

ASSESSING ENDURANCE LEVELS IN ROWING ATHLETES

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Abstract

Endurance is a crucial factor for success in rowing competitions, as the sport demands high physical exertion and sustained resistance to fatigue. This study aims to assess the endurance levels of rowing athletes. A quantitative descriptive methodology was employed to provide a comprehensive overview of the endurance conditions among these athletes. The sample comprised 35 rowing athletes, including 18 males and 17 females. Athlete endurance was measured using the Multi-Stage Fitness Test (MSFT). The collected data were analyzed using descriptive statistics and compared against established MSFT norms. Results indicated that 51% of the athletes fell into the "less" endurance category, highlighting the need for targeted interventions to enhance their endurance levels. Improving endurance is essential to mitigate fatigue during competitions, thereby enhancing athletic performance.

Keywords: Rowing Endurance, Athlete Stamina, Aerobic Capacity.

INTRODUCTION

Exercise is a good thing to do regularly because this will increase body immunity, body immunity will increase by exercising regularly 3-4 times a week (Neldi et al., 2023). Sports in general have two categories, namely sports for fitness and sports for achievement. In intense sports activities are generally an activity that in the process can drain a lot of energy, where in the situation of demonstrating a sports activity that has a high enough load in general there are several factors that affect one of them, namely endurance (Alimuddin et al., 2024). The ability of normal body homeostasis when doing intense sports activities can be manifested by regulating and maintaining breathing rhythm (regular) to minimize fatigue (Hostrup & Bangsbo, 2017). The ability to regulate breathing has an important role in maintaining the homeostasis of the body while performing intense sports activities. When viewed from the perspective of sports players, this intense training has a significant impact on body conditions such as fatigue, sleep disorders and other common problems (Yadav et al., 2019). Intense exercise that involves many muscles must certainly require good physical condition in coaching sports achievements (Komaini et al., 2023). In sports at least individuals must have a good VO₂max level, because this has a close relevance to human endurance in carrying out a sports activity based on the intensity and volume of exercise. Physical condition is included in internal factors and plays an important role in sports achievements (Mulyadi, 2019; Khairuddin et al., 2022).

Endurance is the maximum amount of oxygen that the body can use in 1 minute when the muscles exercise a lot (Williams et al., 2017) endurance is an important element in intense sports, where endurance provides feedback on the form of action performed. Sports that involve endurance such as long-distance running, rowing, and swimming require good cardiovascular quality for a long period of time (Al-Khelaifi et

al., 2019). Endurance not only talks about how to train muscles to be the main source of energy in the sport performed, but must also train several other supporting factors such as VO₂max endurance factors. Another sport with erratic intensity and volume certainly requires endurance, considering that exercise in this type requires a lot of oxygen supply (Chaeroni et al., 2022).

Rowing is one sport that utilizes the environment above rivers, lakes, and seas by using rowing as a medium for implementation (Ihsan et al., 2022). Rowing sports are increasingly developing with the holding of many championships, both regional and national levels. Rowing is one type of sport that utilizes water and rowing as its implementing media, where rowing sports have categories, namely some are games and some are competitions (Prakoso et al., 2022). Canoeing is one sport that is divided into two branches, namely Canoe (C) where athletes pedal in a side-facing position followed by kneeling on one knee as a support, and Kayak (K) where athletes pedal both sides, namely by alternating right and left with a sitting position. It is a type of race where athletes compete in distances (1000m, 500m, 200m) in calm water.

Rowing sports require good physical condition, one component that is often encountered is endurance. Endurance has a close correlation in the implementation of rowing competitions, where in addition to arm muscle endurance, oxygen supply endurance (VO₂max) is needed (Gani et al., 2022)(Arwandi et al., 2023), this indicates that in competitive sports such as rowing requires good and maintained VO₂max endurance. Rowing sports when viewed in terms of fatigue, of course, will give different results if athletes have different endurance conditions, fatigue is a common or natural thing or problem, where this is caused by excessive energy use and in terms of the ability of each participant to have relative abilities (Wati et al., 2024). However, fatigue in the world of competitive sports can certainly be minimized with an emphasis on physical condition, one of which is on the endurance component (Haryanto et al., 2024). In this modern era, many tools are used to monitor heart rate, the amount of oxygen supplied, and the ability to move, the tool is in the form of a black vest with GPS features, so with that the analysis team can take evaluations and can even make decisions when outside or in the field. With this tool, coaches and staff can guide athletes in making endurance improvements (VO₂max).

The results of previous research on the physical condition of rowing athletes stated that the physical condition of the national canoeing rowing team in the national team was quite good (Yasin & Asmara, 2018). Not only physical factors, the research conducted by (Dhesa et al., 2020) reviewed in terms of athletes' nutritional adequacy. The results of his research explained that the implementation of dietary nutrition rules for athletes has been carried out well by 63% but 37% has not been implemented, things such as menu design, portion determination and nutritional value assessment have not been carried out so it needs to be improved in the future because to improve performance it is not enough just to train hard without being supported by optimal nutritional intake. From several studies that have been done. Research on the endurance of rowing athletes at the provincial level is still difficult to find, so this research needs to be done.

This study aims to seek the endurance ability of athletes at the provincial level, with the knowledge of the ability of rowing athletes at the provincial level, the results of this study can be used by coaches to evaluate their endurance ability so that future training programs can be evaluated and athletes' abilities can be improved.

MATERIALS AND METHOD

Study design

This study used quantitative approach and descriptive method. Researchers wanted to reveal how endurance level rowing athletes are. This research was conducted in Kuantan Singinging District, Riau Province, Indonesia.

Participants

Because the population is not too large, this study uses the census method in determining the sample, it means that the entire population of 35 rowing athletes (18 male and 17 female) are used as a sample.

Instrument

To measure the maximum endurance capacity possessed by rowing athletes, the Multi-stage Fitness Test (MSFT) is used.

Procedure

The athletes were provided with detailed instructions on how to perform the test and were given the opportunity to practice up to level 1 back 3. Once all participants understood the procedure and became familiar with the musical cues, the researchers organized them into several groups for the actual test implementation. Each group consisted of 10 participants.

Statistical Analysis

Data analysis was carried out by checking all test results that had been carried out, the scores obtained by each athlete were converted and then grouped their endurance abilities based on the Multistage Fitness Test norms in table 1 below.

Table 1: Multistage Fitness Test Norm

Male	Age
	20 to 29
Superior	66.3 or higher
Excellent	57.1 to 66.2
Good	50.2 to 57.0
Fair	44.9 to 50.0
Poor	38.1 to 44.8
Very poor	38.0 or lower
Female	Age
	20 to 29
Superior	56.0 or higher
Excellent	46.5 to 55.9
Good	40.6 to 46.4
Fair	34.6 to 40.5
Poor	28.6 to 34.5
Very poor	28.5 or lower

Source: (Bushman & Medicine, 2017)

RESULTS

In general, the results of this study indicate a deficiency in endurance among rowing athletes. Further details of the research findings are provided in Table 2 below.

Table 2: Endurance levels of male rowing athletes

Category	Frequency	Percentage
Superior	0	0.00
Excellent	0	0.00
Good	5	27.78
Fair	7	38.89
Poor	2	11.11
Very Poor	4	22.22

The data results indicated that the lowest endurance level among the rowing athletes was 31, while the highest was 54.3. The average endurance score fell within the medium category at 45.24, with a standard deviation of 6.84.

Table 3: Endurance levels of female rowing athletes

Category	Frequency	Percentage
Superior	0	0.00
Excellent	0	0.00
Good	0	0.00
Fair	0	0.00
Poor	5	29.41
Very Poor	12	70.59

The findings revealed that among rowing athletes, endurance levels ranged from a minimum of 25.3 to a maximum of 31.8. The average endurance score for the athletes fell within the medium category, recording a mean of 27.78, with a standard deviation score of 1.90.

DISCUSSION

In this study, the results showed that the endurance level of rowing athletes in general (51%) was still at a low level. This is in line with the findings of research conducted by (Hasyim et al., 2022) which revealed that the endurance possessed by rowing athletes in general (50%) is in the sufficient category and 18.8% have excellent endurance so that these athletes can win matches at the national level. The study conducted by (Yadi & Hendrayana, 2020) also explained that the endurance level of rowing athletes in general (50%) has reached a good level so that athletes and coaches must be able to maintain or even optimize even more to get to a very good level.

The role of endurance in the sport of rowing stings is important, movements that are carried out repeatedly and in a relatively long period of time demand good endurance athletes to maintain the speed of the boat. If the speed experiences a significant slowdown, it is certain that defeat will befall the team, therefore endurance training must be considered by rowing coaches to win the race (Latif et al., 2022). Excellent physical condition is needed in this rowing sport, elements of physical condition such as endurance, abdominal muscle strength and arm muscles will make athletes able to pedal fast and for a long time (Prakoso et al., 2022). Endurance can be increased by interval training and *circuit training*, *interval training* provides a more optimal effect compared to training using the *circuit training* method, with the results of these studies, rowing trainers can provide interval training (Sumintarsih et al., 2022).

Rowing is one type of sport that requires large aerobic and anaerobic capacity, high cooperation ability, sharpness of concentration for a long time, has height, large and long limbs and arms and has resistance to fatigue or pressure. Endurance is the ability

of resistance (resistance) to fatigue and quickly recover from fatigue (recovery) from fatigue. Someone who has high endurance can do longer activities continuously without experiencing significant fatigue. In rowing itself, the problem of endurance is the most important thing that every rower must have in order to improve good performance (Iswana & Priyono, 2024). The physical condition of the rower is closely related to the achievement of athlete performance optimally, by doing coordinated, scheduled training and guided by the right training theory, it will be able to improve physical condition and potential to achieve the expected achievement. Endurance is needed by rowers when coordinating organs such as the heart, lungs, blood circulation and muscles so that they can work optimally so as to support continuous pedaling movements for a long time and can reach a specified distance (Nugraheni et al., 2024).

The condition of athletes' achievements in Indonesia has not reached optimal conditions, one of which is influenced by unbalanced nutrient intake, the level of nutritional intake of rowing athletes who exercise and do not exercise in the consumption of carbohydrates, fats, energy is mostly below 100% except for the level of protein consumption, most of which are above 100% in the normal category (Rifki et al., 2024). Unbalanced nutritional intake is thought to be due to inadequate knowledge about the role of nutrition in improving athlete performance. The nutrients needed by athletes consist of macronutrients and micronutrients, which belong to the group of macronutrients, namely carbohydrates, fats and proteins, while micronutrients are vitamins and minerals. Carbohydrates are one type of nutrient that is very important for athletes. In order for athletes' energy reserves to meet their needs, carbohydrates are the main energy supply. For athletes who pursue sports for a long time, muscle carbohydrate replenishment is sometimes a very appropriate choice to provide adequate energy reserves during training and competition (Periyasamy et al., 2024).

CONCLUSION

This study reveals that a significant portion of rowing athletes exhibit suboptimal endurance levels, with 51% categorized as having "less" endurance. This finding underscores the necessity for targeted training programs aimed at enhancing aerobic capacity and overall stamina among these athletes. By focusing on improving endurance, athletes can better withstand the physical demands of competition and reduce fatigue, ultimately leading to improved performance. Future research should explore specific training interventions and their effectiveness in elevating the endurance levels of rowing athletes to ensure they meet the rigorous demands of their sport. Furthermore, conducting longitudinal research to track changes in endurance over time with consistent training, and identify critical periods for endurance development in rowing athletes is also beneficial for the future research in this sport.

Reference

- 1) Al-Khelaifi, F., Abraham, D., Diboun, I., & Elrayess, M. A. (2019). *Chapter Twenty-Three - Proteomics and metabolomics research in exercise and sport* (D. Barh & I. I. B. T.-S. Ahmetov Exercise, and Nutritional Genomics (eds.); pp. 539–566). Academic Press. <https://doi.org/https://doi.org/10.1016/B978-0-12-816193-7.00023-3>
- 2) Alimuddin, A., Liza, L., Syafrianto, D., Sepriadi, S., Zakaria, J., Wahyuddin, W., Kardi, I. S., Komaini, A., Ndayisenga, J., & Okilanda, A. (2024). Effects of ABC Running and Bodyweight Training combination: A case study on the speed of hurdling athletes. *Retos: Nuevas Tendencias En Educación Física, Deporte y Recreación*, 55, 120–125.

- 3) Arwandi, J., Bais, S., Padli, Zarya, F., Haryanto, J., Putra, T. I., Mardela, R., & Soniawan, V. (2023). The effects of training using an android-based media blocker tool on the West Sumatra pelatprov sepaktakraw smash in 2023. *Journal of Physical Education and Sport*, 23(12), 3391–3399. <https://doi.org/10.7752/jpes.2023.12389>
- 4) Bushman, B., & Medicine, A. C. of S. (2017). *ACSM's Complete Guide to Fitness & Health*. Human Kinetics.
- 5) Chaeroni, A., Komaini, A., Pranoto, N. W., & Antoni, D. (2022). The Effect of Physical Activity Programs and School Environments on Movement Activities and Mental Health. *International Journal of Human Movement and Sports Sciences*, 10(2), 131–137. <https://doi.org/10.13189/saj.2022.100201>
- 6) Dhesa, D. B., Demmalewa, J. Q., & Abadi, E. (2020). *Manajemen Perencanaan Gizi pada Atlet Dayung di Sekolah Menengah Atas Negeri (SMAN) Keberbakatan Olahraga Bahteramas Sulawesi Tenggara*. 01(04), 34–40.
- 7) Gani, R. A., Setiawan, E., Gazali, N., Németh, Z., Achmad, I. Z., Septiadi, F., & Haryanto, J. (2022). Culture of Movement Awareness through Physical Literacy Integrated in Physical Education, Physical Activity and Sport during COVID-19: Systematic Literature Review. *Health, Sport, Rehabilitation*, 8(4 SE-Review Articles), 83–94. <https://doi.org/10.34142/HSR.2022.08.04.07>
- 8) Haryanto, J., Setiawan, E., Gani, R. A., Padli, & Ildil. (2024). Academic performance of online physical education learning during COVID-19 outbreak: systematic literature review. *International Journal of Evaluation and Research in Education* , 13(1), 488–495. <https://doi.org/10.11591/ijere.v13i1.26723>
- 9) Hasyim, Sulaema, Adill, A., Setiawan, I., & Sudirman, A. (2022). Cardiovascular endurance of rowing athletes ' performance : study at south sulawesi. *Journal of Positive School Psychology*, 6(6), 1596–1601. <https://www.journalppw.com/index.php/jpsp/article/view/7361/4811>
- 10) Hostrup, M., & Bangsbo, J. (2017). Limitations in intense exercise performance of athletes – effect of speed endurance training on ion handling and fatigue development. *Journal of Physiology*, 595(9), 2897–2913. <https://doi.org/10.1113/JP273218>
- 11) Ihsan, A., Asyhari, H., & Kamaruddin, I. (2022). Pengukuran Komponen Fisik Atlet PON Cabang Olahraga Dayung Sulawesi Selatan. *ABDIKAN: Jurnal Pengabdian Masyarakat Bidang Sains Dan Teknologi*, 1(2), 218–224.
- 12) Iswana, B., & Priyono, B. (2024). Coaches ' knowledge o n long term athletes development for learning to training and training to training phases in south sumatra martial art (pencak silat) training centers. *Community Practitioner*, 21(04), 1519–1525. <https://doi.org/10.5281/zenodo.11096254>
- 13) Khairuddin, Alnedral, Komaini, A., Syharastani, & Masrun. (2022). Effect of learning approach and motor skills on physical fitness. *Journal of Physical Education and Sport*, 22(9), 2273–2280. <https://doi.org/10.7752/jpes.2022.09289>
- 14) Komaini, A., Kiram, Y., Mario, D. T., & Handayani, S. G. (2023). Fundamental Movement Skills in Children in Mentawai Islands: Indigenous Tribes in Indonesia. *Physical Education Theory and Methodology*, 23(4), 520–530. <https://doi.org/https://doi.org/10.17309/tmfv.2023.4.05>
- 15) Latif, R. A., Ghazali, M. S., Rahman, Z. A., Mohamed, A. M. D., & Fauzee, M. S. O. (2022). Relationship between Cardiovascular Endurance and Mental Toughness among Academy Mokhtar Dahari (AMD) Football Players. *Asian Journal of University Education*, 18(1), 166–178.
- 16) Neldi, H., Nasriah, Komaini, A., Mario, D. T., Umar, Arsil, & Rasyid, W. (2023). Physical and psychological conditions in kayaking: Strength, flexibility, and motivation. *Journal of Human Sport and Exercise*, 19(1 SE-Performance Analysis of Sport), 148–158. <https://doi.org/10.14198/jhse.2024.191.13>
- 17) Nugraheni, H., Murwani, R., Shaluhiah, Z., & Widjanarko, B. (2024). Major Factor Related To Physical Activity Among Elementary School Student. *Community Practitioner*, 21(3), 388–398. <https://doi.org/10.5281/zenodo.11075970>

- 18) Periyasamy, B., Kiran Singh, R. S. A., Singh, A. P., Palanikumar, K., Periasamy, P., & Gunasekaran, S. (2024). Eating Habits and Sleep Patterns Among College Students in Tamil Nadu During the Covid-19 Pandemic Lockdown: a Cross-Sectional Study. *Community Practitioner*, 21(3), 647–659.
- 19) Prakoso, G. B., Budi, D. R., Kusuma, I. J., & Heiza, N. (2022). Olahraga Dayung : Bagaimanakah Profil Kondisi Fisik Atlet Kabupaten ? *SPRINTER : Jurnal Ilmu Olahraga*, 3(1), 31–38.
- 20) Rifki, M. S., Huda, A., Sepdanius, E., Ariston, A., Hanifah, R., Fajri, H. P., & Sepriadi. (2024). Development of a Volleyball Learning Model for Students During the Covid-19 Pandemic. *Community Practitioner*, 21(3), 660–664. <https://doi.org/10.5281/zenodo.11076901>
- 21) Sumintarsih, S., Saptono, T., Mustofa, H., & Indriharta, L. (2022). Perbandingan Circuit Training dan Interval Training Terhadap Vo2 Max Dengan Indeks Massa Tubuh Pemain Bola Voli. *Jurnal Cahaya Mandalika (JCM) e-ISSN 2721-4796*, 3(3), 687–696.
- 22) Wati, I. D. P., Haryanto, J., Samodra, Y. T. J., Riyanti, D., Syam, A., Suryandi, D., Suratmin, S., Anggara, N., Santos, M. H. Dos, & Santos, H. A. Dos. (2024). *Micronutrient intake in the martial arts community: Preparation for national sports*. 2024(1), 274–278. <https://doi.org/https://doi.org/10.56984/8ZG2EF8D9s>
- 23) Yadav, N., Kumar, A., Mahajan, U., & Datta, K. (2019). Post-intense exercise sleep concerns in weightlifters: A pilot study. *Medical Journal Armed Forces India*, 75(3), 325–329. <https://doi.org/10.1016/j.mjafi.2018.09.005>
- 24) Yadi, J. I., & Hendrayana, Y. (2020). The ability basic physical components of row athlete. *Quality in Sport*, 5(4), 46–55. <https://doi.org/10.12775/qs.2019.024>
- 25) Yasin, S. N., & Asmara, H. (2018). Profil Performa Atlet Dayung Kayak Tim Indonesia. *Jurnal Olahraga*, 4(2), 71–76.