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VARIATION OF ARM MUSCLE STRENGTH TRAINING IN ARCHERY: A SYSTEMATIC LITERATURE REVIEW

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Abstract

This study is to examine the use of variations in arm muscle strength training in archery because this sport relies heavily on the arm muscles, and physical training for these muscles has a significant impact on the arm muscle strength when pulling the bowstring. The PRISMA guidelines for systematic reviews and meta-analyses were followed in this review investigation. Studies must have been released within the last five years, namely January 2020 to July 2024. The terms used in the search procedure were (1) strength; and (2) archery. The search for this study was conducted using the Scopus research journal database. The findings of this investigation were The overall theme of this study was 97. covering 71 items, 10 of which were selected as relevant. Therefore, it can be said that weight training such as push-ups, pull-ups, and bench dips using tools such as resistance bands and barbells are examples of variations in arm muscle strength training in archery. based on relevant findings, such as improving archery ability, improving muscle strength in archery competitors, improving physical fitness and accuracy in archery competitors, and reducing arm tremors.

Keywords: Arm Muscle; Strength; Archery

INTRODUCTION

Archery is a sport that aims to release arrows with high accuracy to the target. It requires precise and consistent archery techniques to achieve a high level of accuracy (Humaid, 2014). Archery requires stability, flexibility, endurance, and balance to produce accurate shots. Regular training and good physical condition are essential to support these factors. An archer must have sufficient strength and good endurance to be able to perform consistently throughout the match, not just at the beginning. Accuracy in shooting in archery involves gaining points from the target by using a bow to release arrows with a focused and skilled approach (Kusuma, 2016). Archery does not require much motor skill, and archery is actually a simple sport. Archery is a sport that releases arrows at the target as precisely as possible. Since archery involves the muscles responsible for drawing the bow, these muscles must be strong and durable in order to draw the bow consistently and steadily along the axis of motion. In archery, the shoulder muscles, the muscles of the pulling fingers, the muscles of the forearms, the muscles of the wrists, the abdominal

muscles, the muscles of the legs, and the muscles of the chest must be trained and developed (Noviantoro & Irianto, 2022) . Thus, it can be concluded that archery is a sport that emphasizes strength, calmness, concentration, and focus on basic skills in archery and emphasis on hand strength when pulling the bow and releasing the arrow towards the target.

Archery involves 9 steps which include: (1) standing position, (2) placing the arrow on the bowstring, (3) preparing the pulling fingers and grip position, (3) pre-pull, (5) full pull, (7) Approaching the target, (8) releasing the arrow, (9) continuous movement (Humaid, 2014). In the archery technique of pulling the bowstring, the muscles experience isotonic contractions, especially during the first half of the draw. During the full bow draw, the fingers pulling the bow should touch the chin and be placed under it (anchored), while the arm holding the bow should be fully extended along with the pulling arm (Noviantoro & Irianto, 2022). Thus it can be concluded that the basic techniques of archery are as follows: holding the bow, maintaining the position of the feet when shooting, fitting the arrow, pulling the bowstring until it touches the lips and nose, aiming, and finally releasing the bowstring.

Bodyweight training involves using only your own body weight for exercises such as pull ups, push ups, chair dips, crunches, and planks, without the need for equipment. Bodyweight training involves organic movements that allow for unrestricted range of motion during the exercise. This exercise will help to increase muscle strength in various areas without the need for equipment (Yachsie, Nasrulloh, et al., 2022). Strength weight training should not only focus on weight, but also on speed when lifting, pushing, and pulling. burden (Adi et al., 2023) . These exercises focus on using body weight instead of external weights, making it possible to do them without the help of a trainer or the need for much space. Exercises include Regular Push-Ups, Diamond Push-Ups, Wide Push-Ups, Pike Push-Ups, Pseudo Push-Ups, Archer Push-Ups, Hindu Push-Ups, and Bent Knee Push-Ups (Bernhardin, 2022)Weight training is an activity carried out against resistance to improve the quality of muscle performance trained in individuals who exercise to improve fitness. (Iskandar et al., 2023) . It can be concluded that weight

training is a strength-centered exercise using certain loads that are carried out gradually and repeatedly, there are several types of arm muscle strength training without the help of tools, namely push ups, pull ups, flanks, chair dips, crunches. And there are also those who use tools, namely using resistance bands, hand grips, and barbells.

In research (Humaid, 2014) The method of measuring muscle strength and archery techniques has not been explained in detail , research advanced (Yachsie et al., 2024). Variations of other exercise methods that may be more effective than push-ups and pull-ups in increasing arm muscle strength. Furthermore , research (Nasrulloh et al., 2022) . This study may not have taken into account psychological factors that can affect athlete performance. With these problems, this study was conducted to complement the limitations of previous studies to make them better.

METHOD

Systematic Literature Review research refers to a group of studies on data collection techniques or research subjects investigated using various library resources, such as books, encyclopedias, scientific journals, magazines, and documents (Rumini et al., 2024). Researchers used the literature research method, which means collecting data from books, journals, articles, magazines, and the internet on the subject of the relationship between flexibility training and sports performance (Adi S et al., 2023).

Study participants

The words : “strength”, “archery” . were searched in articles published from Scopus Collection (Science Citation Index Expanded; Social Sciences Citation Index; Science Arts & Humanities Citation Index) from 2020 to 2024.

Study Organization

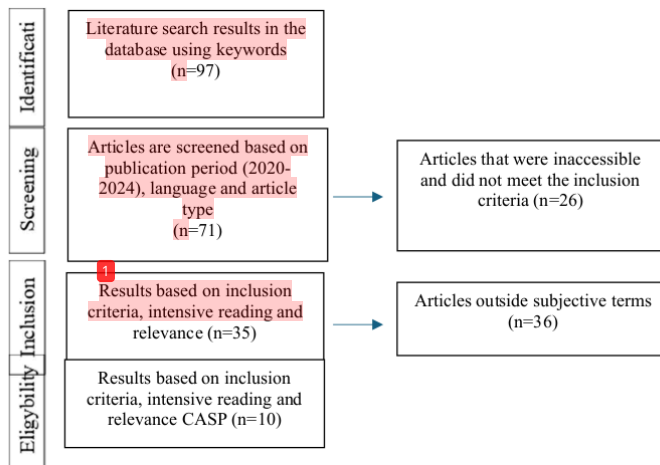
The literature review considers the following factors: (a) annual trend of articles published between 2020 and 2024; (b) distribution of publications at the first author's institution; (c) number of authors; (d) field of research (experimental, descriptive, correlational, or others); (e) type of research (experimental, descriptive, correlational, others); and (f) average number of citations per article.

Statistical analysis

The article title, abstract, and keywords were focused on because they were enough to create a reliable and feasible core of the article for use and review by others. This review study only included publicly accessible articles because the authors did not want to exclude anyone who could not access their research. The following inclusion and exclusion criteria were used to obtain only relevant studies that addressed a specific topic exclusively.

RESULT

Identification of literature search results in databases using the keywords strength and archery is found (n=97), from the entire database will be filtered from 2020 to 2024 and selected article categories (n=71), Inaccessible articles that did not meet the inclusion criteria (n=26). Then from the filtered articles will be selected to use keywords that are in accordance with the theme of *strength and archery* (n=35). Then the electability that will be included in the results (n=10) relevant articles.



The following table shows the total number of publications published during the selected time period. Year published.

Table 1. Evolution of the number of publication of year

Year of publication	Number of articles	Percentage
Year 2020	8	15.7 %
Year 2021	10	19.6%
Year 2022	10	19.6 %
Year 2023	11	21.6 %
Year 2024	12	23.5 %
Total	51	100 %

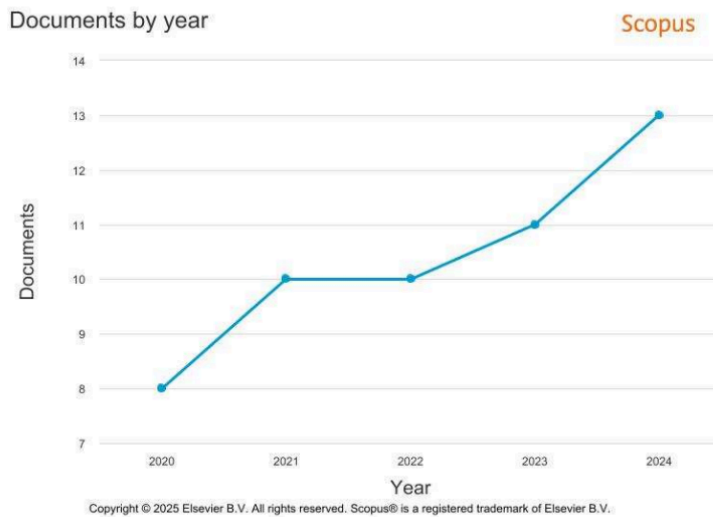


Figure 1. Evolution of the number of publication of year

from the 2nd picture above shows the increase in the number of publications over time. First, the scientific output from 2020 (8 articles), 2021 (10 articles), 2022 (10 articles), 2023 (11 articles), and 2024 (12 articles) experienced a significant increase.

According to the literature, the analysis that can be applied in plyometric exercises is shown in the table:

Table 2. literature applied in plyometric exercises

Topic	Sampel	Results
The influence of arm muscle strength, length of pull and archery technique on archery performance (Humaid, 2014)	athlete	improve archery skills
Application of push-up and pull-up exercises to improve arm muscle strength endurance in archery athletes (Yachsie et al., 2024)	athlete	increase the muscle strength of archery athletes.
The effect of weight training with the compound set method on strength and endurance archery athletes (Nasrulloh et al., 2022)	athlete	increase the muscle strength of archery athletes.
The effect of circuit training on physical fitness and archery accuracy in novice athletes(Susanto et al., 2021)	athlete	improve physical fitness and archery accuracy in archery athletes
Muscle Strength Enhancement and Metabolism Acceleration of College Students in Traditional Archery Program Based on Functional Training (Zhang, 2024)	athlete	increase the muscle strength of archery athletes.
The Relationship between Hand Grip Strength Balance and Body Balance to Archery Ability (Prasetyo & Prasetyo, 2023)	athlete	improve archery skills
Correlation of physical capacity and achievement in Indonesian sub-elite archery athletes (Rusdiawan et al., 2024)	athlete	increase the muscle strength of archery athletes.
Activation and tremor of the shoulder muscles to the demands of an archery task (Lin et al., 2010)	athlete	reduce tremors in the arms
Postural stability, clicker reaction time, and bow draw force predict performance in elite recurve archery (Spratford & Campbell, 2017)	athlete	improve archery skills
Effect of exercise devised to reduce arm tremor in the sighting phase of archery(Shinohara et al., 2023a)	athlete	increase the muscle strength of archery athletes.

Discussion

The correlation between arm size, BMI, and arm muscle strength plays an important and significant role in archery accuracy results (Kusuma, 2016). Circuit bodyweight training has a positive impact on arm muscle endurance and the accuracy of archery athletes (Yachsie, Suharjana, et al., 2022). Aerobic circuit training affects the muscular endurance, cardiorespiratory endurance, and archery accuracy of archers (Saputro et al., 2022). It can be concluded that the accuracy of arrows in shooting is influenced by strong muscle strength, through weight training which can strengthen the arm muscles.

Weight lifting exercises (bench press and lateral full downs) performed continuously can have a significant impact on increasing arm muscle strength in archery.(Bernhardin, 2022). Dumbbell Bicep Curl, Dumbbell Fly, and Shoulder Press training methods can be recommended and implemented in school extracurricular training programs to strengthen and improve arm muscle power..(Iskandar et al., 2023). ⁴ Athletes who have high muscular endurance are better suited to do push ups, while athletes who have low muscular endurance are better suited to do pull ups.(Yachsie, Nasrulloh, et al., 2022). It can be concluded that weight training such as dumbbell biceps, push ups, pull ups, and others have a significant impact on arm muscle strength in archery which is highly dependent on arm muscles.

A regular, smooth, and consistent final pull is essential to getting a high score in archery. (Edelmann-Nusser et al., 2006). Neurofeedback can increase reaction speed, maintain attention longer, and improve emotional management, which significantly contributes to athlete performance.(Corrado et al., 2024). Aspects such as; training strategies and methods, experience, use of technology in training programs, and individual skill development are more important in improving archery skills in beginner children.(Yusfi et al., 2024). It can be concluded that archery skills greatly influence the results of arrow shooting, archery skills can be improved through proper training and regular physical exercise.

tremors during the aiming phase of archery can be minimized by performing a side bridge at a certain body angle for a certain period of time. (Shinohara et al.,

2023b). Strength training using Thera-bands as well as Respiratory Muscles Conditioning intervention simultaneously improved archery stability and performance..(Laishram et al., 2008). Through push up and pull up exercises, tremors in the left arm when pulling the bow can be overcome. (Yachsie, Nasrulloh, et al., 2022). It can be concluded that tremors have a significant negative impact on the accuracy of archery. Therefore, tremors can be overcome by performing weight training such as pull ups, push ups, and others regularly and competently.

CONCLUSION

Variations of arm muscle strength training in archery include weight training for arm muscles such as push ups, pull ups, bench dips, which use aids such as resistance bands and barbells. Based on relevant results, including improving archery skills, increasing muscle strength in archery athletes, improving physical fitness and accuracy in archery in archery athletes, reducing tremors in the arms, There are limitations in previous studies, Weight training for arm muscles will always be increased in terms of intensity, frequency, and focus on one form of training. So that further research is expected to develop effective and efficient training programs.

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