



Contribution of Arm Endurance, Leg Strength, and Hip Flex to Cockerical Skill Motion in Amateur Gymnastic Athletes

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ABSTRAK

Komponen daya tahan otot lengan, kekuatan tungkai dan kelentukan pinggul merupakan komponen biomotorik yang sangat diperlukan dalam teknik dasar kayang pada cabang olahraga gymnastik. Faktor-faktor tersebut mempengaruhi keterampilan senam pada atlet senam amatir. Tujuan penelitian ini adalah untuk menganalisis kontribusi daya tahan lengan, kekuatan tungkai, dan kelentukan punggung terhadap keterampilan kayang pada atlet amatir di club Idola Gymnastik Lampung. Metode penelitian ini menggunakan deskriptif kuantitatif. Populasi dan sampel pada penelitian ini sebanyak 20 atlet dengan teknik total sampling. Tes daya tahan lengan menggunakan push up, tes kekuatan tungkai menggunakan alat Leg dynamometer dan tes kelentukan punggung menggunakan sit and reach, serta tes kemampuan keterampilan kayang dengan menggunakan lembar observasi keterampilan kayang. Teknik analisis data menggunakan rumus korelasi ganda kemudian diuji dengan teknik analisis korelasi product moment dan diuji signifikan. Hasil penelitian menunjukkan bahwa (1) adanya kontribusi yang signifikan antara daya tahan lengan terhadap keterampilan kayang pada atlet, (2) adanya kontribusi yang signifikan antara kekuatan tungkai terhadap keterampilan kayang pada atlet, (3) adanya kontribusi yang signifikan antara kelentukan punggung terhadap keterampilan kayang pada atlet. Sehingga dapat disimpulkan bahwasanya adanya kontribusi yang signifikan secara bersama-sama antara daya tahan lengan, kekuatan tungkai, dan kelentukan punggung terhadap keterampilan kayang pada atlet amatir Club Idola Gymnastik Lampung. Maka hal ini pentingnya peran pelatih dalam mengetahui kontribusi dari beberapa komponen tersebut guna untuk menunjang gerak keterampilan yang lebih optimal khususnya pada atlet gymnastik kelas amatir.

ABSTRACT

The components of arm muscle endurance, leg strength, and hip flexibility are bio motor components that are indispensable in the basic kayang technique in gymnastics. These factors affect gymnastics skills in amateur gymnastics athletes. The purpose of this study was to analyze the contribution of arm endurance, leg strength, and back flexibility to kayang skills in amateur athletes at the Lampung Gymnastics Idol Club. This research method uses descriptive quantitative. The population and sample in this study were 20 athletes with a total sampling technique. Arm endurance tests using push-ups, leg strength tests using a Leg dynamometer and back flexibility tests using sit and reach, and kayang skill ability tests using kayang skill observation sheets. The data analysis technique used a multiple correlation formula and then tested with product-moment correlation analysis techniques and tested significantly. The results showed that (1) there is a significant contribution between arm endurance to kayang skills in athletes (2) there is a significant contribution between leg strength to kayang skills in athletes (3) there is a significant contribution between back flexibility to kayang skills in athletes. So it can be concluded that there is a significant contribution together between arm endurance, leg strength, and back flexibility to kayang skills in amateur athletes of Club Idola Gymnastik Lampung. So this is the importance of the coach's role in knowing the contribution of some of these components to support more optimal skill movements, especially in amateur class gymnastics athletes.

1. INTRODUCTION

Sport is an effort to maintain physical fitness which can be divided into two groups, namely aerobic and anaerobic. In the process of exercise it is necessary to use energy derived from burning oxygen, and requires oxygen (Fatimah et al., 2020; Hanan et al., 2023). Basic movement is a movement ability that needs to be improved in a beginner athlete, namely a movement pattern that underlies a

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movement, ranging from simple movement ability to complex movement ability. Basically, basic human movements are walking, running, jumping, and throwing (Jamilah & Nugraheni, 2017; Mikel, P., 2023). All of these abilities must be possessed by children well, so that an athlete has a foundation to develop more complex movement abilities (Adhitya & Ilahi, 2021; Mulyana, 2018). Basic motion is a form of human movement behavior, while psychomotor is used to study the development of motion in humans. Thus, amateur athletes need basic movements to carry out the training process, one of which is gymnastics (Edeng et al., 2018; Sugarwanto & Okilanda, 2020). Gymnastics is a sport that involves the performance of movements that require strength, speed and harmony of regular physical movements. Modern forms of gymnastics are unbalanced bars, balance beams, floor gymnastics. These forms are said to have evolved from exercises used by the ancient Greeks to board and descend a horse and circus performances (Adnyana & Lestari, 2018; Susanto & Nuraini, 2019). Gymnastics is commonly used by people for recreation, relaxation or calming the mind, usually there are those who do it at home, in the gymnasium, or at school. Many young children are used to being taught gymnastics, both by parents, and by sports teachers at school. Gymnastics is important for the formation of body flexibility for human survival (Mulyana, 2018; Prasetya, 2017).

Gymnastic movements are very suitable for filling physical education programs. The movement stimulates the development of physical fitness components such as muscle strength and endurance from all parts of the body (Amrullah & Widodo, 2017; Imansyah, 2018). In addition, gymnastics also has the potential to develop basic general skills, as an important foundation for mastering the technical skills of a sport (Oktariana & Hardiyono, 2020). The understanding of gymnastics is so broad in scope that it covers various characteristics of movement. In modern times, the development of gymnastics sports is of many kinds, therefore it is limited to gymnastics activities managed by the World Gymnastics Union Federation Internationale de Gimnastique (FIG) which in Indonesia became the International Gymnastics Federation. Gymnastics is an effective physical activity to optimize children's growth and development (Pratomo & Gumantan, 2020). Floor gymnastics is a gymnastic exercise carried out on a mat, the elements of movement consist of rolling, jumping, spinning in the air, resting with hands or feet to maintain a balanced posture or when jumping forward or backward. Floor gymnastics in PE learning has a variety of very complex movements, including forward rolling, backward rolling, kayang, hand stand, handspring, candle stance, wheeling (Rahayu & Permana, 2022; Setiawan et al., 2018)

Floor gymnastics emphasizes dexterity and coordination. Because gymnastics is an individual sport, gymnasts must be able to overcome their fears alone in doing acrobatic movements. All previous gymnasts had to learn from the most basic level to complex movements (Adhi & Soenyoto, 2017; Argantos, 2017). By often repeating movements, a gymnast will also have good physical condition, such as power, endurance, speed, flexibility, balance, agility and coordination (Ridho Alfianto et al., 2020). In the basic technique, the floor gymnastics movement requires the right technique and movement and the right rhythm, so that the force used can be carried out safely, efficiently, and effectively. Of the various activities carried out in floor gymnastics, it aims to form and develop body muscles, develop physical quality, shape body beauty, and maintain physical fitness (Larasati et al., 2021; Sukawi et al., 2021). Based on field observations of kayang abilities at the Lampung gymnastics idol club, it is known that some athletes who are large in stature are still low in the ability to perform kayang movements. The average athlete has difficulty doing kayang movements from a standing position, before both hands reach that position because the student's body has fallen to the mat due to the lack of flexibility of the student's torso or body. Even if the flexibility of the arms, legs and back can bounce well, sometimes the arm's endurance is lacking so that the student's body is not perfect and falls quickly, the lack of flexibility also results in an imperfect position. Errors that are often made by students when kayang include one hand or both hands placed too far from the point of weight, while the position of both hands that is good in kayang is getting closer to the position of both feet so that the kayang attitude is less perfect. Another factor that the author observes as a cause of the low level of flexibility / flexibility of students so that the stomach, waist and back cannot bounce perfectly or in other words, the low flexibility of students so that they cannot maintain their body attitude so that the body attitude is less than optimal. One of the gymnastic movements taught at Club Idola Gymnastik Lampung is kayang skills. Kayang is a very dynamic skill that requires minimal deflection. Starting from the acceleration obtained at the beginning, resting both hands on the floor and making an upward flexing motion. Kayang is a form or posture of supine and bowed, resting on both hands, and both feet with straight elbows and knees. To be able to do gymnastic movements, students need physical components such as the development of muscular endurance, strength, flexibility, coordination, agility and balance (Abdillah et al., 2021; Adhi & Soenyoto, 2017). When the body position rests with four points in an inverted state by stretching and lifting the abdomen and pelvis. In the kayang movement, flexibility is needed to facilitate the implementation of motion. In addition, flexibility is an important component to produce maximum movement (Rawe et al., 2017; Sahabuddin et al., 2022).

Flexibility can be interpreted as the ability of muscles and joints to move freely in maximum space. If someone has optimal flexibility or flexibility, it will increase efficiency in moving. Flexibility in kayang movement occurs in all limbs, both upper limbs consisting of arms, shoulder joints, chest, abdomen, back and lower limbs, namely waist, thighs, and legs. Of the several elements of physical conditions that support the ability of kayang movement, researchers want to emphasize the physical factors that support the success of kayang in terms of muscles related to kayang ability (Cahyono et al., 2018; Rustiawan & Rohendi, 2021). This research is supported by relevant research related to the effect of hand muscle strength training, muscle endurance, and balance on athletic sports skills. This study states that these factors provide support for the success of athletes in carrying out sports well (Oktariana & Hardiyono, 2020; Sukawi et al., 2021). In addition, there is also research related to the relationship between Abdominal Muscle Flexibility and Kayang Basic Movement Skills in Artistic Gymnastics. This study states that abdominal muscle flexibility affects the implementation of kayang sports in artistic gymnastics (Jamilah & Nugraheni, 2017; Mikel, P., 2023). The novelty of this research is to analyze the success of gymnastic skill movements in amateur gymnastics athletes from various supporting factors. So based on the results of the explanation above, this study aims to analyze the contribution of arm endurance, leg strength, and back flexibility to kayang skills in amateur athletes at the Lampung gymnastics idol club.

2. METHODS

This research method uses quantitative descriptive to determine how much the contribution of arm endurance, leg strength, and back flexibility to kayang skills at Club Idola Gymnastik Lampung. Research Design Design showed in Figure 1.

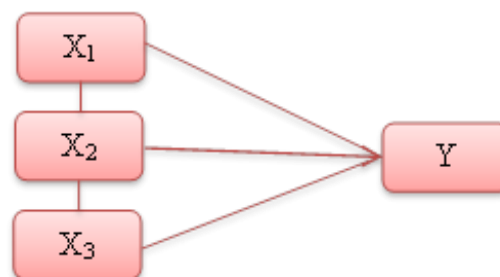


Figure 1. Research Design Design

Information:

X₁ : Arm Muscle Endurance

X₂ : Limb Strength

X₃ : Back Bending

Y : Kayang Skills

This population amounted to 20 athletes, and the sample used in this study researchers used the total sampling method, so that the sample in this study amounted to 20 athletes. The instruments used for data retrieval use tests and measurements on each component. For the endurance test of the arm using the Push Up test instrument, the leg strength test using the Leg Dynamometer test instrument, and the flexibility test of the back of the researcher using the Sit and Reach test. Data analysis in this study there are two types of data analysis that can be used, namely statistical data analysis and non-statistical analysis using SPSS 25 and a more in-depth study with prerequisite tests, which include normality tests and hypothesis tests.

3. RESULT AND DISCUSSION

Results

The description in this study is the result of collecting data on the object of research which is a special illustration to determine the condition of the sample consisting of 20 novice athletes of the Lampung gymnastic idol club. Descriptive Group Data showed in Table 1. Results of Data Analysis of Each Variable showed in Table 2.

Table 1. Descriptive Group Data

No.	Variable	Average	Minimum	Maximum	Std. Deviation
1.	Arm endurance (X ₁)	10,7	6	16	2,75
2.	Limb strength (X ₂)	110,2	85	136	15,85
3.	Back Bending (X ₃)	20,6	11	30	5,78

Table 2. Results of Data Analysis of Each Variable

No.	Variable	Correlation Results	Sig. (p<0.05)	Information	Relationship Interpretation
1.	Arm endurance (X ₁) to kayang skill (Y)	0,910	0,000	Significant	Very Powerful
2.	Limb strength (X ₂) to kayang skill (Y)	0,709	0,008	Significant	Strong
3.	Back Flex (X ₃) to kayang skill (Y)	0,602	0,028	Significant	Strong

Based on the results of data analysis on beginner gymnastics club idol athletes in Lampung, it showed that a sig of 0.000 ($p < 0.05$) was obtained and a positive value of 0.910. Then the amount of contribution with a coefficient of determination of 82.81%. So that there is a significant contribution between arm endurance and kayang skills in beginner athletes of the Lampung gymnastic idol club. This means that, if a beginner gymnastic athlete has a good arm endurance value, then the maximum ability results are followed. Vice versa, if a beginner gymnastic athlete has a lower than normal arm endurance value, it will be followed by the results of not maximum ability. Based on the results of data analysis on beginner gymnastics club idol athletes in Lampung, it showed that a sig of 0.008 ($p < 0.05$) was obtained and a positive value of 0.709. Then the amount of contribution with a coefficient of determination of 50.26%. So that there is a significant contribution between leg strength to kayang skills in beginner athletes of the Lampung gymnastic idol club. Based on the results of data analysis on novice gymnastics club idol athletes in Lampung, it showed that a sig of 0.028 ($p < 0.05$) was obtained and a positive value of 0.602. Then the amount of contribution with a coefficient of determination of 36.24%. So that there is a significant contribution between back flexion to kayang skills in beginner athletes of the Lampung gymnastic idol club.

Discussion

In the overall data results, novice athletes from Lampung idol gymnastics club have female gender. This is the majority that rhythmic gymnastics athletes who are sampled are female and the tendency of novice children to follow rhythmic gymnastics. In the age data results, the most average age of beginners is 5-8 years. This is in line with research which states that to become a rhythmic gymnastics athlete is prepared from an early age to the golden age (Abdillah et al., 2021; Teofa et al., 2019). Whereas in the height data, the average height obtained is mostly 121-131 cm. This shows that the athlete's height provides maximum results in following the training process and growth in children. This opinion is in line with research which states that the athlete's height is very influential because if the gymnast has a high posture, the height of the jump and other basic movements will have better results in doing rhythmic gymnastics (Argantos, 2017; Nata et al., 2020). And in the weight data, the most average body weight is obtained in the range of 17-21 kg. This shows that the more the athlete's weight is not too heavy, the easier it will be to do every gymnastic movement both from flexibility, jumping, and other basic movements. Thus, there is an opinion in accordance with this body weight data which shows that nutritional arrangements during training periodization must be adjusted to the volume and intensity of training, health status, fitness status, physical condition, body composition, and body weight of athletes (Amrullah & Widodo, 2017; Hanan et al., 2023). From this study, results were obtained that showed that there was a significant contribution between arm endurance and the results of kayang skills. The results of this study are in line with research showing that novice athletes need good basic kayang techniques and are supported by arm endurance, leg strength to produce optimal kayang movements. Thus when doing kayang in training, it takes strength or endurance of a strong arm to be able to hold the position of the body when doing kayang (Jamilah & Nugraheni, 2017; Mikel, P., 2023). Based on testing the first hypothesis, it turns out that there is a significant contribution between arm endurance and the results of

kayang skills, in this study shows that arm endurance contributes to the results of kayang when doing movements and holding body weight, so as to produce good, precise and maximum kayang. This is in line with the results of research showing that good kayang movements are the basis for doing gymnastic movements because humans consist of many tissues, each of which has a certain function in everyday life, especially power is important for sports (Larasati et al., 2021; Rawe et al., 2017). Where athletes must exert explosive energy and power is recognized as a component of physical conditions that allow athletes to develop their abilities to achieve higher levels of achievement in the sport they are engaged in. The thing expressed by the supporting theory is in accordance with the hypothesis of researchers where moving the kayang is the main basic motion to perform other movements and requires good power (Adhitya & Ilahi, 2021; Argantos, 2017). Based on testing the second hypothesis, there is a significant contribution between leg strength and the results of kayang skills, in this study shows that, leg strength contributes to the results of kayang skills when supporting the body and holding body position, thus producing accurate kayang. In the results of the study showed that some athletes obtained high value results because the athletes had better leg strength and were trained. In relation to sports, strength is one of the basic components of biomotor needed in almost every sport and is one of the supports for someone to achieve maximum achievement (Amrullah & Widodo, 2017; Susanto & Nuraini, 2019). Strong and well-trained limbs have an important role that will support the performance of an athlete when holding and performing kayang movements (Adnyana & Lestari, 2018). This is also in line with the researchers' hypothesis that strength is a component of a person's physical condition created by or a group that the body uses and fights resistance or loads in certain activities and protects the body from injury.

Based on testing the third hypothesis, there is a significant contribution between back flexibility and kayang skill results. Seeing the results of this study, a novice athlete must be able to respond positively to the importance of back flexibility to improve body abilities which are the basis for improving athlete performance. Thus, it is urgently needed by novice athletes of the idol gymnastics club in Lampung that good and optimal back flexibility has good results. This is in line with the results of previous research which states that increasing the ability of novice athletes to perform attitudes can be done through the application of incentive training in the form of flexibility training (Fatimah et al., 2020; Jamilah & Nugraheni, 2017). Finally, based on the fourth hypothesis test conducted jointly, it shows that there is a contribution between arm endurance, leg muscle strength, and back flexibility together to kayang skills. These results find relevance to the results of previous research that a novice athlete must be able to respond positively to the importance of arm endurance, leg strength, and back flexibility to improve his achievements in gymnastics, especially kayang gymnastics (Larasati et al., 2021; Oktariana & Hardiyono, 2020). The above is in line with research which states that arm endurance, leg strength, and back flexibility are aspects of physical condition that can affect the results of gymnastics skills because gymnastics is influenced by arm endurance, leg strength, and back flexibility that athletes have (Subekti et al., 2021; Sugarwanto & Okilanda, 2020). When doing kayang movements correctly, to support body weight depends on leg strength while other physical conditions are arm endurance as a means of supporting body weight when kayang and requires optimal back flexibility. So that the body condition of amateur athletes will be stable and easier to perform movements. This study has the advantage of being able to provide in-depth insight into the physical factors that are essential for improving gymnastics performance, so that coaches can design more effective training programs that focus on improving these abilities. The implication of this study is that it can be used to develop better and more specific training methods, helping athletes reach their maximum potential in competition. However, this study may have shortcomings such as the limitation of the sample which only included amateur athletes, so the results may not be fully applicable to professional athletes. In addition, other variables such as technique, mentality, and nutrition also need to be considered. Suggestions for future relevant research are to expand the research sample to include various skill levels and integrate analysis of additional factors that affect the overall performance of gymnastics athletes.

4. CONCLUSION

Based on the discussion of the three independent variables such as arm endurance, leg strength, and back flex above, it can be concluded that there is a contribution of arm endurance, leg strength, and back flexibility to kayang skills in beginner gymnastic club Idol Athletes Lampung. Thus, arm endurance, leg strength, and back flexion together contribute to the results of kayang skills in beginner gymnastics club idol athletes in Lampung. However, from some of these components, arm muscle endurance has a very significant impact compared to leg strength and stump flexibility. So this is the importance of the coach's role in knowing the contribution of some of these components in order to support more optimal skill movements, especially in amateur gymnastics athletes.

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