Analysis of traditional food perangi protein intake, energy and body mass index on power of student Sports Education and Training Center (PPLP) rowing Kendari athletes

Análisis de la ingesta de proteínas, la energía y el índice de masa corporal de los alimentos tradicionales perangi en la potencia de los atletas de remo del Centro de Educación y Entrenamiento Deportivo (PPLP) de Kendari

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Abstract

Introduction: this research contributes significantly to the development of sports nutrition strategies, particularly for adolescent athletes in training, to support optimal physical performance.
Objective: this study aimed to examine the effect of the consumption of traditional food proteins such as sashimi, energy intake and body mass index on the performance of rowing athletes in Kendari.
Methodology: this study employs an analytical observational cross-sectional design, with a sample of 46 athletes who have achieved national-level success in rowing. The instrument employed for the measurement of power was the vertical jump test. Data on traditional dietary protein intake and energy were obtained through the administration of a 2 × 24-hour food recall questionnaire, accompanied by characteristic interviews. Body weight and height were measured using a digital scale and a microtoice, respectively.
Results: the results of the analysis indicated a significant correlation between the consumption of traditional perangi food and protein intake ($p = 0.011$), as well as a negative correlation between body mass index and the power of rowing athletes ($p = 0.019$). However, no relationship was found between energy intake and rowing performance. It can be concluded from this study that as body mass index increases, the athlete's power decreases.
Discussion: in keeping with estimates, athletes with a higher protein intake have more power than those who are deficient.
Conclusions: this finding can help adolescent athletes plan their nutrition to improve rowing efficiency and performance.

Keywords

Body mass index; energy; power; protein; rowing athletes.

Resumen

Introducción: esta investigación contribuye significativamente al desarrollo de estrategias de nutrición deportiva, en particular para atletas adolescentes en entrenamiento, para promover un rendimiento físico óptimo.
Objectivo: este estudio tuvo como objetivo examinar el efecto del consumo de proteínas de alimentos tradicionales como el sashimi, la ingesta energética y el índice de masa corporal en el rendimiento de los remeros en Kendari.
Metodología: este estudio empleó un diseño analítico observacional transversal, con una muestra de 46 remeros que han alcanzado éxito a nivel nacional. El instrumento empleado para la medición de la potencia fue la prueba de salto vertical. Los datos sobre la ingesta de proteínas y energía de la dieta tradicional se obtuvieron mediante la administración de un cuestionario de recordatorio de alimentos de 2 × 24 horas, acompañado de entrevistas características. El peso corporal y la altura se midieron con una báscula digital y un microtoice, respectivamente.
Resultados: los resultados del análisis indicaron una correlación significativa entre el consumo de alimentos tradicionales perangi y la ingesta de proteínas ($p = 0{,}011$), así como una correlación negativa entre el índice de masa corporal y la potencia de los remeros ($p = 0{,}019$). Sin embargo, no se encontró relación entre la ingesta energética y el rendimiento en remo. De este estudio se puede concluir que, a medida que aumenta el índice de masa corporal (IMC), la potencia del atleta disminuye.
Discusión: según las estimaciones, los atletas con una mayor ingesta de proteínas tienen mayor potencia que aquellos con deficiencia.
Conclusiones: este hallazgo puede ayudar a los atletas adolescentes a planificar su nutrición para mejorar la eficiencia y el rendimiento en el remo.

Palabras clave

Atletas de remo; energía; indice de masa corporal; potencia; proteínas.

Introduction

Food, alongside clothing and shelter, constitutes one of the most fundamental human necessities (Pothiawala, 2015). It is a multifaceted entity composed of numerous essential nutrients vital for human sustenance and well-being (Gropper & Smith, 2013; Whitney et al., 2019). Despite its nutritional significance, consumers often prioritize the sensory attributes of food, particularly taste over its health-related benefits (Grunert, 2005). Moreover, the persistence and prominence of traditional foods within a given region play a pivotal role in shaping and reinforcing regional identity and cultural heritage (Alonso & O'Neill, 2009). These culinary traditions may be indigenous in origin or shaped by external influences, including migration and cultural exchange. This phenomenon is notably reflected in the traditional cuisines of the Buton, Muna, and Wakatobi regencies.

In the field of sports science, ensuring the fulfillment of athletes' nutritional requirements particularly regarding protein and energy intake is essential to support the physiological demands of high-intensity training and competition (Thomas et al., 2016). Protein plays a central role in the dietary regimen of athletes, serving critical functions in muscle synthesis, repair, and recovery following strenuous physical activity (Phillips, 2004; Tarnopolsky, 2004). Moreover, the assessment of nutritional status through indicators such as Body Mass Index (BMI) remains a key parameter in evaluating athletic readiness and performance, especially in disciplines where strength and endurance are paramount (Gabbett & Domrow, 2007).

The Kendari Rowing Student Sports Education and Training Center (PPLP) represents a leading institution in Indonesia dedicated to the development of young, high-potential athletes. Given the rigorous nature of their training routines, athletes at PPLP must maintain a precise balance between energy expenditure and nutritional intake to optimize performance outcomes. According to foundational sports training principles, physical conditioning must be accompanied by a diet that meets both macro- and micronutrient requirements to ensure sustained peak performance (Bompa & Fox, 1994).

Within this context, the quality of food preparation and nutritional content emerges as a decisive factor influencing athletic performance indicators such as energy availability, BMI regulation, and recovery capacity. Specific attention is drawn to the consumption of high-quality protein sources, including traditional Japanese preparations such as sashimi. These fish-based foods offer not only high palatability but also dense nutritional profiles that contribute positively to health and performance. The versatility of the fish used in these dishes allows for various culinary applications, while its nutrient composition supports the metabolic demands of athletes engaged in endurance sports such as rowing.

Despite the clear physiological benefits, many promising athletes remain unaware of the direct and measurable links between optimal nutrition, energy balance, BMI regulation, power output, and long-term athletic sustainability. A comprehensive understanding of these relationships is imperative for maximizing performance and preventing overtraining or injury. The nutritional composition of fish commonly utilized in these diets is outlined in Table 1 below, categorized by species to illustrate their respective contributions to an athlete's dietary needs.

Table 1. Nutritional Content of Tuna Fish by Type

	Type of Tuna Fish			
Composition	Bluefin	Skipjack	Yellowfin	Unit
Energy	121,0	131,0	105,0	g
Protein	22,6	26,2	24,1	g
Fat	2,7	2,1	0,1	g
Ash	1,2	1,3	1,2	mg
Calcium	8,0	8,0	9,0	mg
Phosphorus	190,0	220,0	220,0	Mg
Iron	2,7	4,0	1,1	Mg
Sodium	90,0	52,0	78,0	Mg
Retinol	10,0	10,0	5,0	Mg
Thiamin	0,1	0,03	0,1	Mg
Riboflavin	0,06	0,15	0,1	Mg
Niasin	10,0	18,0	12,0	Mg

In competitive rowing, athletes strive to outperform their opponents by maximizing stroke efficiency and muscular power output (Abidin & Adam, 2013; Tomschi et al., 2024). Weight regulation is particularly critical, as rowing competitions are typically classified according to age, gender, and weight categories (Arif, 2007; Dunford, 2006). This classification system often compels athletes to prioritize weight management strategies that may, in some cases, override optimal Body Mass Index (BMI) considerations. As noted by Schmidt and Wrisberg (2000), both structured training and appropriate dietary practices are pivotal to enhancing athletic performance.

According to Herbold and Eldestein (2012), energy requirements for athletes may increase by 30% to 100%, ranging from 3,000–6,000 kcal/day for males and 2,500–4,000 kcal/day for females. Protein demands are also elevated, with recommended intake ranging from 1.2 to 1.7 g/kg of body weight per day to support anabolic processes and recovery (Rodriguez et al., 2009). In strength- and power-oriented sports, athletes frequently attempt to enhance absolute power through the strategic reduction of body fat mass, aiming to optimize power-to-weight ratios.

Empirical findings by Welis et al. (2012) demonstrated an inverse correlation between elevated BMI and athletic performance, emphasizing the importance of maintaining an optimal body composition. Concurrently, training intensity has been identified as a key determinant of power development. Dewangga (2015) reported that increasing training intensity can substantially improve muscular power. Nutritional strategies during the training cycle are essential not only to mitigate fatigue and reduce injury risk but also to facilitate post-exercise recovery and long-term adaptation (Thomas et al., 2016).

From a physiological standpoint, muscular power is defined as the coordinated output of multiple muscle groups that generate rapid and forceful movements (Widiastusi, 2015). Data from the Kendari PPLP Rowing Program indicate that rowing athletes contributed to 37% of performance outcomes in 2023. This represented a significant decrease from 67% in 2022, followed by a further decline to 27% in subsequent reporting periods (PPLP Rowing Kendari, 2023). These fluctuations highlight the need to examine performance determinants more closely.

Accordingly, this study seeks to investigate the influence of protein, energy intake, and BMI on the muscular power of rowing athletes at the Kendari Student Sports Education and Training Center (PPLP), with a particular focus on those consuming traditional local foods. The aim is to generate insights that could inform the development of culturally appropriate, sustainable nutrition strategies to support athlete performance and long-term development.

Protein, as a fundamental macronutrient, is indispensable for muscle tissue synthesis, repair, and functional performance. Adequate protein consumption has been shown to enhance muscle strength, accelerate recovery following exercise, and improve neuromuscular efficiency during rowing. Given that rowing efficiency is directly associated with sustained power output, the role of protein in enhancing movement coordination and endurance is of considerable importance.

The primary objective of this study is to elucidate the relationship between protein intake and rowing efficiency among PPLP Kendari athletes. The findings are expected to underscore the critical role of daily protein adequacy in supporting muscular endurance and optimizing rowing performance, thereby contributing to evidence-based nutrition planning in athlete development programs.

Method

Participants

The participants in this study were student-athletes from the Kendari Rowing Student Sports Education and Training Center (PPLP), a regional training institution for high-performance youth rowers. Inclusion criteria required that participants (1) were actively engaged in structured training programs at PPLP Kendari, (2) had secured at least one medal in an officially sanctioned rowing championship, (3) fell within the age range defined as "student-athlete" under PPLP regulations, and (4) provided informed consent to participate in the entire research process.

Exclusion criteria included (1) the presence of injury or illness that could compromise physical performance, (2) unwillingness to participate in the research, (3) current leave or inactivity in training programs, and (4) medical conditions or specialized dietary requirements that significantly alter standard protein intake patterns.

A purposive sampling technique was initially applied to identify individuals who met the inclusion criteria, based on the study's specific objective of examining the relationship between protein intake and rowing efficiency among high-performing athletes. From a total population of 80 eligible PPLP Kendari rowers, a simple random sampling method was subsequently employed to ensure representativeness and reduce selection bias, resulting in a final sample of 46 athletes who consented to participate.

All study procedures were conducted in accordance with recognized research ethics principles, including respect for autonomy, beneficence, confidentiality, and voluntary participation. Prior to data collection, each participant received a clear explanation regarding the aims, procedures, potential risks, and benefits of the study. Written informed consent was obtained from all participants. The study protocol was approved by the relevant institutional ethics committee.

Procedure

This study employed a cross-sectional observational analytical design to explore the association between dietary protein intake and rowing efficiency. The two primary variables examined were protein intake (independent variable) and rowing efficiency (dependent variable). In addition, demographic variables, including age (in years), sex (male/female), education level, and training experience (in years) were recorded for descriptive and control purposes.

Protein and energy intake were measured using a 2 × 24-hour dietary recall method, wherein participants documented all food and beverage consumption over two non-consecutive days (one weekday and one weekend day). The dietary recall data were subsequently analyzed to determine each athlete's average daily intake of protein (g/day) and energy (kcal/day). Tuna sashimi, a traditional food rich in high-quality protein, was the primary dietary protein source consumed by participants during the study period.

Anthropometric data, including body weight and height, were measured using calibrated digital scales and stadiometers, respectively, to compute Body Mass Index (BMI). Rowing efficiency was evaluated through structured performance observations conducted during regular training sessions, using coach-led assessments based on stroke quality, consistency, and power output over a fixed distance.

Data analysis

Nutrient intake data were categorized in accordance with the Indonesian Ministry of Health's Dietary Adequacy Recommendations (2016), which classify protein and energy intake into "deficient," "adequate," and "excessive" categories relative to age- and gender-specific standards. Descriptive statistics were computed for all variables. Pearson correlation and multiple regression analyses were conducted to assess the strength and direction of associations between protein intake, BMI, and rowing efficiency. All statistical analyses were performed using SPSS version 25, with a significance level set at $p < 0.05$.

Table 2. Categories of Energy and Protein Intake of Traditional Foods Fighting Sashimi According to the Ministry of Health

Category	Percentage %
Very low	≤ 70% AKE
Low	(70 – < 100% AKE)
Normal	(100–130% AKE)
High	> 130% AKE)

Body Mass Index (BMI) score based on WHO (2004):

Table 3. Body Mass Index (BMI) score based on WHO (2004):

Category	BMI (kg/m^2)
Severe Underweight	<16
Moderate Underweight	16·0–16·9
Mild Underweight	17·0–18·49
Normal Range	18·5–24·9

Table 3. Body Mass Index (BMI) score based on WHO (2004):

Category	BMI (kg/m^2)
Overweight	25
Preoboese	25–29·9
Obesity	30
Obese Class I	30–39·9
Obese Class II	35–39·9
Obese Class III	40

The categorisation of athlete power is based on the performance evaluation test proposed by Mackenzie (2005), there are three categories: below average (≤ 39 cm), average (40-49 cm), and above average (≥ 50 cm). This study's data was analyzed using descriptive analysis to describe respondents' characteristics and research variables, including average, minimum, and maximum values for numeric variables like age, protein intake, energy intake, BMI, and athlete power. The Fisher exact test was used to assess the relationship between protein intake and athlete power.

Results

The status of rowing athletes is categorised according to age, gender, and place of residence.

Table 4. State of Kendari Rowing Athletes

Athlete Profile	Total	Percentage (%)
Age		
≤ 19	18	39,1
> 19	28	60,9
Gender		
Male	31	67,4
Female	15	32,6
Place of Recidence		
Muna	18	39,1
Buton	28	60,9

The demographic data presented in the table above indicate that the majority of participating athletes were non-residents of Kendari City and were not residing in boarding facilities during the study period. The sample demonstrated a higher representation of male athletes compared to female athletes, reflecting a gender imbalance consistent with broader participation trends in competitive rowing at the regional level. Furthermore, most respondents were aged 19 years or younger, aligning with the classification criteria for student-athletes within the PPLP system. A summary of the key demographic indicators, including total number of participants, mean age, age range, and standard deviation is provided to offer a comprehensive overview of the athlete population involved in this study.

Tabel 5. Descriptive Statistics of Age of Research Participants

Data	n	Average Age	Range	Std. Deviasi
Participants	46	16.37	6	2.28

Table 6 presents the descriptive statistics related to the age distribution of the study participants. The total sample comprised 45 athletes, with a mean age of 16.37 years. The age range spanned six years, reflecting the difference between the youngest and oldest participants. A standard deviation of 2.28 indicates a moderate level of variability in the age distribution, suggesting that most participants' ages were clustered relatively close to the mean.

Nutritional intake data, obtained through structured 2×24-hour food recall interviews, revealed that athletes residing in Kendari exhibited a more varied dietary pattern compared to their non-resident counterparts. Specifically, the analysis focused on energy and protein intake derived from traditional foods, notably *perangi* (sashimi), in relation to rowing performance. The intake values were evaluated against the recommended dietary standards established by the Indonesian Ministry of Health (2016).

Energy requirements were estimated based on three core components: Basal Metabolic Rate (BMR), Specific Dynamic Action (SDA), and the energy expenditure associated with physical activity. For male rowing athletes aged 18–29 years, BMR was calculated using the World Health Organization (WHO, 2004) formula:

$$BMR = (15.3 \times \text{body weight in kg}) + 679,$$

while for females in the same age group, the formula was:

$$BMR = (14.7 \times \text{body weight in kg}) + 496.$$

The energy required for digestion, represented by SDA, was estimated as 10% of the BMR value. In addition to their athletic training, participants were also engaged in academic activities, which were considered in the overall assessment of physical activity level. Accordingly, the athletes' activity level was classified as moderate, with an energy expenditure multiplier in the range of $1.4 \leq PAL < 1.6$, based on the physical activity level (PAL) classification provided by the Ministry of Health (2016). A detailed breakdown of these calculations is provided in the following table.

Table 6. Classification of Athlete Energy Intake

Energy Category	Percentage
Low	95,7%
Less	4,3%
Average energy intake of Athletes	1390,4 ± 520 kalori
Body Mass Index	
Thin	80,4% atlet
Obesity	2,2% atlet
Average Body Mass Index of Athlete	21,9 ± 2,8 kg/m2
Protein	
Low	71,7%
Less	23,9%
Normal	4,3%
Average Protein intake of Athletes	50,4 ± 22,7 g

This allows for the determination of whether the athlete's body weight is within the range considered to be ideal in comparison to his height. The athlete's body mass index (BMI) exhibits an average value of 21.9 ± 2.8 kg/m^2, with a minimum value of 17.1 kg/m^2 and a maximum value of 31.7 kg/m^2. Table 7 presents the distribution of body mass index among athletes.

Table 7. Body Mass Index Category of Athletes

BMI Category	Total	
	N	%
Severe Underweight	0	0
Moderate Underweight	1	2.2
Mild Underweight	7	15.2
Normal Range	38	82.6
Overweight	0	0
Preoboese	0	0
Obesity	0	0
Obese Class I	0	0
Obese Class II	0	0
Obese Class III	0	0
Total	46	100.0

As presented in Table 6, the average daily energy intake among the athletes was 1,390.4 ± 520 kcal, indicating a substantial deviation from recommended dietary energy levels for adolescent athletes engaged in moderate to high physical activity. Notably, 95.7% of participants were classified as having very low energy intake, suggesting a widespread inadequacy in dietary energy consumption. This nutritional deficit is reflected in the Body Mass Index (BMI) distribution detailed in Table 7, where 17.4% of athletes were categorized as underweight comprising 15.2% with mild underweight and 2.2% with moderate underweight. Nonetheless, the majority of participants (82.6%) fell within the normal BMI range, indicating that some athletes maintain normative weight despite suboptimal energy intake, potentially due to metabolic adaptations or variations in body composition.

The observed low levels of energy and protein intake underscore the critical need for improved dietary strategies tailored to the metabolic demands of rowing athletes. To evaluate the physiological implications of this condition, a correlation analysis was conducted to examine the relationship between energy intake and muscular strength. Depending on the distribution characteristics of the dataset, appropriate inferential statistical tests were applied, including the Fisher's Exact Test for categorical associations. The results of the analysis demonstrated a statistically significant relationship between energy intake and athlete strength output, with the BMI category identified as a moderating factor. These findings reinforce the role of adequate nutritional intake in supporting physical performance, recovery, and overall athlete development, particularly in endurance- and power-based disciplines such as rowing.

Table 8. Cross-Distribution of Energy Intake, Protein and BMI with the Power of Power of Student Sports Education and Training Center (PPLP) Rowing Athletes in 2023

Variable	Classification	Athletes Power Below Average		Average		Above Average		Total		Exact Test
		N	%	N	%	N	%	n	%	
Energy	Very low	27	61,4	7	15,9	10	22,7	44	100	0,635
	Low	1	50,0	0	0,0	1	50,0	2	100	
	Normal	0	0,0	0	0,0	0	0,0	0	0,0	
	High	0	0,0	0	0,0	0	0,0	0	0,0	
IMT	Very thin	1	33,3	0	0,0	2	66,7	3	100	0,718
	Thin	21	56,8	7	18,9	9	24,3	37	100	
	Normal	3	100,0	0	0,0	0	0,0	3	100	
	Overweight	2	100,0	0	0,0	0	0,0	2	100	
	Obesity	1	100,0	0	0,0	0	0,0	1	100	
Protein	Very low	23	69,7	6	18,2	4	12,1	33	100	0.005
	Low	5	45,5	0	54,5	6	54,5	11	100	
	Normal	0	0,0	1	50,0	1	50,0	2	100	
	High	0	0,0	0	0,0	0	0,0	0	0,0	

The correlation between body mass index (BMI) and the power of rowing athletes is demonstrated in the table above. Fisher's Exact Test revealed no significant relationship between energy intake levels and rowing power in PPLP Kendari athletes ($p = 0.635 > 0.05$). Thus, energy intake status had no significant effect on power levels across the "below average," "average," and "above average" categories.

The Fisher's Exact Test found no significant relationship between BMI categories and athlete power levels ($p = 0.718$). However, the linear-by-linear association analysis revealed a significant linear trend ($p = 0.035$), implying a linear relationship pattern between BMI and power, even though the overall category relationship was not significant. Most athletes with a normal body mass index (BMI) and those who are overweight exhibit a power category that is below average. Table: High BMI values are a consequence of excess weight relative to the standard range. This indicates that individuals with a higher body weight experience a greater burden than those with the same height. It can therefore be concluded that athletes with a higher BMI exhibit reduced power.

According to Fisher's Exact Test, there is a significant relationship between protein intake and power among PPLP Kendari rowing athletes ($p = 0.005$). This finding demonstrates that variations in protein intake are strongly related to athletes' power performance. Furthermore, the linear-by-linear association test revealed a significant linear tendency ($p = 0.008$), indicating that athletes' power tendencies increase as their protein intake improves.

Discussion

A Power Analysis of Rowing Athletes

An effective analysis of physical power among rowing athletes is crucial, as power output directly influences boat velocity and competitive success. Higher power levels enable rowers to generate greater propulsion, allowing them to overtake opponents and reach the finish line more efficiently (Widiastuti, 2015). In this study, male athletes demonstrated an average power output of 45.8 cm, while female athletes exhibited a lower average of 27.1 cm, indicating below-average performance across both groups. These differences are consistent with physiological studies; for instance, Giriwijono and Santoso (2012) attribute the greater physical strength observed in male athletes to higher testosterone levels. Moreover, Iglesias et al. (2024) emphasized the need for specificity in training selection, which should align with the demands of the discipline and motor patterns characteristic of competition or rehabilitation phases.

Correlation between Energy Intake and Power of Rowing Athletes

The analysis of the relationship between energy intake and rowing power among athletes from the Kendari Student Sports Education and Training Center (PPLP) was conducted using Fisher's exact test. The results showed no statistically significant correlation (p = 0.635), suggesting that energy intake does not directly predict power performance in this cohort. This lack of association may be attributed to an uneven distribution of energy intake values across the sample. Additionally, limitations in the variables assessed such as handgrip strength and endurance may not fully capture the complexity of power output (Nurkholis et al., 2024).

Nevertheless, the data revealed that 61.4% of athletes with very low energy intake exhibited below-average power output, while athletes with relatively higher energy intake showed more variability in performance. This underscores the multifactorial nature of energy metabolism in athletes. According to the Ministry of Health (2014), energy expenditure depends on exercise type, intensity, and duration, which may vary significantly even within a homogenous athletic group.

The correlation between protein intake and the power of rowing athletes was investigated using the Fisher exact correlation test

Protein intake was significantly correlated with rowing power output, as evidenced by the results of Fisher's exact test (p = 0.005). This finding indicates a strong relationship between protein consumption and athletic performance, particularly in rowing athletes consuming traditional food proteins such as Perangi (sashimi). Most athletes who reported sufficient protein intake through traditional sources demonstrated above-average power levels, whereas those with lower protein intake tended to perform below average.

Protein, as a macronutrient, provides essential amino acids vital for muscle repair, hypertrophy, and energy metabolism (Bosy-Westphal et al., 2021). Up to 80% of free amino acids are stored in muscle tissue, where they are oxidized to produce ATP (Poortmans et al., 2012). These results are in line with Sumida et al. (2012), who reported a positive correlation between protein intake and muscle power among Japanese athletes. Adequate protein also supports recovery from exercise-induced muscle damage, contributing to improved performance.

Harahap (2014) demonstrated that training three times per week can lead to reduced glutamine concentrations, compromising immune function even when dietary intake is otherwise adequate. Supplementing with 20 grams of protein daily was found to enhance performance, as one-third of protein-derived amino acids are used for glutamine synthesis in muscle. Domínguez and Sánchez-Oliver (2018) further emphasized that nutritional strategies must be individualized to match the athlete's physiological and contextual needs.

The correlation between body mass index (BMI) and the power of rowing athletes

The study also examined the relationship between Body Mass Index (BMI) and rowing power. The findings indicated a significant association: athletes categorized as "underweight" particularly those in the "less" BMI range exhibited higher power performance. Conversely, those with higher or imbalanced BMI values generally showed lower power output. This suggests that BMI, when interpreted in conjunction with muscle mass and body composition, may be a predictor of athletic capability in rowing.

Athletes who consumed adequate protein consistently performed better, while extremely low protein intake was associated with diminished power. In contrast, energy intake did not show a statistically significant effect. These results highlight the importance of maintaining ideal body weight and nutritional balance for optimal performance. BMI is a commonly used anthropometric indicator to assess body weight relative to height (Adiningsih et al., 2016), and this study aligns with previous research by Welis et al. (2012), which also identified a correlation between BMI and physical performance.

Study Limitations and Recommendations

This study has several limitations that must be acknowledged. The sample was restricted to a single institution (PPLP Kendari) and included a limited number of participants (n = 45), reducing the generalizability of the findings. The use of a 2 × 24-hour food recall method is subject to recall bias, as it relies on the participants' memory. Furthermore, the study did not control for other influential variables, such as sleep quality, hydration status, psychological stress, or training intensity.

Due to these limitations, the statistical tests performed may not fully capture the complexity of interactions between nutritional intake and performance. Future research should employ a longitudinal design to explore causality between dietary intake and athlete performance. Additionally, larger and more diverse samples spanning multiple regions should be used to increase external validity. To minimize measurement error, food intake assessments can be improved through food diaries or direct observation. Future studies should also integrate other performance-related variables, including hydration status, sleep quality, and training patterns, to develop more comprehensive insights into the determinants of athletic power.

Conclusions

The results of the analysis reveal a significant positive correlation between protein intake from traditional food sources, such as perangi and sashimi, and rowing power performance (p = 0.005). In contrast, no statistically significant correlation was observed between energy intake and rowing power. Additionally, the study identified a negative, though statistically insignificant, correlation between Body Mass Index (BMI) and power performance (p = 0.718), suggesting that an increase in BMI may be associated with a decline in athletic power, albeit without statistical significance in this sample. These findings underscore the importance of monitoring nutrient intake, particularly protein consumption from culturally relevant traditional foods, to support and enhance rowing performance. The results also highlight the potential impact of BMI on physical performance, reinforcing the need for athletes to maintain an optimal body composition. In conclusion, this study demonstrates a significant association between traditional protein intake and rowing power among athletes at the Power of Student Sports Education and Training Center (PPLP) Dayung Kendari, while indicating that energy intake alone may not be a strong determinant of power output in this population.

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