

# The Effect of Land Pulley Training on 100 Meter Freestyle Swimming Speed in Almagary Challenge Swim Palembang Athletes

Dwi Arya Saputra<sup>1</sup>, Jujur Gunawan Manullang<sup>2</sup>, Widya Handayani<sup>3</sup>

<sup>1,2,3</sup>Universitas PGRI Palembang

Corresponding author: [dwiarya685@gmail.com](mailto:dwiarya685@gmail.com)

## Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh latihan katrol darat terhadap kecepatan renang gaya bebas 100 meter pada atlet Almagary Challenge Swim Palembang. Metode yang digunakan adalah metode eksperimental dengan tipe desain pra-eksperimental dan desain pretest-posttest satu kelompok, serta memiliki 19 populasi dan 5 responden yang ditentukan berdasarkan teknik purposive sampling. Teknik pengumpulan data dalam penelitian ini dilakukan melalui tes (pretest-posttest) dan pengukuran kecepatan renang gaya bebas 100 meter pada atlet Almagary Challenge Swim Palembang yang dianalisis menggunakan rumus Paired Sample T-Test dan diperoleh hasil bahwa nilai signifikansi (2-tailed) kelompok katrol darat  $<0,05$  atau hanya  $0,002$  yang berarti  $H_0$  ditolak dan  $H_a$  diterima, dengan kata lain terdapat pengaruh signifikan latihan katrol darat terhadap kecepatan renang gaya bebas 100 meter pada atlet Almagary Challenge Swim Palembang. Hasil penelitian ini diharapkan dapat dijadikan dasar pemahaman sehingga dapat meningkatkan peran pelatih dalam menciptakan program pelatihan tambahan yang sesuai agar atlet mampu mencapai kecepatan maksimal dalam renang gaya bebas 100 meter dan mampu meraih lebih banyak prestasi di tingkat regional, nasional, dan internasional.

**Kata kunci:** Kecepatan, Katrol Darat, Renang Gaya Bebas

## Abstract

This study aims to determine the effect of land pulley training on the speed of 100 meters freestyle swimming in athletes Almagary Challenge Swim Palembang. The method used is an experimental method with a pre-experimental design type and with a one-group pretest-posttest design and has 19 populations and 5 respondents determined based on purposive sampling techniques. The data collection technique in this study through tests (pretest-posttest) and measurements of the speed of 100 meters freestyle swimming in athletes Almagary Challenge Swim Palembang which were analyzed using the Paired Sample T-Test formula and obtained the result that the significance value (2-tailed) of the land pulley group  $<0.05$  or only  $0.002$  which means  $H_0$  is rejected and  $H_a$  is accepted, in other words there is a significant effect of land pulley training on the speed of 100 meters freestyle swimming in athletes Almagary Challenge Swim Palembang. The results of this study are expected to be used as a basis for understanding so that it can increase the role of coaches in creating appropriate additional training programs so that athletes are able to have maximum 100 meter freestyle swimming speed and are able to achieve more achievements at regional, national, and international levels.

**Keywords:** Speed, Land Pulley, Freestyle Swimming

## 1. INTRODUCTION

Sport is a form of physical activity that plays a crucial role in maintaining physical fitness, promoting mental health, and enhancing overall quality of life. Participation in sports improves cardiovascular function, muscular endurance, and overall physical resilience, while also supporting psychological well-being and social development (Santoso, 2022). Beyond health benefits, sports serve as a platform for recreation, character building, and competitive

### History:

Received : 2 March 2026  
Revised : 2 March 2026  
Accepted : 4 March 2026  
Published : 7 March 2026

**Publisher:** Horizon Edukasi Prima Indonesia

**Licensed:** This work is licensed under  
a Creative Commons Attribution 4.0 License



achievement at regional, national, and international levels. Among competitive sports, swimming is widely practiced across all these levels (Wahyuni & Hidayat, 2023).

Swimming requires not only technical skill but also a combination of strength, speed, endurance, and efficient movement to achieve optimal performance in competitions. Competitive swimming consists of several styles, including freestyle, breaststroke, backstroke, and butterfly (Saputra, 2024). This study focuses specifically on freestyle swimming due to its prominence in sprint events.

Freestyle swimming, the fastest and most popular style, allows swimmers to move efficiently while maintaining forward visibility (Manullang, 2015). Sprint distances in freestyle, such as the 50 m and 100 m, emphasize speed as the key performance factor, while middle and long distances (200–1500 m) additionally require endurance (Epriyani et al., 2022). Thus, the 100-meter freestyle, as a sprint event, strongly relies on speed.

Speed is a fundamental determinant of success in freestyle swimming, functioning both as a measure of performance and a predictor of competitive outcomes (Nursalam & Aziz, 2020). It is defined as the ability to move rapidly within a short period, reflecting an athlete's power and efficiency in stroke execution (Zulfata et al., 2020). One of the main factors influencing swimming speed is arm muscle strength. Strong arm muscles allow swimmers to perform faster and more efficient strokes, directly impacting sprint performance (Batubara & Ridlo, 2024). Conversely, weak arm strength can reduce stroke effectiveness and limit speed (Handayani, 2018).

Observations at Almagary Challenge Swim Palembang on January 20, 2025, revealed that most athletes could perform only 4–6 push-ups and showed suboptimal arm movement during 100-meter freestyle drills, highlighting insufficient arm muscle strength as a barrier to maintaining speed. This issue aligns with findings from previous studies that indicate a lack of upper body strength reduces swimming performance in sprint events (Khairana et al., 2024).

Dryland strength training, such as land pulley exercises, has been shown to improve arm muscle strength and sprint performance in swimmers (Ramadhani & Heri, 2018; Kembaren & Novita, 2024). Previous research demonstrates that land-based training interventions can significantly enhance upper body strength, muscular explosiveness, and sprint swimming performance in adolescents (Fadillah et al., 2021; Putra & Lestari, 2022; Ardiansyah & Sari, 2023). These studies suggest that integrating dryland training with in-water practice is an effective strategy to improve freestyle sprint performance.

Based on the above, this study aims to investigate the effect of land pulley training on the speed of the 100-meter freestyle swimming in athletes of Almagary Challenge Swim Palembang. The research seeks to determine whether targeted land-based arm strength training can enhance sprint performance and contribute to competitive success.

## 2. METHOD

This research employed an experimental approach, specifically utilizing a pre-experimental design with a one-group pretest-posttest model. The study involved five athletes who were selected through purposive sampling, a technique based on specific criteria and considerations for participant selection (Sugiyono, 2016). Data collection was conducted at the Almagary Challenge Swim Palembang club, using instruments designed to measure the athletes' performance in the 100-meter freestyle. Following data acquisition, statistical analysis was performed in two stages:

1. Assumption testing, which included:
  - a) Normality testing using the Shapiro-Wilk method to assess whether the data distribution met parametric assumptions.
  - b) Homogeneity testing using Levene's test to evaluate the consistency of variances across measurements.
2. Hypothesis testing, conducted using the Paired Sample T-Test, to determine whether there was a statistically significant difference in 100-meter freestyle speed before and after the intervention.

This design allows for the assessment of the impact of land pulley training on sprint swimming performance while controlling for individual baseline differences among the selected athletes.

## 3. RESULT AND DISCUSSION

### *Result*

The research conducted at the Almagary Challenge Swim club in Palembang, totaling 16 meetings including pretest and posttest, was completed by the researcher on September 12, 2025 and obtained the following results.

**Table 1.** *Tabulation of Research Results Data*

No	Athlete Name	Test Results		Ascension
		<i>Pretest</i>	<i>Posttest</i>	
1	Responden 1	0:01:17,66	0:01:15,49	0:00:02,17
2	Responden 2	0:01:26,38	0:01:24,63	0:00:01,75
3	Responden 3	0:01:26,64	0:01:24,41	0:00:02,23
4	Responden 4	0:01:32,19	0:01:29,50	0:00:02,69
5	Responden 5	0:01:34,81	0:01:31,10	0:00:03,71
Rate-rate		0:01:27,54	0:01:25,03	0:00:02,51
Minimum		0:01:17,66	0:01:15,49	
Maksimum		0:01:34,81	0:01:31,10	

Based on the data tabulation above, it is known that of the 5 athletes, there is 1 athlete who has swimming results that can be categorized as the fastest time, namely respondent 1 with a time of 0:01:17.66. Furthermore, there is also an athlete who has the slowest swimming results or is in last place, namely for 0:01:34.81 obtained by respondent 5. Similarly to the pretest results, when the final test (posttest) was carried out, the results obtained were that respondent 1 remained in first place reaching the finish with a time of 0:01:15.49, and for the final position or slowest time was still occupied by respondent 5, namely for 0:01:31.10.

In addition, the data in Table 1 also contains the average time obtained by the athletes during the 100-meter freestyle swimming pretest, which is 0:01:27.54. Then, for the average time obtained during the posttest, which is 0:01:25.03. Thus, it can be indirectly seen that the posttest results have increased compared to the pretest results, with an average increase of 0:00:02.51. Furthermore, to find out the results of the study and their interpretation in more detail, can be seen in the following data analysis results, including; prerequisite tests (normality and homogeneity tests) and hypothesis tests (paired sample t-test).

### 1. Normality Test

The following are the results of the normality test on the swimming results (pretest-posttest) of 5 athletes from the Almagary Challenge Swim Palembang using SPSS version 22.

**Table 2.** Normality Test Results

	<i>Tests of Normality</i>					
	<i>Kolmogorov-Smirnov<sup>a</sup></i>			<i>Shapiro-Wilk</i>		
	<i>Statistic</i>	<i>Df</i>	<i>Sig.</i>	<i>Statistic</i>	<i>Df</i>	<i>Sig.</i>
<i>Pretest</i>	,230	5	,200*	,940	5	,669
<i>Posttest</i>	,260	5	,200*	,907	5	,452

Based on the formula used in conducting the normality test as explained in the previous chapter, namely Shapiro-Wilk, it can be seen that the data listed in table 2 above, both pretest and posttest data, can be categorized as normally distributed because they have a significance value of 0.669 and 0.452 or >0.05.

### 2. Homogeneity Test

The results of the homogeneity test on the pretest and posttest data of the five Almagary Challenge Swim Palembang athletes using the Levene formula with the help of SPSS version 22 can be seen in the table below.

**Table 3.** Results of Homogeneity Test

<i>Test of Homogeneity of Variances</i>			
<b>Hasil Renang</b>			
<i>Levene Statistic</i>	<i>df1</i>	<i>df2</i>	<i>Sig.</i>
,051	1	8	<b>,827</b>

Looking at the results in Table 3 above, we can see that the significance value is  $>0.05$ , or 0.827. Therefore, it can be concluded that the data obtained is homogeneous.

### 3. Hypothesis Testing

Hypothesis testing in this study used the Paired Sample T-Test formula. More detailed data analysis results can be seen in the following table.

**Table 4.** Hypothesis Test Results

		<i>Paired Samples Test</i>							
		<i>Paired Differences</i>							
		<i>Mean</i>	<i>Std. Deviation</i>	<i>Std. Error Mean</i>	<i>95% Confidence Interval of the Difference</i>		<i>T</i>	<i>df</i>	<i>Sig. (2-tailed)</i>
					<i>Lower</i>	<i>Upper</i>			
<i>Pair 1</i>	<i>Pretest - Posttest</i>	0:00:02,510	0:00:00,749	0:00:00,335	0:00:01,580	0:00:03,440	7,493	4	<b>,002</b>

Based on the hypothesis test results table above, it is known that the significance value (2-tailed) is 0.002 or  $<0.05$ . Referring to the basis of decision-making, from these results it can be concluded that  $H_0$  is rejected and  $H_a$  is accepted. In other words, there is a significant effect of land pulley training on the 100-meter freestyle swimming speed of Almagary Challenge Swim Palembang athletes.

### Discussion

This study aimed to examine the effect of land pulley training on the 100-meter freestyle swimming speed of athletes at the Almagary Challenge Swim Palembang. From the total of 19 athletes, five were selected as participants based on predetermined purposive sampling criteria. The analysis of the collected data demonstrated that the proposed hypothesis was supported, indicating a significant positive effect of land pulley training on the 100-meter freestyle performance of the sampled athletes.

To contextualize these findings, the results were compared with relevant previous studies. Khairana et al. (2024) reported that land pulley training significantly enhanced the speed of 50-meter freestyle swimming, aligning with the outcomes of this study. Similarly, Irmayanti (2024) found a significant improvement in 50-meter freestyle performance following a pulley-based training program.

Further supporting evidence comes from Tarigan (2021), who concluded that elastic rubber training, conducted both on land and in water, had a significant impact on the 50-meter crawl speed of male swimmers aged 14–15 years at the Dolphin Swimming Club, Binjai. Beyond freestyle performance, land pulley training has also been shown to enhance arm muscle power, which in turn improves performance in other strokes, such as the butterfly. This was demonstrated in the study by Mulyani (2023), titled “*The Effect of Training Using Land Pulleys on Increasing Arm Muscle Power and Its Implications for 50-Meter Butterfly Speed*”, conducted on advanced athletes at the Sukapura Swimming Club, Tasikmalaya.

In summary, these findings indicate that land pulley training has a significant positive impact on swimming speed, not only in 50- and 100-meter freestyle events but also in other strokes such as butterfly. The results from the athletes at Almagary Challenge Swim Palembang confirm that land pulley exercises can serve as effective training aids, enhancing arm strength and improving sprint performance in competitive swimming.

#### **4. CONCLUSION**

Based on the results of the previous research and discussion, the researcher can conclude that the significance value (2-tailed) of the land pulley group  $<0.05$  or only 0.002 which means  $H_0$  is rejected and  $H_a$  is accepted, in other words there is a significant effect of land pulley training on the speed of 100 meters freestyle swimming in Almagary Challenge Swim Palembang athletes. As for suggestions for further researchers, it is hoped that they can consider and conduct more specific research on various problems experienced by athletes and affect their performance.

#### **5. ACKNOWLEDGEMENT**

The author would like to express his deepest gratitude to himself for successfully completing this article to the maximum and on time. Furthermore, the author would also like to thank the supervisors, Mr. Dr. Jujur Gunawan Manullang, M.Pd and Mrs. Dr. Widya Handayani, S.pd., M.Si, who have taken the time to provide guidance and direction during the process of writing this article. Then, thank you also to Almagary Challenge Swim Palembang for providing the convenience and opportunity to collect data for this article.

Finally, the author would like to thank Melisa Andini, whose unwavering support spanned the entire process from start to finish. Hopefully, this article will be beneficial to many, especially the Almagary Challenge Swim Palembang club, coaches, and athletes.

## 6. REFERENCES

- Batubara, C. F., & Ridlo, A. F. (2024). The effect of arm muscle power training, push up, dumbbell swing, and hand walking on 50 meter freestyle swimming speed in the Al-Muslim Middle School swimming extracurricular. *Monotion: Jurnal Riset Physical Education*, 14(2), 99–105. <https://doi.org/10.33558/motion.v14i2.10030>
- Edith Cowan University. (2018). *Dryland strength training to enhance swimming performance* [Undergraduate thesis]. <https://ro.ecu.edu.au/cgi/viewcontent.cgi?article=3011&context=theses>
- Epriyani, I., Imansyah, F., & Akhbar, M. T. (2022). The effect of weight training using water rubber on the waist on the 50 meter freestyle swimming speed of PPLPD athletes in Musi Banyuasin Regency. *Jurnal Penjaskesrek*, 9(2), 1–15. <https://doi.org/10.46244/penjaskesrek.v9i2.1887>
- Exercise Med. (2020). Dry-land strength training effect on 50 and 100 m freestyle performance. *Exercise Medicine Journal*. <https://www.exercmed.org/m/journal/view.php?doi=10.26644/em.2020.004>
- Handayani, W. (2018). The relationship between hand-eye coordination and arm muscle strength with the accuracy of forehand serve results in badminton games among extracurricular participants at SMA Negeri 2 Kayuagung. *Wahana Didaktika: Jurnal Ilmu Kependidikan*, 16(2), 256–266. <https://doi.org/10.31851/wahanadidaktika.v16i2.2052>
- Irmayanti, S. (2024). The effect of pulley training on 50 m freestyle swimming ability in terms of arm muscle strength in Makassar Potere swimming athletes [Undergraduate thesis, Makassar State University]. <https://lib.unm.ac.id/layanan/karya-ilmiah/pengaruh-latihan-kontrol-terhadap-kemampuan-renang-gaya-bebas-50-m-ditinjau-kekuatan-otot-lengan-pada-atlet-renang-potere-makassar>
- Kembaren, A. A. S., & Novita, N. (2024). The contribution of knee tuck jump and stretch cords training to the results of the 50 meter breaststroke swimming in male athletes of age group II Club Tirta Prima Medan. *Jurnal Jendela Ilmu Olahraga*, 95–106.
- Khairana, A. F., Sutresna, N., & Kardjono, K. (2024). The effect of training using land pulley aid with hand paddle on swimming speed in 50 meters freestyle. *Long-Term Development in Sport and Physical Activity (LTSDPA)*.
- Manullang, J. G. (2015). *History of basic swimming techniques and swimming competition rules*. Noer Fikri. <https://www.researchgate.net/profile/Jujur-Manullang/publication/354783358>
- Mulyani, L. (2023). The effect of training using a land pulley on increasing arm muscle power and its implications on swimming speed in the 50 meter butterfly stroke [Undergraduate thesis, Siliwangi University].
- Nugroho, W. A., Umar, F., & Iwandana, D. T. (2021). Improving 100-meter freestyle swimming speed through interval training in para-swimming athletes of the Indonesian Special School for Sports for the Disabled (SKODI). *Jurnal MensSana*, 6(1), 56–65. <https://doi.org/10.24036/MensSana.06012021.20>

- Nursalam, H., & Aziz, I. (2020). Contribution of leg muscle strength endurance and arm muscle strength endurance to 100 meter freestyle swimming speed. *Jurnal Patriot*, 2(1), 233–243. <https://doi.org/10.24036/patriot.v2i1.559>
- Ramadhani, S., & Heri, Z. (2018). The difference in the effect of hip belt cords training and dryland cords training on freestyle swimmers. In N. Simatupang & I. Akhmad (Eds.), *Improving the quality of teachers and learning in physical education, sports, and health* (pp. 659–664). Faculty of Sports Science, State University of Medan. <https://digilib.unimed.ac.id/id/eprint/35752>
- ResearchGate. (2021). Peningkatan kecepatan renang 100 meter gaya bebas melalui latihan interval akuatik. <https://www.researchgate.net/publication/356331000>
- Saputra, D. A. (2024). The effect of warm-up duration on 50 meter freestyle swimming speed in Almagary Challenge Swim Palembang athletes [Undergraduate thesis, PGRI University of Palembang]. <http://eprints.univpgri-palembang.ac.id/402/>
- ScienceDirect. (2019). Effects of dry-land strength training on competitive sprinter swimmers. *Journal of Exercise Science & Fitness*. <https://www.sciencedirect.com/science/article/pii/S1728869X19300565>
- Santoso, I. (2022). *Sport and physical activity for health and well-being*. Jakarta: PT Remaja Rosdakarya.
- Sugiyono. (2016). *Metode penelitian pendidikan: Pendekatan kuantitatif, kualitatif, dan R&D* (23rd ed.). Alfabeta.
- Swim Design Space. (2023). Dryland training for swimmers: Building strength outside water. <https://www.swimdesignspace.com/blog/dryland-training-for-swimmers>
- Tarigan, Y. K. (2021). The effect of training using elastic rubber on land and in water on the 50-meter crawl swimming speed [Undergraduate thesis, Medan State University]. <https://digilib.unimed.ac.id/id/eprint/48112/>
- Thaksin University Journal. (2021). The effects of a dry-land training program on muscle strength, freestyle 100 m, and IGF-I in youth swimmers. *Thaksin University Journal*. <https://he02.tci-thaijo.org/index.php/TNSUJournal/article/view/244490>
- Zulfata, R., Purwanto, B., & Harlina, H. (2020). Modified warm-up method shortens 50-meter freestyle swimming time. *Jurnal Segar*, 8(2), 96–102. <https://doi.org/10.21009/segar/0802.06>