Journal of Sport Medicine and Physiotherapy
2(1); 19-40 (2026) E-ISSN: -

Journal of Sport Medicine and Physiotherapy (JoSMPt) **Open Access**

The Correlation Between Resting Heart Rate and Aerobic Capacity (VO_2max) in Among Active Sports Science Students

Citra Adhitya Putri[1], Zefanya Putri Amelia Fo'eh[1], Suci Nurmarisa[1], Adelia Gita Pratiwi[1], Resti Nurpratiwi[1*]

[1] Departement of Physiotherapy, State University of Surabaya, Jl. Raya Kampus Unesa, Lidah Wetan, Kec. Lakarsantri, Surabaya, East Java 60213, Indonesia

*Correspondence: restinurpratiwi@unesa.ac.id
[1] Departement of Physiotherapy, State University of Surabaya, Jl. Raya Kampus Unesa, Lidah Wetan, Kec. Lakarsantri, Surabaya, East Java 60213, Indonesia

Submitted : 30 June 2026
Accepted : 30 June 2026
Published : 30 June 2026

Abstract

Background: Resting heart rate (RHR) and maximum oxygen consumption (VO2max) are essential indices of cardiovascular health and physical fitness. Regular aerobic exercise is known to produce cardiovascular adaptations that may affect both RHR and VO 2max. Previous research have mostly focused on general populations or clinical groups, however there is little evidence for the association between RHR and VO2max in sports science students. Therefore, further studies are needed to elucidate the relationship between these characteristics among physically active university students.
Objectives: The purpose of this study was to determine the link between resting heart rate (RHR) and aerobic capacity (VO_2max) in sports sciences students.
Methods: This research used quantitative observational analytical design using a cross-sectional method. A purposive sample was drawn from 30 active sports science students aged between 19 and 22 years. Resting heart rate was assessed using a digital blood pressure monitor and pulse palpation. VO 2max was determined using the 12-minute Cooper test. Data were analyzed with IBM SPSS Statistics v. 26. Normality was assessed using the Shapiro-Wilk test and Pearson correlation analysis was conducted. $p < 0.05$ and 95% confidence interval were considered to be statistically significant. The respondents gave their informed agreement to participate in the study.
Results: The mean RHR of the subjects was 69.13 ± 5.35 bpm and the mean VO_2max was 45.39 ± 4.93 mL/kg/min. Pearson correlation analysis revealed a significant negative connection between RHR and VO_2max ($r = -0.514$; $p = 0.004$).
Conclusion: The data imply that RHR can be employed as a feasible, non-invasive index of cardiorespiratory fitness, particularly in populations undergoing systematic physical training.

Keywords: Resting heart rate, VO_2max, aerobic capacity, sports science students, health

INTRODUCTION

Students in sports science must be physically fit and healthy to assist them in their academic and non-academic performance. The physical activity that they do, as well as the extra obligations of player and coach, means they are very dependent on an efficient cardiovascular system. Resting heart rate (RHR) is a simple, non-invasive marker to assess this disease. Resting Heart Rate: Your resting heart rate is the number of times your heart beats per minute when your body is at rest. This is typically logged when you first wake up and before you accomplish anything . Resting heart rate (RHR) is a commonly used indicator of cardiovascular health and aerobic fitness. (Altini & Plews, 2021).

VO_2max is an additional significant indicator of cardiorespiratory fitness in addition to RHR (Chaliki et al., 2025). It is the maximum amount of oxygen that can be inhaled by the body during strenuous activity (Ross et al., 2016). Maximal oxygen uptake or VO_2max or aerobic capacity is the ability of the body to absorb, transport and use oxygen during maximal exercise which can lead to a greatly higher amount of oxygen consumption (Kaminsky et al., 2022) Direct measurement of VO_2max . It displays the efficiency of the physiological systems of the body in delivering oxygen to the working muscles and removing metabolic waste, which adds to the physical performance(Candra, 2021). A high VO2max value is a useful signal for the ideal aerobic capacity directly connected with the endurance, the training performance and the athletic achievement in university students, especially the students in sports science programs and doing systematic physical training.

VO_2max and RHR are not only independent markers but also interrelated and reciprocally influencing each other in the evaluation of the physical fitness of an individual. Resting heart rate (RHR) is closely linked with cardiorespiratory fitness (CRF) and aerobic capacity (e.g., VO2max) (Garcia et al., 2022). In general, a higher VO2max is associated with a lower RHR as the heart becomes more efficient, mostly due to an increase in stroke volume (Altini & Plews, 2021). Therefore, RHR can serve as an indirect marker to assess fitness levels and the body's adaptation to physical training. Improvements in VO_2max resulting from regular exercise also contribute to a reduction in RHR, which reflects enhanced cardiac efficiency and overall cardiovascular fitness.

Several studies have indicated that RHR (Plaza-Florido et al., 2022) can be used as an indirect indicator of VO_2max, making it a practical method for assessing cardiorespiratory fitness (Sandercock et al., 2008). A population-based study from the HUNT Study in Norway, conducted over a 23-year period, revealed a negative correlation between RHR and VO_2max: individuals with higher RHR tend to have lower VO_2max levels (Nauman et al., 2012). These findings are consistent with results from the Fenland Study (UK), in which RHR was shown to be a valid population-level biomarker of cardiorespiratory fitness (CRF), closely associated with VO_2max (Gonzales et al., 2023).

Sports science students represent a productive age group that is particularly vulnerable to lifestyle changes, especially upon entering university life (Sutradhar & Jyoti, 2024). Not all of these students maintain ideal levels of VO_2max and resting heart rate (RHR), due to lifestyle factors and the demanding nature of academic and extracurricular activities (Fan et al., 2020). Therefore, monitoring and improving VO_2max and RHR, particularly among sports science students, is a crucial step in supporting their physical performance.

This study is important to conduct, as cardiorespiratory capacity is a primary indicator for assessing an individual's level of aerobic fitness, particularly among sports science students who face high physical demands in their daily activities (Ho et al., 2025). Direct measurement of VO_2max requires complex equipment (Xiang et al., 2025). and procedures; thus, it is essential to identify simpler, non-invasive, and cost-effective predictive methods (Spathis et al., 2022). One potential and relatively easy-to-measure indicator is resting heart rate (RHR) (Tekin et al., 2025). Moreover, most previous studies have focused on the general population or clinical groups, while research specifically targeting sports science students remains limited (Kaminsky et al., 2023). Yet, in this population, adaptations of the cardiorespiratory system play a critical role in supporting physical performance, recovery, and the prevention of fatigue or injury.

The unique contribution of this study is the focus on sports science students, a group that is often regularly physically active but underrepresented in studies examining the association between RHR and VO2max. This study shows that RHR can be a simple and feasible indicator of aerobic fitness in dynamic academic settings, which is different from previous research that has mostly used general populations or clinical patients. The peculiarity of this study is therefore the demographic specificity and concentrate on the non-invasive technique to measurement of cardiorespiratory fitness in university level sports science students.

METHODS

This study was an analytical observational study using a cross sectional design. The purpose of this study was to investigate the association between resting heart rate (RHR) as an independent variable and aerobic capacity (VO_2max) as a dependent variable in sports science students. This investigation was conducted at the Universitas Negeri Surabaya athletics field in October 2024.

The subjects of the study were active students of sports science, aged between 19 and 22 years, who took part freely. Purposive sampling was used to recruit 30 students in total. Sample size was calculated by means of an a priori power analysis for correlation analysis, with an assumed medium effect size (r = 0.50), a significance level of 0.05 and a statistical power of 80%, leading to a minimum sample size of about 29 individuals. Thus, 30 subjects were included in this investigation.

The inclusion criteria were: (1) active students in sports science; (2) aged 19–22 years; (3) physically active; and (4) willing to engage in the study by signing informed agreement. Participants were excluded if they had a history of cardiovascular disease, musculoskeletal injury that hindered their physical activity, or diseases that could impact resting heart rate measures.

The study was conducted according to the norms of ethical research. All individuals gave informed consent to participate in the study. Resting heart rate (RHR) was monitored in the morning between 06.00–08.00 a.m. to reduce the effect of daily activities. Participants were asked to refrain from severe exercise, coffee intake and food consumption before to the measurement. Measurement was performed after participants rested in a supine position for 10 minutes. Resting heart rate (RHR) was measured using a digital blood pressure monitor with confirmation by manual pulse palpation. The measure was recorded in beats per minute (bpm).

Aerobic capacity was evaluated using the 12-minute Cooper test on a regular 400-meter athletics track. They were asked to run or walk as far as they could in 12 minutes. Total distance covered was measured in metres. VO_2max was estimated according to the Cooper equation. The data analysis was performed using IBM SPSS Statistics version 26. Participant characteristics and research factors were summarized using descriptive statistics. Normality of the data was tested using Shapiro–Wilk test. As the data satisfied the normal distribution assumptions, Pearson correlation analysis was utilized to analyze the association between RHR and VO_2max. Statistical significance was considered at $p < 0.05$, with 95% confidence interval.

This study is a descriptive quantitative study. It uses an observational-analytic strategy. Purposive sampling was used to choose 30 active students aged between 19 and 22 years who voluntarily participated in the study. The research was conducted at the athletics field of Universitas Negeri Surabaya in October 2024, with the aim of examining the effect of resting heart rate (RHR) on aerobic capacity (VO_2max). The independent variable is VO_2max and the dependent variable is RHR . Aerobic capacity data were gathered with the 12-minute Cooper test, and RHR was measured with a digital blood pressure monitor and pulse palpation. Descriptive statistics, normality test, and Pearson correlation analysis were used to assess the data and to test the link between the two variables.

RESULTS

Research results are presented in the form of graphs, tables, or descriptive. Analysis and interpretation of these results is required before they are discussed. The table is written in the middle or at the end of each descriptive text of research results/acquisitions. If the width of the table is not enough to be written in half a page, it can be written a full page. Table titles are written from left to right, all words are capitalized, except for conjunctions. If more than one line is written in single space. For example, it can be seen in the table bellow.

Table 1. Descriptive Characteristics

Variable	Min	Max	Mean	SD
RHR (bpm)	56	79	69.13	**5.35**
VO_2Max (mL/kg/min)	34.84	55.76	45.39	**4.93**

Table 1 presents the descriptive characteristic values. The mean resting heart rate (RHR) of 69.13 ± 5.35 bpm indicates that the majority of respondents had a normal RHR. Meanwhile, the average VO_2max value of 45.39 ± 4.93 mL/kg/min suggests that the subjects generally had good

aerobic capacity, which is consistent with the characteristics of physically active sports science students.

Table 2. VO_2max Categories

Category VO_2Max	Range (mL/kg/min)	Number of Subject
Very Good	> 50	7
Good	43 – 50	17
Fair	36 – 42	5
Poor	<36	1

Table 2 shows that the majority of respondents fell into the "good" (57%) and "very good" (23%) categories for VO_2max, followed by the "fair" category (17%), with the remaining participants classified as "poor" (0.3%). This distribution indicates that the participants' aerobic capacity was generally in good condition.

Table 3. Normality Test

Variabel	p-value
IMT	0.708
VO_2Max	0.733

The results of the normality test showed that both variables had p-values greater than 0.05, indicating that the data were normally distributed. Therefore, the Pearson correlation test was deemed appropriate for further analysis.

Table 4 Pearson Correlation Test

Variabel	R	p-value
IMT vs VO_2Max	-0,514	**0,004**

Table 4 presents the results of the Pearson correlation test, showing a statistically significant negative relationship between RHR and VO_2max (r = −0.514; p = 0.004). The correlation coefficient indicates a moderate correlation, suggesting that a decrease in RHR is associated with an increase in aerobic capacity (VO_2max).

DISCUSSION

The results of this study indicate a significant negative correlation between resting heart rate (RHR) and VO_2max among sports science students, with a moderate correlation coefficient of r = −0.514 and p = 0.004. This finding suggests that lower RHR values are associated with higher aerobic capacity (Ramakrishna et al., 2022) . In other words, students with higher VO_2max levels tend to have lower resting heart rates. This relationship implies that RHR can serve as an indirect yet effective indicator for assessing an individual's level of cardiorespiratory fitness (Aparicio et al., 2022). These findings are consistent with those reported by (Nauman et al., 2012) in the HUNT Study conducted in Norway, as well as by (Gonzales et al., 2023) in the Fenland Study in the United Kingdom, both of which concluded that RHR can be used as a population-level biomarker of fitness in relation to VO_2max. Furthermore, the results align with fundamental principles of exercise physiology, which state that one of the key cardiovascular adaptations to intensive physical training is a reduction in resting heart rate.

Resting heart rate (RHR) is an important physiological parameter that reflects the efficiency of the heart in pumping blood throughout the body. Individuals with good cardiorespiratory fitness—such as athletes and sports science students who engage in regular training—generally have lower RHR compared to the general population (Gonzales et al., 2023). This is attributed to an increased stroke volume, or the amount of blood ejected by the heart with each beat. As a result, their hearts do not need to work as hard when the body is in a state of complete rest. (Altini & Plews,

2021) also emphasized in their study that a reduction in RHR is a primary physiological adaptation in response to long-term, regular aerobic exercise.

Based on the measurement results, the average VO_2max of the students in this study was 45.39 ± 4.93 mL/kg/min. This value falls within the "good" to "very good" category according to the aerobic fitness standards applied in this research. The distribution of participant categories also indicated that more than 80% of the subjects were classified as having good to very good VO_2max levels, suggesting that the majority of students possessed adequate fitness to support both their academic and non-academic activities. This condition reflects that sports science students generally have cardiorespiratory endurance levels appropriate to the physical demands of university life and extracurricular activities (Lavie et al., 2022). These findings are consistent with (Candra, 2021) who stated that higher VO_2max levels are positively correlated with improved physical performance.

The average resting heart rate (RHR) found in this study was 69.13 ± 5.35 bpm. This value lies within the usual range of an active population according to exercise physiology criteria. However, some people exhibited higher than usual RHR values, which might be associated with stress, sleep quality or inadequate fitness. Sports science students should examine these aspects to maintain steady cardiorespiratory fitness. In prior studies, Fan et al., (2020) also reported that the majority of the sports students in their study had VO2max levels that were classified as good to very good, which is consistent with their characteristics as physically active individuals. This points to the need of regular exercise in the maintenance and improvement of aerobic capacity. The mean VO_2max was 45.39 mL/kg/min with a standard deviation of 4.93 in the present study, which shows that the diversity in fitness level among the individuals was within a fair range.

People with a high VO2max usually have a lower resting heart rate (RHR) due to the long-term cardiac adaptations to exercise, such as increased stroke volume and better parasympathetic tone (Mongin et al., 2022).). The lower the RHR , the more efficient your heart has become in pumping blood throughout your body while at rest . This physiological reaction is relevant to students of sports science who perform strenuous physical training programmes on a regular basis (Altini & Plews, 2021).

In conclusion, the findings of the present study provide important practical consequences for the sports science students and associated educational organizations. RHR is easy to assess and monitor on a regular basis and can give students a basic understanding of their cardiorespiratory fitness without expensive laboratory testing. Furthermore, sports program directors can use these insights to build more structured training programs based on the students' physiological data. This work also provides chances for additional research to build VO2max prediction models based on RHR (Liu et al., 2022), as proposed by (Tekin et al., 2025) and (Ho et al., 2025). Therefore, RHR monitoring could be used not only as a health assessment tool but also as a vital part in improving physical performance and preventing injury or weariness in sports science students.

These findings are congruent with a study by (Kato et al., 2016), who found a substantial negative correlation between resting heart rate (RHR) and exercise capacity (peak VO2) in patients with sinus rhythm. In that study, lower RHR was related with increased VO 2 max, even after adjusting for characteristics such as age, gender and usage of heart rate reducing drugs . In addition, prior studies have also established that RHR is a good marker for assessment of cardiorespiratory fitness and prediction of health outcomes in the general population and in patients with cardiovascular illnesses . From these previous research it can be stated that the use of RHR as a tool for fitness monitoring is relevant and advantageous in the context of education and athletic training. The present findings, together with an increasing body of international scientific evidence, suggest the inclusion of RHR monitoring in fitness development programs for students.

A study by (Kang & Ko, 2019) also shows similar support in that persons with lower resting heart rates (RHR) tend to have greater VO2max values. This study revealed that RHR is negatively related to VO 2 max confirming the utility of RHR as a simple and practical criterion for assessing cardiorespiratory fitness. Furthermore, the results of (Kang & Ko, 2019) point out that monitoring of RHR is an important part of physical fitness development of sports science students.

CONCLUSION

The results of this study indicate there is a strong association between resting heart rate (RHR) and aerobic capacity (VO_2max) among sports science students. The correlation study indicates that lower RHR in a person is associated with higher VO_2max. This negative association shows that RHR could be a useful practical measure for the assessment of cardiorespiratory fitness levels.

Therefore, our work contributes meaningfully to the development of cardiovascular fitness monitoring tools, especially for sports science students. The results can be used as reference for sports science programs in order to build more quantifiable physical training plans based on simple physiological characteristics such as resting heart rate (RHR). In addition, the study offers scope for future research with a larger population and different measures. In the future, routine RHR monitoring will be part of regular evaluations for sports students to avoid losses in physical performance and ensure long-term cardiorespiratory health.

CONFLICT OF INTEREST

The author hereby declares that this research is free from conflicts of interest with any party.

AUTHOR'S CONTRIBUTION

Putri and Fo'eh contributed data collection, Nurmarisa, dan Pratiwi contributed editing the final version, Nurpratiwi contributed statiscal analysis and script preparation.

FUNDING/SPONSORSHIP

This research does not receive external funding.

References

Altini, M., & Plews, D. (2021). What is behind changes in resting heart rate and heart rate variability? A large-scale analysis of longitudinal measurements acquired in free-living. *Sensors*, *21*(23), 1–18. https://doi.org/10.3390/s21237932

Aparicio, V. A., Coll-Risco, I., Camiletti-Moirón, D., & Nebot, E. (2022). Association between resting heart rate and cardiorespiratory fitness in healthy adults: A systematic review and meta-analysis. *European Journal of Preventive Cardiology, 29*(Supplement_1), zwac056. https://doi.org/10.1093/eurjpc/zwac056

Candra, A, T., Setiabudi, M, A. (2021). Analisis Tingkat Volume Oksige Maksimal VO2Max Camba Prodi Pjkr. *Jurnal Pendidikan Kesehatan Rekreasi*, *7*(1), 10–17.

Chaliki, K., Sharma, A., Sharma, A., Yee, C., Chaliki, H., & Reddy, S. (2025). Key Resting Echocardiographic Parameters for the Estimation of Exercise Parameters of Peak VO_2, Heart Rate Recovery, and Ventilatory Efficiency. Journal of Clinical Medicine, 14(9), 3013. https://doi.org/10.3390/jcm14093013

Fan, L. M., Collins, A., Geng, L., & Li, J. M. (2020). Impact of unhealthy lifestyle on cardiorespiratory fitness and heart rate recovery of medical science students. *BMC Public Health*, *20*(1), 4–11. https://doi.org/10.1186/s12889-020-09154-x

Garcia, G. L., Porto, L. G. G., da Cruz, C. J. G., & Molina, G. E. (2022). Can resting heart rate explain the heart rate and parasympathetic responses during rest, exercise, and recovery? *PLoS ONE, 17*(12), e0277848. https://doi.org/10.1371/journal.pone.0277848

Gonzales, T. I., Jeon, J. Y., Lindsay, T., Westgate, K., Perez-Pozuelo, I., Hollidge, S., Wijndaele, K., Rennie, K., Forouhi, N., Griffin, S., Wareham, N., & Brage, S. (2023). Resting heart rate is a population-level biomarker of cardiorespiratory fitness: The Fenland Study. *PLoS ONE*, *18*(5 May), 1–17. https://doi.org/10.1371/journal.pone.0285272

Ho, C. A., Yeh, H. C., Lau, H. T., Chang, E. Y., Hsu, C. W., Chang, C. H., Huang, C. C., Chien, W. S. C., & Ho, C. S. (2025). Establish VO2max prediction models based on exercise and body parameters from the step test. *International Journal of Medical Sciences*, *22*(11), 2676–2685. https://doi.org/10.7150/ijms.109977

Kaminsky, L. A., Imboden, M. T., Arena, R., Myers, J., Peterman, J. E., & Bonikowske, A. R. (2022). Updated Reference Standards for Cardiorespiratory Fitness Measured With Cardiopulmonary Exercise Testing Using Cycle Ergometry: Data From the Fitness Registry and the Importance of Exercise National Database (FRIEND) Registry. *Mayo Clinic Proceedings*, *97*(2), 285–293. https://doi.org/10.1016/j.mayocp.2021.08.014

Kaminsky, L. A., Imboden, M. T., Ozemek, C., Lavie, C. J., & Arena, R. (2023). It's Time to Recognize the Considerable Clinical and Public Health Significance of Cardiorespiratory Fitness. *Journal of the American College of Cardiology*, *82*(7), 595–607. https://doi.org/10.1016/j.jacc.2023.05.040

Kang, S. J., & Ko, K. J. (2019). Association between resting heart rate, VO 2 max and carotid intima-media thickness in middle-aged men. *IJC Heart and Vasculature*, *23*, 100347. https://doi.org/10.1016/j.ijcha.2019.100347

Kato, Y., Suzuki, S., Uejima, T., Semba, H., Nagayama, O., Hayama, E., & Yamashita, T. (2016). The relationship between resting heart rate and peak VO2: A comparison of atrial fibrillation and sinus rhythm. *European Journal of Preventive Cardiology*, *23*(13), 1429–1436. https://doi.org/10.1177/2047487316633885

Lavie, C. J., Arena, R., Kaminsky, L. A., & Myers, J. (2022). Making the Case to Measure and Improve Cardiorespiratory Fitness in Routine Clinical Practice. *Mayo Clinic Proceedings*, *97*(1), 3–5. https://doi.org/10.1016/j.mayocp.2021.11.006

Liu, Q., Wang, Y., Zhang, X., & Li, J. (2022). Multimedia recognition and monitoring of respiration and heart rate VO_2max in exercise training based on regression equation. *Advances in Multimedia, 2022*, 9023144. https://doi.org/10.1155/2022/9023144

Mongin, D., Chabert, C., Gomez Extremera, M., Hue, O., Courvoisier, D. S., Carpena, P., & Bernaola Galvan, P. A. (2022). Decrease of heart rate variability during exercise: An index of cardiorespiratory fitness. *PLoS ONE, 17*(9), e0273981. https://doi.org/10.1371/journal.pone.0273981

Nauman, J., Aspenes, S. T., Nilsen, T. I. L., Vatten, L. J., & Wisløff, U. (2012). A Prospective Population Study of Resting Heart Rate and Peak Oxygen Uptake (the HUNT Study, Norway). *PLoS ONE*, *7*(9), 1–9. https://doi.org/10.1371/journal.pone.0045021

Plaza-Florido, A., Amaro-Gahete, F. J., Acosta, F. M., Sacha, J., & Alcantara, J. M. A. (2022). Heart rate rather than heart rate variability is better associated with cardiorespiratory fitness in adults. *European Journal of Sport Science,* *22*(6), 836–845. https://doi.org/10.1080/17461391.2021.1892198

Ramakrishna, S. B., Biswas, B., Biswas, A., & Bhunia, G. B. (2022). Resting heart rate and cardiovascular endurance of provincial cricketers and middle-distance runners: An observation. *Physical Education Theory and Methodology, 22*(3s), 195–201. https://doi.org/10.17309/tmfv.2022.3s.18

Ross, R., Blair, S. N., Arena, R., Church, T. S., Després, J. P., Franklin, B. A., Haskell, W. L., Kaminsky, L. A., Levine, B. D., Lavie, C. J., Myers, J., Niebauer, J., Sallis, R., Sawada, S. S., & Williams, M. A. (2016). Importance of Assessing Cardiorespiratory Fitness in Clinical Practice: A Case for Fitness as a Clinical Vital Sign. *Circulation, 134*(24), e653–e699. https://doi.org/10.1161/CIR.0000000000000461

Sandercock, G. R. H., Bromley, P. D., & Brodie, D. A. (2008). Effects of exercise on heart rate variability: Inferences from meta-analysis. *Medicine & Science in Sports & Exercise, 40*(7), 1233–1240. https://doi.org/10.1249/MSS.0b013e31816a2b73

Spathis, D., Perez-Pozuelo, I., Gonzales, T. I., Wu, Y., Brage, S., Wareham, N., & Mascolo, C. (2022). Longitudinal cardio-respiratory fitness prediction through wearables in free-living environments. *NPJ Digital Medicine, 5*, 80. https://doi.org/10.1038/s41746-022-00630-9

Sutradhar, S., & Jyoti, R. (2024). *Determination and comparison of maximum aerobic capacity in terms of physical fitness index and maximum oxygen uptake between physically active and physically non-active male-female students of Tripura*. *8*(2), 65–70. https://doi.org/10.31254/sportmed.8207

Tekin, R. T., Kudas, S., Buran, M. M., Cabuk, S., Akbasli, O., Uludag, V., &

Yosmaoglu, H. B. (2025). The relationship between resting heart rate variability and sportive performance, sleep and body awareness in soccer players. *BMC Sports Science, Medicine and Rehabilitation*, *17*(1). https://doi.org/10.1186/s13102-025-01093-7

Xiang, L., Deng, K., Mei, Q., Gao, Z., Yang, T., Wang, A., Fernandez, J., & Gu, Y. (2022). Population and age-based cardiorespiratory fitness level investigation and automatic prediction. *Frontiers in Cardiovascular*