

Recorded freestyle swim times after a training program among Bina Tirta Utara athletes

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ARTICLE INFO	ABSTRACT
Article history: Received: 29 September 2026 Revised: 05 October 2026 Accepted: 16 October 2026 Keywords: Freestyle swimming Time trial Training Youth athletes Data verification	This study re-examines pretest and posttest swim times for 20 athletes at Bina Tirta Utara, North Jakarta, following a training period described in an undergraduate thesis as an upper-limb-strength intervention. The thesis states a 100-m freestyle outcome, but its posttest table is headed 50 m and the race distance is not independently documented. Twenty named records can be paired across the two score tables. Mean time fell from 48.15 s (SD 2.99) to 46.68 s (SD 3.14), a mean decrease of 1.47 s (95% CI 1.07–1.87). A recalculated paired t-test gives $t(19) = 7.744$, $p < .001$; 19 athletes recorded shorter times and one was unchanged. The source also describes push-up and handgrip tests, yet provides no individual strength results or reproducible training load. Its reported test output uses $df = 29$ rather than 19. The observed within-group time change is clear in the printed records, but the event distance and intervention details must be verified before attributing the change to upper-limb strengthening.

I. Introduction

Freestyle performance over a fixed distance is commonly expressed as elapsed time. A lower time indicates a faster completed trial when the distance, course, start procedure, and timing method are the same. During front crawl, propulsion and drag depend on coordinated arm and leg actions, body position, breathing, starts, and turns. Strength training can be one part of a program, but a change in trial time cannot by itself identify which physical or technical component changed.

The source thesis was conducted in the Bina Tirta Utara swimming club in North Jakarta. It describes a practical concern that some athletes were not achieving the desired freestyle speed and that training organization could be improved. The stated purpose was to assess the influence of upper-limb strength exercises on a 100-m freestyle time. The report adopted a single-group before–after design among 20 active swimmers. These features can document change over the study interval, although they cannot isolate the training from ordinary swim practice, learning the trial, maturation, or other activities.

The broader evidence is mixed enough to make precise reporting important. An eight-week randomized trial among adolescent swimmers found additional freestyle improvement with dryland strength training compared with swimming alone (Alshdokhi et al., 2020). In contrast, Norberto et al. (2023) found no additional improvement in water performance across two dryland models in their study. Another investigation of competitive sprinters reported improved strength and swim performance after combined training, but intervention context and training content matter (Lopes et al., 2021). These studies differ in age, volume, and comparator design; none licenses an automatic causal conclusion from a single group of 20 swimmers.

Research question and outcome definition

The central empirical question is whether the 20 printed paired times were shorter at the final test than at the first test. The thesis uses the phrase “increased speed,” but the recorded variable is time in seconds. A faster performance corresponds to a lower number. The article therefore reports a reduction in elapsed time as the primary observed outcome. The distance cannot be fixed confidently from the supplied file: the title and pretest table say 100 m, whereas the posttest table column says 50 m. The result is presented as a freestyle time trial pending confirmation that both measurements covered the same distance.

This distinction is more than a typographical detail. A 100-m and a 50-m trial are not directly comparable, and an apparent time reduction could reflect a shorter course. The printed times around 40–51 seconds warrant inspection of the original stopwatch sheets and pool-lap log, especially because the methods describe a 25-m pool. This article does not substitute an inferred distance merely because one label appears more often. The author should confirm the number of lengths completed at both tests before a journal submission states a 100-m result.

Upper-limb strength and freestyle performance

The forearm and hand interact with the water during the catch and pull, while shoulder and trunk coordination help transmit force and maintain alignment. A dryland exercise can increase force production yet fail to transfer to water if it changes neither technical efficiency nor the timing of the propulsive stroke. Conversely, ordinary water training can improve time without a change in dryland strength. A study seeking to test the strength mechanism should measure strength and swimming performance at both times and report their individual-level relationship. The source thesis specifies push-ups and handgrip tests but does not supply usable strength results in its results section.

The thesis also alternates between “arm strength,” a “freestyle speed program,” and general swim training when describing the treatment. The precise exercises, resistance, volume, progression, supervision, and adherence are not established in a session-by-session table. The intervention can therefore be described as the reported training period, not as a

fully reproducible upper-limb protocol. This is an important limit on both interpretation and practical replication.

II. Method

Design, setting, and participants

The study used a one-group pretest–posttest design at Bina Tirta Utara. The thesis states that 40 athletes were active in the club and 20 were selected for testing. The criteria mentioned include active participation, being physically able to train, and willingness to take part; the sampling method and numbers screened or excluded are not fully explained. The table lists athletes of both sexes and varying ages, but several reported sex and age labels conflict with names or dates of birth. To protect the young participants and avoid reproducing inaccurate personal attributes, this article uses only anonymous numbered score pairs.

The results chapter gives a pretest date of 20 April 2026 and a posttest date of 10 June 2026. Another sentence calls the study period 23 April to 10 June. The methods specify 16 meetings, twice each week on Monday and Wednesday from 16:00 to 18:00, whereas the results say three sessions weekly and elsewhere call the treatment 14 sessions. The coherent interpretation may be 14 training meetings plus two tests, but the source does not explicitly reconcile the schedules. Table 1 records these discrepancies rather than choosing an unverified timetable.

Item	Source statement	Status for article
Design	One group with pretest and posttest	Consistent across main sections
Participants	20 of 40 club athletes	20 matching names in both score tables
Trial distance	100 m in title and pretest; 50 m in posttest header	Requires original test log
Meetings	16 total; also 14 treatments	Clarify tests versus sessions
Weekly frequency	Twice weekly in methods; three times in results	Requires session log
Strength outcome	Push-up and handgrip tests described	No usable results reported

Table 1. Study facts and unresolved details carried forward from the source thesis.

Testing procedure

The methods describe a 25-m pool, two digital stopwatches, a whistle, a ten-minute warm-up, a start from a block or the pool edge, and a timed freestyle effort. Athletes were said to receive two attempts, with the best time retained. The document mentions a timer at 50 m and another at 100 m but does not provide split times or explain the timing reconciliation. Water

conditions, lane allocation, rest between trials, and whether the same start method was used at both assessments were not documented.

A push-up test for one minute and handgrip dynamometry were proposed as measures of upper-limb function. The procedure describes three maximal grips with each hand and an average result, but neither the individual scores nor pretest/posttest summary values are present in the accessible results. A one-minute push-up count represents repeated muscular effort; a handgrip score emphasizes grip force. Neither should be treated as proof of improved arm strength in this cohort without the actual observations.

Data extraction and analysis

The pretest and posttest tables contain the same 20 athlete names in the same order. Times were transcribed from the two tables, converted from decimal commas to decimal points, and paired using the matching names. The article presents anonymized IDs 01–20. A time improvement is defined as pretest minus posttest, giving a positive number for a shorter final time. The mean and sample standard deviation of each measurement, the mean paired difference, and a 95% confidence interval were calculated directly from the printed values.

A two-sided paired-samples t-test evaluates whether the mean difference differs from zero. The Shapiro–Wilk test was applied to the 20 paired differences, the relevant distribution for this test. The threshold was .05. The thesis reports a table labeled paired test with $df = 29$ and a “test value = 0,” which cannot be the paired test for 20 athletes. This article recalculates the analysis instead of copying that output. A homogeneity test between the pretest and posttest score sets is not required for a paired t-test.

A statistical difference in elapsed time is not equivalent to a causal estimate of the training effect. There was no group that continued ordinary swim training without the described program, and neither the water training load nor attendance was quantified. The results section therefore reports the observed within-athlete change and then discusses plausible alternative explanations. The distance-label conflict further constrains interpretation until the measurement record is checked.

III. Results and Discussion

Freestyle trial times

Across 20 athletes, the pretest average was 48.148 seconds (SD 2.990; range 42.03–51.34). The posttest average was 46.678 seconds (SD 3.138; range 40.28–49.99). The average paired reduction was 1.471 seconds (SD of reductions 0.849). Nineteen records had a shorter final time and one record had the same time at both tests. The individual reductions ranged from 0 to 3.56 seconds. Table 2 summarizes the two distributions and the paired analysis.

Measure	n	Mean (s)	SD (s)	Range (s)
Pretest	20	48.148	2.990	42.03–51.34

Posttest	20	46.678	3.138	40.28–49.99
Pretest – posttest	20	1.471	0.849	0.00–3.56

Table 2. Recalculated times from the 20 matched names printed in the thesis.

The recalculated paired t statistic was $t(19) = 7.744$ with $p < .001$. The 95% confidence interval for the mean reduction was 1.073 to 1.868 seconds. The Shapiro–Wilk test of paired differences gave $p = .552$. These analyses describe a consistent within-group reduction in recorded time. They do not verify that the two tests used the same race distance or isolate the arm-strength component from regular swim training.

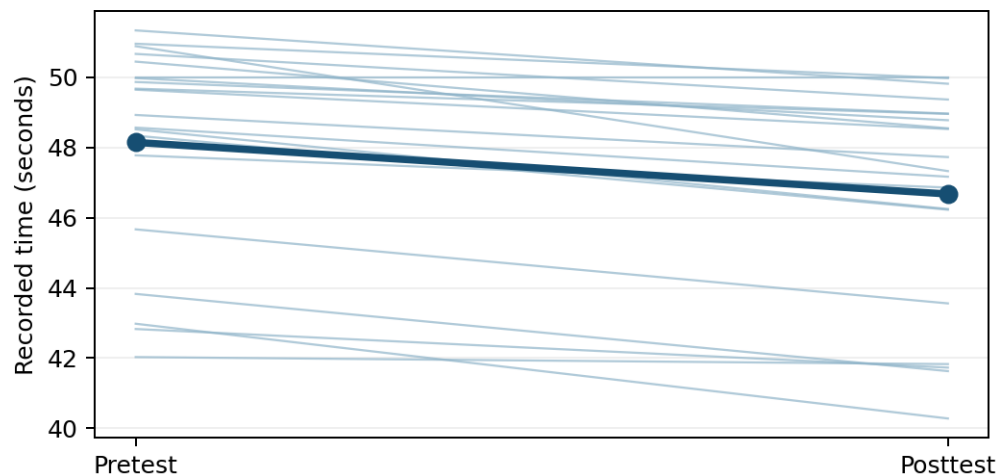


Figure 1. Twenty matched time records; the dark line links the two group means.

Individual pattern and data audit

A group average can conceal whether a result depends on a small number of swimmers. Table 3 shows the anonymous paired times from the printed thesis tables. Most changes were around one to two seconds, with a few larger improvements. One athlete had identical 49.99-second times. All rows use the same names for matching, despite some inconsistent sex labels elsewhere in the source. The table permits direct checking of the mean and the t test without disclosing participant names.

ID	Pretest (s)	Posttest (s)	Reduction (s)
01	43.83	41.63	2.20
02	42.98	40.28	2.70
03	45.67	43.56	2.11
04	48.34	46.23	2.11
05	42.03	41.83	0.20
06	50.67	49.37	1.30
07	47.78	46.86	0.92
08	49.87	48.97	0.90

09	49.65	48.53	1.12
10	48.57	47.17	1.40
11	49.68	48.96	0.72
12	48.93	47.73	1.20
13	50.96	49.98	0.98
14	42.83	41.73	1.10
15	49.98	48.78	1.20
16	48.52	46.25	2.27
17	50.89	47.33	3.56
18	49.99	49.99	0.00
19	50.45	48.55	1.90
20	51.34	49.82	1.52

Table 3. Anonymized paired trial times; shorter posttest time means faster performance if distance is identical.

The thesis output giving $t = 78.761$, $df = 29$, and a mean difference of 46.779 resembles a one-sample comparison of times with zero, not a test of 20 paired pretest–posttest differences. A second row with $df = 29$ and mean difference 1.500 is also incompatible with the sample size. The document’s normality narration gives $p = .022$ and $.026$ while calling the distributions normal; those values are below $.05$ under its own criterion. The recalculated difference distribution, rather than the marginal scores, supports the paired test reported here. These errors require correction in the source analysis file.

Interpreting the observed change

The reduction in recorded times is a finding about this cohort across two dates. It can arise from adaptation to training, improved pacing, better starts or turns, increased familiarity with the timed task, changes in effort, or a combination. Front crawl performance depends on stroke technique, body alignment, breathing, leg kick, and fitness in addition to upper-limb force. Since the manuscript does not report a measured increase in push-up or handgrip scores, the proposed strength mechanism cannot be tested within these data.

The study period was about seven weeks between the stated test dates. Fourteen training sessions over that interval would average roughly two per week, whereas a statement of three per week would imply a different exposure. Without attendance and training logs, neither can be treated as the verified dose. The description also shifts between arm-focused exercises and broader swimming practice. A journal article should name exercises, sets, repetitions, rest intervals, progression, and regular in-water training so that readers can understand what differed from usual practice.

The most consequential uncertainty remains trial distance. If both assessments were truly 100 m, a reduction in seconds may be interpreted as a better 100-m time, subject to the design

limitations. If the posttest header of 50 m accurately identifies that test, the two means are not commensurate and the statistical comparison has no valid performance interpretation. The current document cannot distinguish these cases. No final article should call the outcome “100-m speed” without the original pool-length and lap-count records.

Context from controlled studies

Alshdokhi et al. (2020) assigned adolescent swimmers to dryland strength plus swim training or swimming only and found additional freestyle improvement in the combined group. The comparator helps separate a contribution of added strength work from ordinary practice more clearly than the present design. The intervention duration and swimmer profile differ from Bina Tirta Utara, so its effect size cannot be transferred directly. It does indicate that an appropriately specified dryland component is a testable hypothesis.

Norberto et al. (2023) reported that two dryland approaches did not improve water performance beyond the comparison condition, illustrating that strength gains need not translate automatically to a faster swim. Lopes et al. (2021) studied competitive sprinters in a combined dryland and swimming program and discussed strength and 50-m and 100-m outcomes. Taken together, the original studies support a balanced interpretation: context, technique, training specificity, and comparator design matter. The present single-group change is compatible with several explanations and cannot resolve the broader debate.

Implications for coaching

A coach can use time trials to monitor an individual swimmer when distance and procedures are standardized. Repeating the same pool length, number of laps, start, timing method, warm-up, and rest conditions makes a time difference easier to interpret. If the objective is to evaluate strength training, strength tests should be recorded at the same two dates and linked to the athlete’s trial result. Improvement in a push-up count or handgrip value would still not prove mediation, but it would establish whether the intended physical outcome changed.

For younger athletes, training progression and recovery are central to safe, reproducible coaching. The thesis lists a wide age range and one common program without age-specific intensity or individual attendance. A future protocol should describe supervision and adaptation to skill level, as well as the existing water workload. This would let coaches distinguish an achievable training plan from a general recommendation to practise more often.

Limitations and reporting priorities

The absence of a comparison group is a design limitation: maturation, familiarization, and concurrent training are not controlled. The sample includes 20 athletes from one club, and selection from a stated population of 40 is incompletely explained. Sex and age fields contain inconsistencies; the present analysis does not use them. The test distance discrepancy is a

potential measurement failure, not a minor editorial issue. The strength outcome and intervention load are unavailable, restricting the paper to recorded time changes.

The source names young athletes. Any publication should omit names, dates of birth, and photographs unless properly justified and authorized. The article uses anonymized IDs and does not invent ethics approval, parental consent, or participant assent. The author must verify school or club permission, guardian permission, assent, and data access arrangements from original documentation before submission. The email of the corresponding author is also not present in the supplied thesis and must be provided by the author.

A stronger replication would use a swim-only comparison group, verified 100-m trial distance, consistent timekeeping, a logged upper-limb program, and complete strength and technical outcomes. Pre-specifying the main comparison would prevent confusion between a one-sample test and a paired change test. Repeated measurements after a follow-up interval could show whether any improvement was retained. These are recommendations for future research, not procedures claimed for this study.

Distribution of individual reductions

Figure 2 displays the twenty improvements as a distribution rather than only a mean. The presence of a zero change shows that the response was not universal, while the largest value of 3.56 seconds shows some heterogeneity. A response distribution is useful for a coach: if the same standard test is repeated, one can distinguish an athlete who improves little from one who responds more strongly. It is not possible here to explain those differences by age, sex, attendance, or initial skill because the metadata and exposure record are inconsistent or unavailable.

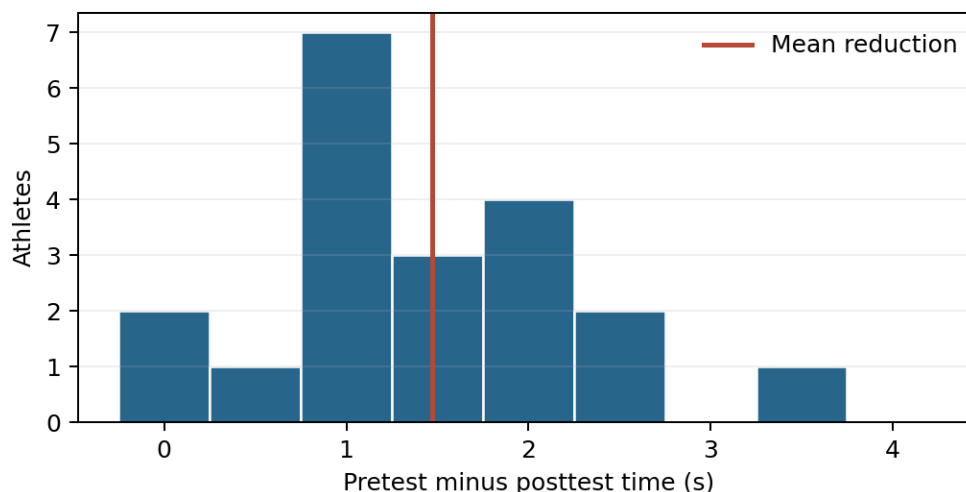


Figure 2. Distribution of reductions in recorded trial time across 20 athletes.

Why the event distance must be checked

The pretest table explicitly heads its score column “100 M Gaya Bebas,” and the posttest table is titled as a 100-m test while its internal score column says “50 M Gaya Bebas.” This mismatch makes two possibilities plausible: the internal heading is a copy-editing error, or the two tests were run over different distances. The thesis gives a 25-m pool and proposes one timer at 50 m and another at 100 m, but does not show split times, laps, or raw timing sheets. Neither possibility can be selected on the basis of formatting alone.

The magnitude of the recorded times is another reason for checking, not a substitute for checking. Athletes aged around late childhood to mid-adolescence can have widely varying capabilities, yet a group mean under 50 seconds over 100 m would imply a performance level that merits confirmation against competition or coach records. The same times are much easier to imagine over 50 m. This is an inference about plausibility, not evidence of the actual distance. The article deliberately avoids converting the times into metres per second, because the denominator is unresolved.

A minimal audit would retrieve the pretest and posttest session forms, identify the pool length, count the lengths for each swimmer, check whether the stopwatch started at the same signal and stopped at the same touch, and confirm that the second attempt was conducted under similar conditions. The race distance should then be corrected consistently in the thesis title, methods, tables, figures, and journal article. If the tests used different distances, the paired statistical result must be withdrawn and new comparable measurements collected. This issue is a condition of substantive validity, not merely a journal style requirement.

Statistical meaning and practical scale

The paired mean difference has a clear arithmetic definition: for each name, subtract the final recorded time from the initial recorded time, then average the 20 values. Its standard error is approximately 0.190 seconds; dividing 1.471 by that standard error yields the recalculated *t* statistic of 7.744. The confidence interval of 1.073 to 1.868 seconds indicates that a zero mean difference is inconsistent with these paired values under the statistical model. It does not account for systematic differences in timing procedure or distance between sessions.

A percentage expression could be computed by dividing 1.471 by the initial group mean 48.148, giving about 3.05%. That number is interpretable only when both time points measure the same event and the timing protocol is comparable. It is not an estimate of an intervention effect against a control group. Reporting the absolute seconds remains more transparent while the distance is unverified. The article also refrains from introducing an effect size whose interpretation could distract from the central measurement issue.

The original normality discussion mixes marginal distributions and the paired-change assumption. A Shapiro–Wilk *p* value of .552 for the 20 differences does not show a strong departure from normality, although a small sample limits sensitivity. The paired *t*-test is generally a model for the mean difference, not a test that the entire pretest and posttest datasets

each pass a normality threshold. The source values .022 and .026, if they are indeed normality p values, would lead to rejection under a strict .05 rule, contrary to the thesis narrative. The present analysis states exactly which vector was tested.

Separating a training package from an arm-strength effect

The thesis names arm-muscle strength as the independent variable, but a variable in an intervention study must be operationalized through a known exposure or dose. The methods mention push-ups and handgrip as tests, and the results refer to a swimming program with varied exercises, without a table specifying the actual strength sets completed by each athlete. Even if all time trials covered the same distance, the evidence would support “time improved during the training period” rather than “arm strength caused faster swimming.” The latter requires both an observed strength change and a design that limits competing explanations.

An arm-focused program could influence swimming through greater propulsive capacity during the underwater pull, but the relationship may depend on stroke technique, timing, and the athlete’s ability to apply force against water. A larger handgrip value would not by itself demonstrate more effective propulsion. Coaches could pair grip and push-up measures with stroke rate, stroke length, split time, and video review. Those additional outcomes would test a mechanism instead of assuming one from an overall race time. They were not available for this dataset.

Regular swimming is itself a meaningful exposure. Athletes in a club commonly continue technique practice, endurance sets, and starts or turns while taking part in a study. If those loads change over seven weeks, an added dryland effect cannot be separated without a comparison group or careful within-person training records. The controlled studies cited above differ from the thesis on precisely that point. The observed gain is useful as a local performance record, while the strength-specific claim remains an open hypothesis.

A reproducible follow-up protocol

A follow-up could pre-register 100-m freestyle time as the primary outcome, conducted in the same 25-m pool with four documented lengths, an identical start procedure, electronic or dual stopwatch timing, and a fixed recovery interval between attempts. A swim-training-only comparison group would clarify the additional contribution of the strength component. Recording age and prior experience accurately would allow transparent description of the sample without publishing identifying information.

The dryland sessions should specify exercise selection, sets, repetitions, resistance, progression, rest, and the number of sessions attended. Pretest and posttest push-up and handgrip values can verify whether the intended physical capacities changed, while video-based stroke variables could indicate whether those changes translated to swimming technique. The reporting should include all recruited and analyzed athletes, missed sessions,

and reasons for any missing outcomes. Such a protocol would turn the practical coaching question raised by the thesis into a more decisive evaluation.

IV. Conclusion

The 20 matching pretest and posttest records in the thesis show a mean reduction of 1.47 seconds in recorded freestyle trial time, with 19 shorter final times and one unchanged time. Recalculated paired analysis gives $t(19) = 7.744$, $p < .001$. The performance meaning of this difference depends on confirming that both trials covered the same distance; the thesis alternately labels the outcome 100 m and 50 m. The source does not provide strength results or a reproducible intervention log, and a one-group design does not establish that upper-limb training caused the change. Verification of the test log and original data is essential before journal submission.

Acknowledgment

The author should complete funding, club permission, and contributor acknowledgments from verified records.

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