikansi/p-value adalah 0,043, dan durasi latihan dengan kekuatan otot kaki adalah r hitungan 0,5647> r tabel 0,514. Nilai signifikansi/nilai p adalah 0,009, lama latihan dengan kekuatan otot punggung adalah r hitungan 0,813> r tabel 0,514, dan nilai signifikansi/nilai p adalah 0,000 karena nilai signifikansi adalah p<0,05.

Kata Kunci: olahraga gulat, olahraga, durasi, kekuatan otot

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INTRODUCTION

One of the sporting achievements in Indonesia is wrestling. There are many competitions in wrestling, ranging from regional, national, and international championships (Zakharova et al., 2021). Wrestling is an achievement sport that has a characteristic that is a sport that deals with using the limbs, trying to bring down the opponent by pulling, pushing, tackling, slamming, pressing, and holding so that the opponent sticks to the mat without violating the predetermined rules. In wrestling, two styles are competed both nationally and internationally, namely the Freestyle and the Greek-Roman Style (Greco Romaine). Freestyle is a wrestling game procedure that allows wrestlers to attack both opponents' legs, namely tackling and pulling the leg according to the specified rules. In comparison, the Greek-Roman style (Greco Romaine) is a wrestling game procedure that prohibits wrestlers from attacking the lower body parts of the pelvis, such as tackling, pulling legs, and folding opponents. Freestyle wrestling has a variety of top attack techniques, namely: foot catch, one leg caught, two leg catch, arm pull, shoulder slam, neck slam, arm slam, front kayak, side kayak, and rear kayak (zubless). While in the Greek-Roman style (Greek-Roman), there are various top attack techniques, namely: waist slam, neck slam, arm slam, sway slam, front kayak, side kayak, zubless, and others (Tarakanov et al., 2021).

In wrestling, skill in mastering technique alone does not fully support achievement. However, the achievement is also determined by long preparation through a systematic, continuous maximum training program, good coaching, and the athlete's talent (Takada et al., 2020). Physical exercise in its

implementation is more focused on the process or duration of training for the condition of athletes, and the aim is to increase the functional potential of athletes and develop biomotor abilities to the highest degree (Novakovsky et al., 2022).

According to Moadab et al. (2023) research, muscle strength is a person's physical condition created by muscles used by the body to fight resistance or loads in certain activities. Good arm muscle strength affects high throw results. According to Martinez-Saravia et al. (2020) on the contribution of leg muscle strength and back muscles to the waist kick ability, it was concluded that the leg muscle strength and back muscles are the dominant muscle strength in performing the waist kick technique (Juhanis, 2015).

The researchers will describe the related research first from the research that will be taken regarding the relationship between exercise duration and muscle strength. According to Lovyagina et al. (2020) research on the relationship between exercise duration and leg muscle explosive power for taekwondo athletes, there is a relationship between exercise duration and leg muscle explosive power. The regular exercise that the respondent undergoes has a very positive impact on the athlete's body's muscle strength and physical condition (Gustiawan & Ali, 2021).

Based on interviews with coaches and wrestling athletes from Kendal Regency, athletes have never measured dominant muscle strength. It is hoped that after this research, the trainer can measure the muscle strength of the wrestling athletes using standard tools. From the results of observations when carrying out direct work practices from September to December at KONI Kendal Regency, researchers have information that wrestling in Kendal Regency is a sport with many athletes who also have achievements at the provincial level. Most athletes are still young, 15-20 years. Thus, the researcher would like to combine the above problems with the study title The Relationship of Length of Wrestling Exercise to the Strength of the Arms, Legs and Back Muscles of Wrestling Athletes in Kendal Regency.

METHODS

This research was a survey, test, and interview research. The population in this study was Kendal Regency, wrestling athletes. The sample of this study was 15 wrestling athletes aged 15-20 years in Kendal Regency. The sampling technique used the purposive sampling technique. Data collection techniques using tests and interviews. The research instrument used a pull & push dynamometer to measure arm muscle strength. The research also used a back & leg dynamometer to measure leg and back muscle strength and interviews with athletes to determine the length of their training. Data analysis used the normality test and the Spss for windows 2020.

RESULTS AND DISCUSSION

This study aimed to determine the relationship between exercise duration and arm muscle strength, leg muscles, and back muscles. So, research in the field was carried out by measuring the independent and dependent variables. 1) length of exercise by interview 2) arm muscle strength using push & pull dynamometer 3) leg and back muscle strength using back & leg dynamometer. The distribution of the characteristics of the Kendal district wrestling athletes can be seen in the table below.

Table 1. Characteristics of Wrestling Athletes Characteristics

Characteristics	Means (n =15)
Age (Years)	17±1.184
Duration of exercise (Hours)	142.6±18.33
Height (m)	1.63±6.323
Weight (kg)	56.7±9.885
Arm Muscle Strength (kg)	29.8±6.108
Limb Muscle Strength (kg)	39.4±6.33
Back Muscle Strength (kg)	74.2±10.798

The normality test results aim to determine whether the test data in the group is normally distributed or not by using SPSS 16. Conditions for data to be said to be normally distributed if the calculated significance value is > 0.05, then Ho is accepted and normally distributed. If the calculated significance value is <0.05, Ho is rejected and is not normally distributed.

Table 2. Normality Test Calculation Results

Variable	P
Duration of exercise	0.200
Arm Muscle	0.200
Limb Muscle	0.200
Back Muscle	0.200
Duration of exercise	0.200

*p>0.05 (normal) p<0.05 (no normal), Test of normality shapiro-wilk

The length of the exercise group obtained a significance level of 0.200> 0.05, so the results of the arm muscle strength group data were normally distributed. The arm muscle strength group data obtained a significance level of 0.200> 0.05, so the results of the arm muscle strength group data were normally distributed. The back muscle strength group data obtained a significance level of 0.200>0.05, so the back muscle strength group data results were normally distributed. The back muscle strength group data obtained a significance level of 0.200>0.05, so the back muscle strength group data results were normally distributed.

In this research, the proposed hypothesis is as follows: Ho: there is no significant positive relationship between the length of exercise and the strength of the arm, leg, and back muscles of wrestling athletes in Kendal Regency. Ha: there is a significant positive relationship between exercise duration and the strength of the arm, leg, and back muscles of wrestling athletes in Kendal Regency.

The hypothesis will be tested by parametric statistics, namely the "Product Moment" correlation. When finding out the testing hypothesis results, it is possible to test the results of the hypothesis by comparing the significance level (p-value) with the error. Suppose the significance value is p> 0.05. In that case, Ho is accepted, meaning that there is no significant positive relationship between the length of training and the strength of the arm, leg, and back muscles of wrestling athletes in the Kendal Regency. On the other hand, if the significance value is p < 0.05, then Ho is rejected, meaning that there is a significant positive relationship between the length of training and the strength of the arm, leg, and back muscles of wrestling athletes in Kendal Regency. From the collected data collected and passed the stages of the validity-reliability test, two prerequisite tests of normality, then the next stage that must be passed is to test the research hypothesis. This test also uses the SPSS program. The SPSS test results from the hypothesis are as follows:

Table 3. Correlation Test Result

Variable	Sig. Correlations	Pearson correlations
Length of exercise with arm muscle strength	0.043	0.527
Length of exercise with leg muscle strength	0.009	0.564
Length of exercise with back muscle	0.000	0.813

n= 15 p<0.05 significant Correlations

From the data in Table 3, the correlation coefficient between exercise duration and arm muscle strength is 0.527, a significance value of p-value is 0.043, duration of exercise with leg muscle strength is 0.5647, the significance value/p-value is 0.009, the length of exercise with back muscle strength is 0.813, and the significance value/p-value is 0.000 because the significance value is p <0.05, then Ha is accepted, there is a significant positive relationship between exercise duration and arm muscle strength, Leg and back muscles of wrestling athletes in Kendal Regency. The sign on the price of the correlation coefficient also affects the interpretation of the results of the correlation analysis, which is positive (+), indicating the direction of the relationship is in the same direction, meaning that the relationship between the two variables is directly proportional. The higher the Variable X will be followed by, the higher the Variable Y and vice versa. The sign on the correlation coefficient is negative (-), indicating the direction of the opposite relationship, meaning that the relationship between the two variables is inversely proportional. The higher the Variable X will be followed by, the lower the Variable Y and vice versa. The sign of the correlation coefficient from the results of this data analysis is positive, so it indicates a unidirectional relationship. This means that the longer the athlete exercises, the stronger the dominant muscle strength, and vice versa. The positive result of the correlation calculation shows that there is a unidirectional relationship between the athlete's training duration and the athlete's dominant muscle

strength (Peral-Suárez et al., 2020).

Previous research results from research by Liebel et al. (2024), shows that most of the martial arts athletes in the city of Cimahi are new athletes in the city of Cimahi. The regular exercise that these respondents undergo has a very positive impact on the body's muscle strength and physical condition of athletes. Research by Konovalov et al. (2021). There is a significant relationship between the length of exercise and muscle flexibility of modern dancers, with a p-value = 0.000. The value of the correlation coefficient is +0.843, so it shows a very strong and unidirectional correlation or relationship, which means that the higher the length of exercise, the higher the muscle flexibility.

Research by Karelin et al. (2021), To create athletes who excel, it takes practice carried out for a long time (about 8-10 years and over) in one sport consistently, continuously, gradually, and programmed so that the exercise will make a person Athletes will become proficient both physically, technically, tactically and strategically in sports which is pursued. Besides that, good psychological maturity is also needed in athletes in order to maximize physical performance, technique, tactics, and strategy during the match (Peral-Suárez et al., 2020).

Based on the results of the analysis presented and the results of hypothesis testing, it turns out that the proposed hypothesis is accepted as true. There is a significant positive relationship between the length of exercise and the strength of the arm muscles, the length of exercise with the leg muscles, and the length of training with the back muscles of wrestling athletes in Kendal Regency. This is because exercise is a subgroup of physical activity in the form of planned, structured and repetitive (repeated) body movements. Exercise is the process of carrying out sports activities that have been planned systematically and structured over a long period of time to improve movement abilities both in terms of physical, technical, tactical, and mental aspects to support the success of students or athletes in obtaining maximum sports achievement (Balaban et al., 2020).

Wrestling uses a combination of pulling, pushing, lifting, and spinning movements and focuses on slamming, rolling, and locking techniques that are carried out in an effort to reduce the stability of the opponent and increase attack movements in a set Liebel et al. (2024). Other components are also needed, namely good physical and mental conditions for competing. The dominant physical conditions in wrestling are strength, endurance, explosive muscle power, speed, flexibility, balance, coordination, agility, accuracy, and reaction. Dominant wrestling requires the strength of the arm muscles and leg muscles to be able to maximize throw techniques to bring down opponents or defend themselves (Brzezińska et al., 2022). The longer the athlete's training, the stronger the strength of the arm muscles, leg muscles, and back muscles. To perform the technique of wrestling techniques requires good dominant muscle strength.

CONCLUSION

Based on the results of processing, calculating, and analyzing data, it can be concluded that there is a significant relationship between exercise duration (X) and arm muscle strength (Y1) in wrestling athletes in Kendal Regency. This is evidenced by r arithmetic =0.527 > r table = 0.514. And the value of Sig. (2- tailed) 0.043<0.05. There is a significant relationship between exercise duration (X) and leg muscle strength (Y2) in wrestling athletes in Kendal Regency. This is evidenced by r count = 0, > r table = 0.5647. And the value of Sig. (2- tailed) 0.009 <0.05. There is a significant relationship between exercise duration (X) and back muscle strength (Y3) in wrestling athletes in Kendal Regency. This is evidenced by r count = 0.813 > r table = 0.514. And the value of Sig. (2- tailed) 0.000<0.05. Then based on the basis of decision making, it can be concluded that there is a correlation or relationship between the length of exercise and the strength of the muscles of the arms, legs, and back. The relationship is positive, the longer the exercise, the greater the muscle strength.

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