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The Effect of Maltodextrin Supplementation on Anaerobic Power of Rowing Athletes

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Abstract
Maltodextrin, a high-glycemic carbohydrate, is believed to maintain energy and delay muscle fatigue in rowing, a sport that relies on both aerobic and anaerobic energy sys-tems. The purpose of this study was to evaluate the effectiveness of maltodextrin supplementation in maintaining energy and anaerobic performance in rowing athletes. The research with a randomized pretest–posttest control group design involved eight rowing athletes from West Bandung Regency, divided into an experimental group (receiving 0.25 g/kg maltodextrin) and a control group (water). The main instrument used is the Concept-2 rowing ergometer which is equipped with a digital monitor to record power output, stroke rate, and mileage for each sprint. Data were analyzed descriptively to see the mean and difference between groups, followed by the Shapiro–Wilk normality test and the Levene homogeneity test. The results showed that maltodextrin supplementation did not have a statistically significant effect on the increase in anaerobic power of rowing athletes, but physiologically had a positive ef-fect on performance. The group that received maltodextrin had a lower fatigue index (13.5%) than the control group (17.6%), indicating a better ability to maintain strength during repeated sprints. Conclusion This study showed that maltodextrin supplemen-tation at a dose of 0.25 g/kg body weight given two hours before activity had a practi-cal positive effect on the anaerobic power of rowing athletes in West Bandung Re-gency.

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INTRODUCTION

The sport of rowing requires endurance and muscle strength simultaneously with the contribution of the optimal aerobic and anaerobic energy systems, especially in the start, acceleration, and final sprint phases (Krings et al., 2016; Shirai et al., 2015). Rowing over 2000 meters requires a lot of power in a short time and endurance during the race, where the anaerobic system produces fast power while the aerobic system maintains performance (Hargreaves & Spriet, 2020; Khorshidi-Hosseini BCDFG et al., 2013). The use of rowing ergometers can increase the power output and performance of athletes through structured training (Gavala-González et al., 2024; Maughan et al., 2018), with physiological variables such as VO_2max also playing an important role (Battista et al., 2007; Mikulić, 2008; Turner et al., 2021).

Anaerobic power is essential for the explosive phases of rowing, especially at the start and final sprint, with the availability of glycogen as the main energy source of the anaerobic glycolysis pathway (Hargreaves & Spriet, 2020; Kordas et al., 2013). Low glycogen availability can decrease muscle contractions and accelerate fatigue (Roberts et al., 2014). Anaerobic power measurement through fatigue index is an indicator of the ability to maintain performance during intensive and repetitive activities (Jeukendrup, 2011; Podlogar & Wallis, 2020).

Maltodextrin, a complex carbohydrate with a high glycemic index, is quickly absorbed by the body and can increase blood glucose levels and delay muscle fatigue (Baker et al., 2015; Roberts et al., 2014). Maltodextrin supplementation before or during high-intensity activity has been shown to increase peak power, prolong muscle work duration, and lower fatigue index (Jeukendrup, 2011; Khorshidi-Hosseini BCDFG et al., 2013; Podlogar & Wallis, 2020). The combination of maltodextrin with other carbohydrates also accelerates energy recovery and reduces lactate accumulation (Teixeira Mamus et al., 2006), making it a potential fast energy source to support anaerobic performance in repeated sprint rowing (Kim & Kim, 2020).

Can maltodextrin increase the anaerobic power of row-ing athletes?

How does maltodextrin affect fatigue levels during repeated sprints?

Assess the effectiveness of maltodextrin in improving the anaerobic power of rowing athletes and measure the effect of maltodextrin on reducing fatigue during repetitive sprints.

(Khorshidi-Hosseini BCDFG et al., 2013) It shows that maltodextrin supplementation given before intense activity has been shown to increase anaerobic power and help lower muscle fatigue levels during re-peated sprint tests. The results of the study explained that maltodextrin is able to provide fast energy so that power performance is maintained when performing high-intensity activities.

Meanwhile, (Wilburn et al., 2020) It is report-ed that acute consumption of maltodextrin before in-tensive strength training may increase power output and maintain muscle workability in several sets of repetitive exercises. These findings reinforce the evidence that maltodextrin is effective in supporting repetitive anaero-bic power-required performance.

This study showed that maltodextrin supple-mentation at a dose of 0.25 g/kg of body weight given two hours before activity had a practical positive effect on the anaerobic power of rowing athletes in West Bandung Regency. Although the results were not statis-tically significant, the group receiving maltodextrin showed a lower fatigue index (13.5 compared to 17.6 in the control group), indicating a better ability to maintain repetitive sprint performance. Physiologically, maltodex-trin plays a role in increasing energy availability and maintaining blood glucose levels during intensive activi-ty, thereby delaying muscle fatigue.

These results support the use of maltodextrin as a nutritional strategy to improve anaerobic perfor-mance in rowing athletes, especially in sprint phases that require high anaerobic power. The study also confirms the relevance of maltodextrin as a fast energy source that can help the anaerobic energy system when muscle glycogen stores decline.

However, the limitations of this study are the small sample size (8 people) so the statistical power is low, and the short duration of administration of malto-dextrin may not be sufficient to elicit a real physiological adaptation. The positive effects of maltodextrin are expected to be greater when used over a longer period of time or at a larger volume of exercise.

In addition, it is recommended that future studies involve larger samples, longer duration of ad-ministration, as well as measurements of additional variables such as lactate levels and heart rate for more comprehensive and valid results.

The main novelty of this study lies in the practical evidence of maltodextrin supplementation as a nutritional strategy in supporting anaerobic power in rowing athletes through a reduction in fatigue index in repeated sprint tests, which has not been extensively researched specifically in the rowing athlete population in Indonesia.

METHODS

This study uses a quantitative approach with a true experimental design of the randomized pretest–posttest control group type. This design compares the results between the experimental group receiving the treatment and the control group receiving a placebo, with pre- and post-treatment measurements. (BULUS, 2021), This design effectively controls external variables through randomization.

The research was carried out at the West Bandung Regency Rowing Venue in August 2025, with the implementation of the main test using the Concept-2 rowing ergometer.

The study population is active rowing athletes in West Bandung Regency. Samples were selected purposively with the following criteria: age 15–22 years, exercise ≥6 months, healthy, and non-smoking. Based on these criteria, 8 athletes were obtained who were divided into experimental and control groups (4 people each) through matched-pair randomization based on VO_2max values.

The free variable is maltodextrine supplementation, while the bound variable is anaerobic power measured using the Repeated Sprint Rowing Test (RSRT) (Turner et al., 2021).

Participants underwent a pretest to determine VO_2max and physical condition equality. The experimental group received 0.25 g/kg of maltodextrin supplementation of body weight in 250 ml of water two hours before the test, while the control group consumed only the same volume of water. The test was carried out using the Repeated Sprint Rowing Test (RSRT), consisting of 6 sprints for 20 seconds with a 60-second passive break between sprints, using a rowing ergometer with maximum effort. The parameters measured include maximum power, minimum power, and fatigue index (FI). Before the test, participants warmed up for 10 minutes (light pedaling, dynamic stretching, two 5–7 second sprints), and after the test, active cooling and passive recovery were carried out ±50 minutes.

The main instrument used is the Concept-2 rowing ergometer which is equipped with a digital monitor to record power output, stroke rate, and mileage for each sprint. This instrument has high reliability for measuring anaerobic capacity in rowing athletes (Turner et al., 2021).

Data were analyzed descriptively to see the mean and difference between groups, followed by the Shapiro–Wilk normality test and the Levene homogeneity test. The difference between the experimental and control groups was tested using an independent t-test, with a significance level of $p < 0.05$.

RESULTS AND DISCUSSION

The research was conducted at the West Bandung Regency Rowing Venue in August 2025 with 8 active rowing athletes divided into two groups through matched-pair randomization. The experimental group was supplemented with 0.25 g/kg of maltodextrin in 250 ml of water two hours before the test, while the control consumed only the same volume of water. The test uses the Repeated Sprint Rowing Test (RSRT), consisting of 6 20-second sprints with a 60-second break, measuring maximum power, minimum power, and fatigue index (FI).

Table 1. Individual Results of Repeated Sprint Rowing Test.

Athlete Name	Group	Power Max (W)	Power Min (W)	FI (%)	Information
E.1	Experiment	585	542	7,3	Stabil
E.2	Experiment	556	426	23,3	Significant decline
E.3	Experiment	488	438	10,2	Stable
E.4	Experiment	450	391	13	Mild decline
C.1	Control	508	446	12,2	Stable
C.2	Control	600	450	25	Significant decline
C.3	Control	475	380	20	Significant decline
C.4	Control	462	402	13	Stable

The average fatigue index (FI) of the experimental group was lower than that of the control group, which showed a tendency for more stable anaerobic performance after taking maltodextrin.

Table 2. Average Results per Group

Group	Power Max (W)	Power Min (W)	FI (%)
Experiment	495	449	13,5
Control	510	420	17,6

The fatigue index value of the experimental group (13.5%) was lower than that of the control (17.6%), indicating a smaller decrease in repetitive sprint performance in athletes who took maltodextrin.

The p-values of the Shapiro-Wilk test for each variable in both groups (experiment and control) were all greater than 0.05. This means that the data ob-tained from each individual and the entire group is normally distributed or none deviates significantly. For exam-ple, the p-value for maximum power was 0.69 in the experimental group and 0.28 in the control group, indicating that the data in both groups was normal. Due to normal data, the results of the ath-letes' anaerobic performance measurements tended to be stable and homogeneous, without any extreme values due to maltodextrin treatment. However, since the sample was only 8 people (4 per group), additional analysis with non-parametric tests was also performed to rein-force the results. In short, this normality test ensures that the comparison of data between groups is reliable and fair, so the normality test looks at the p-value of each individual and the group as a whole to ensure that the data is worthy of further analysis with parametric statistical methods.

Homogeneity Test results, Levene's test showed $p > 0.05$ for all variables (P Max W = 0.752; P min W = 0.642; FI% = 0.930), so the variance between groups is homogeneous. This indicates the equiva-lence of variation between the experimental and con-trol groups at the initial condition, so that the differ-ence in posttreatment outcomes is more attributable to the effect of the treatment than the heterogeneity of variance between athletes.

The Difference Test (Independent Sample t-test) showed that the significance values for Maxi-mum Power ($p = 0.853$), Power Minimum ($p = 0.449$), and Fatigue Index ($p = 0.409$) were all greater than 0.05. This means that there was no statistically signifi-cant difference between the experimental and control groups on anaerobic power.

Some of the factors that can explain the results are because the small sample size ($n = 8$) causes low statistical power, so the average difference be-tween groups has not reached statistical significance. A short duration of administration of maltodextrin may not be sufficient to elicit a noticeable physiologi-cal adaptation. As a quick source of energy, maltodex-trin generally provides a more optimal effect on medi-um- to long-duration exercise or activity.

The results showed that maltodextrin supplementation did not have a statistically significant effect on the increase in anaerobic power of rowing athletes, but physiologically had a positive effect on performance. The group that received maltodextrin had a lower fatigue index (13.5%) than the control group (17.6%), indicating a better ability to maintain strength during repeated sprints. The findings are in line with previous research that stated maltodextrin can increase blood glucose and delay muscle fatigue (Jeukendrup, 2011; Roberts et al., 2014).

Maltodextrin acts as a fast energy source that supports the work of the anaerobic energy system when muscle glycogen decreases (Hargreaves & Spriet, 2020). In the sport of rowing, this is important because the sprint phase requires high anaerobic power (Shirai et al., 2015). Although not statistically significant, the practical effects of maltodextrin are potentially strong-er if used over a longer period or a larger volume of exercise (Maughan et al., 2018). This research supports the use of maltodextrin as a nutritional strategy to improve the anaerobic performance of rowing athletes theoretically and practically.

CONCLUSION

This study showed that maltodextrin supplementation at a dose of 0.25 g/kg body weight given two hours before activity had a practical positive effect on the anaerobic power of rowing athletes in West Bandung Regency. Although the statistical results were not significant, the group taking maltodextrin had a lower fatigue index (13.5%) compared to the control (17.6%), indicating a better ability to maintain repetitive sprint performance.

Physiologically, maltodextrin increases ener-gy availability and maintains blood glucose levels during intensive activity, thereby delaying muscle fatigue. The findings are beneficial for athletes' nutri-tion strategies, especially in sports with repetitive an-aerobic work such as rowing. Further research is rec-ommended with a larger sample, longer duration, and the addition of variables such as lactate levels and heart rate for more comprehensive results.

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