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**EXTENDED
ABSTRACT**

A Case Study on Biomechanical Parameters Related to Archery Performance Among UiTM Seremban 3 Student Archers

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I. INTRODUCTION

An archer's success is determined not just by technical proficiency, but also by the biomechanical factors that determine their movements. Archery performance is influenced by various biomechanical factors, such as the alignment of the draw force line (DFL) and shooting accuracy [1]. Misalignment can cause muscular fatigue and increased injury risk, eventually reducing performance [2]. Past researchers attribute chronic injuries primarily to repetitive strain and improper technique—conditions like misalignment heighten fatigue, elevate injury risk, and eventually impair performance [3]. When the elbow deviates from the draw force line, the archer must compensate using additional muscle effort (e.g., biceps/triceps), increasing fatigue and risking instability and injury, which negatively impacts performance [4]. Therefore, this case study examined the relationship between these factors among UiTM Seremban 3 student archers, comparing male and female participants.

II. METHODS

This study utilized a digital camera and Kinovea software to analyze the draw force line (DFL) of 7 right-handed, recurve archers from UiTM Seremban 3 with at least two years of experience. Shooting accuracy was assessed using a standard 122 cm target at 10 meters. The accuracy was assessed by assigning points based on the proximity of the arrows to the target center, with higher scores indicating greater accuracy. This approach follows the method used by [5], who assessed archery accuracy by comparing shot scores between experienced and inexperienced archers. Reflective markers on the wrist (condyloid joint), elbow (hinge joint), shoulder (ball-and-socket joint), and sternum are effectively used to accurately measure joint angles and track DFL alignment [6][1]. Descriptive statistics were applied, and independent t-tests compared male and female participants, while Pearson correlation analyzed the relationship between DFL and accuracy.

III. RESULTS AND DISCUSSION

A. Draw Force Line Comparison

There was no significant difference ($p = 0.683$, $p > 0.05$) in the draw force line between male and female archers. This suggests that gender does not influence the alignment of the draw force line in recurve archery [1], implying that other

factors, such as technique or individual differences, may play a more critical role.

B. Shooting Accuracy Comparison

Similarly, no significant difference ($p = 0.066$, $p > 0.05$) was observed in shooting accuracy between male and female archers. This indicates that both genders performed equally in terms of accuracy, further supporting the idea that skill and technique may have a greater impact on performance than gender-based differences [7].

C. Relationship Between Draw Force Line and Accuracy

A moderate negative correlation was found between the draw force line and shooting accuracy, although not significant. As the angle of the draw force line increased, shooting accuracy decreased. This suggests that misalignment in the draw force line could lead to reduced accuracy [1], highlighting the importance of proper technique to optimize performance and prevent potential injuries.

D. Figure and Table

TABLE I

COMPARISON BETWEEN MALE AND FEMALE IN DRAW FORCE LINE ANGLE

	Group	Mean	SD	t	df	p
Draw Force Line	Male	39.2	1.71	0.433	5.00	0.683
	Female	42.1	11.1			

*The significance level was set at $p < 0.05$

TABLE II

COMPARISON BETWEEN MALE AND FEMALE IN SHOOTING ACCURACY

	Group	Mean	SD	t	df	p
Total Score	Male	39.2	1.71	-2.33	5.00	0.066
	Female	42.1	11.1			

*The significance level was set at $p < 0.05$

TABLE III
RELATIONSHIP BETWEEN DRAW FORCE LINE ANGLE AND SHOOTING
ACCURACY

	Draw Force Line Angle	
		Pearson's R
Total Score	Sig. (2-tailed)	0.218
	N	7

IV. CONCLUSIONS

This study demonstrates that gender does not significantly influence the draw force line or shooting accuracy among recurve archers. A moderate negative correlation ($r = -0.533$) was found between draw force line and accuracy, highlighting the importance of proper alignment to enhance performance and reduce injury risk, consistent with the findings of [8]. Future research should conduct detailed biomechanical assessments and apply advanced motion analysis techniques to better understand the relationship between draw force line alignment and accuracy. These insights could support improved injury prevention strategies and guide the development of equipment tailored to individual archers.

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REFERENCES

- [1] Ahmad, Z., Taha, Z., Hassan, H. A., Hisham, M. A., Johari, N. H., & Kadirgama, K. (2014). Biomechanics measurements in archery. *Journal of Mechanical Engineering and Sciences*, 6, 762–771. <https://doi.org/10.15282/jmes.6.2014.4.0074>.
- [2] Hamdan, Z. A., Ahmad, Z., & Johari, N. H. (2022). Investigation of muscle fatigue of the archers during endurance shooting. *Journal of Mechanical Engineering and Sciences*, 16(3), 8987–8995. <https://doi.org/10.15282/jmes.16.3.2022.02.0711>.
- [3] Turner, O. E., & Petrova, E. V. (2023). Archery-related musculoskeletal injuries: An epidemiological study. *Orthopedic Reviews*, 15. <https://doi.org/10.5>.
- [4] Smith N. (2025). The recurve archer's drawing arm. *Bow International*. Retrieved from https://www.bow-international.com/features/the-recurve-archers-drawing-arm/?utm_source=chatgpt.com.
- [5] Eroğlu Kolayış, İ., Çilli, M., Ertan, H., & Knicker, J. A. (2014). Assessment of target performance in archery. *Procedia – Social and Behavioral Sciences*, 152, 451–456. <https://doi.org/10.1016/j.sbspro.2014.09.230>.
- [6] Debnath, S., & Debnath, A. (2018). Analysis of Archery Performance Using Image Processing and Biomechanical Measurements. *International Journal of New Technology and Science*, 6(10), 10–14. Retrieved from <https://ijntse.com/upload/1541054500final%20paper.pdf>.
- [7] Krenn, B., Finkenzeller, T., Würth, S., & Amesberger, G. (2018). Sport type determines differences in executive functions in elite athletes. *Psychology of Sport and Exercise*, 38, 72–79. <https://doi.org/10.1016/j.psychsport.2018.06.002>.
- [8] Lau, J. S., Ghafar, R., Zulkifli, E. Z., Hashim, H. A., & Mat Sakim, H. A. (2023). Comparison of Shooting Time Characteristics and Shooting Posture Between High- and Low- Performance Archers. *Ann Appl Sport Sci*, 11 (2).