RESEARCH ARTICLE
OPEN ACCESS

REVISTA RIICS Investigación e innovación en ciencias de la salud

Comparative Analysis of Physical Activity, Endurance and Functional Status in Health Club

Análisis comparativo de la actividad física, la resistencia y el estado funcional en clubes de salud

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Cite like this
Waqar A, Ahmed K, Iqbal A, Manzoor I, Naseer M, Nazir L, Akhtar S. Comparative Analysis of Physical Activity, Endurance and Functional Status in Health Club. Revista de Investigación e Innovación en Ciencias de la Salud. 2025;7(1):1-13. e-v7n1a354. https://doi.org/10.46634/riics.354

Received: 09/18/2024
Revised: 11/01/2024
Accepted: 12/25/2024

Editor
Fraidy-Alonso Alzate-Pamplona, MSc.

Declaration of interests
The authors have declared that there is no conflict of interest.

Abstract

Objective. To find the association of physical activity, endurance and functional status in different health clubs.

Methods. We conducted a cross-sectional study involving 282 participants from UMT Sports Club, LDA Sports Complex, Genesis, Square Fit, and Velocity. Data collection utilized the International Physical Activity Questionnaire (IPAQ), Harvard Step Test, and Functional Movement Screen (FMS). Participants provided informed consent and were informed of their right to withdraw from the study at any time.

Results. The age range of participants was 18 to 35 years. Among the 282 participants, 190 were male and 92 were female. According to the IPAQ, 155 of the 190 male participants were classified as active, 30 as minimally active, and 5 as inactive. For the 92 female participants, 77 were active, 14 were minimally active, and 1 was inactive. The FMS indicated that 92.81% of participants had a reduced risk of injury, while 82.65% achieved a low average score on the Harvard Step Test.

Conclusion. It is concluded that the cardio respiratory fitness of athlete both in male and female is adequate. Members who participate in physical activities shows that improved endurance, greater muscle strength, and better functional status compared to less active individuals.

Keywords

Physical activity; endurance; muscle strength; cardiovascular fitness; aerobic capacity; wellness.

Data availability
All relevant data is in the article. For futher information, contact the corresponding author.

Funding
The author received no specific funding for this work.

Disclaimer
The content of this article is the sole responsibility of the authors and does not reflect the official position of their institutions, or the *Revista de Investigación e Innovación en Ciencias de la Salud*.

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Arina Waqar: Conceptualization, data curation, funding acquisition, investigation, project administration, resources, supervision, validation, visualization, writing – original draft, writing – review & editing.
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Mahrukh Naseer: Data curation, investigation, project administration, software, validation.
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Resumen

Objetivo. Encontrar la asociación entre la actividad física, la resistencia y el estado funcional en diferentes clubes de salud.

Métodos. Se realizó un estudio transversal con la participación de 282 individuos provenientes del UMT Sports Club, LDA Sports Complex, Genesis, Square Fit y Velocity. La recolección de datos se llevó a cabo utilizando el Cuestionario Internacional de Actividad Física (IPAQ), la Prueba de Escalones de Harvard y la Evaluación de Movimiento Funcional (FMS). Los participantes firmaron un consentimiento informado y fueron informados de su derecho a retirarse del estudio en cualquier momento.

Resultados. El rango de edad de los participantes fue de 18 a 35 años. De los 282 participantes, 190 eran hombres y 92 eran mujeres. Según el IPAQ, 155 de los 190 hombres fueron clasificados como activos, 30 como mínimamente activos y 5 como inactivos. Entre las 92 mujeres participantes, 77 fueron clasificadas como activas, 14 como mínimamente activas y 1 como inactiva. La FMS indicó que el 92,81% de los participantes tenía un riesgo reducido de lesión, mientras que el 82,65% obtuvo un puntaje bajo promedio en la Prueba de Escalones de Harvard.

Conclusión. Se concluye que la capacidad cardiorrespiratoria de los atletas, tanto hombres como mujeres, es adecuada. Los miembros que participan en actividades físicas muestran una mejor resistencia, mayor fuerza muscular y un mejor estado funcional en comparación con los individuos menos activos.

Palabras clave

Actividad física; resistencia; fuerza muscular; condición cardiovascular; capacidad aeróbica; bienestar.

Introduction

Physical inactivity has become a pressing global concern, contributing to an estimated three million deaths annually. As a response, the World Health Organization (WHO) introduced its "Global Action Plan for Physical Activity 2018-2030" with the goal of reducing physical inactivity by 15% by 2030 [1]. Even though people are aware of the hazards of sedentary lifestyles, modern devices and their advancements have led to decline in physical exercise, making inactivity to be common. This lifestyle is strongly linked to many chronic conditions, including cardiovascular diseases, diabetes, obesity, and mental health disorders [2]. That is why promoting regular physical activity is a vital key for decreasing these health diseases and promoting overall health.

A physically inactive person is the one who does not engage in enough physical activity to meet health guidelines, typically not engaging in at least 150 minutes of moderate-intensity exercise per week. This inactivity may include low levels of structured exercise but does not involve prolonged sitting. In contrast, a sedentary lifestyle refers to a pattern of behavior characterized by prolong periods of sitting or minimal movement throughout the day, even if a person occasionally engages in physical activity [3]. While both are linked to negative health outcomes, a sedentary lifestyle highlights the detrimental effects of extended periods of low-energy activities like sitting, whereas

physical inactivity focuses on the overall lack of regular exercise, regardless of the time spent sitting [3].

Endurance, the body's ability to consistent prolonged physical trail, is a vital factor in overall fitness. Functional status, which refers to an one's stamina to pursue daily activities effectively and individually, is also nearly linked to regular physical activity [4]. The association between physical activity, endurance, and functional status is mixed and interdependent, making a positive feedback loop where advancements in one area lead to enhancements in the others. By engaging in structured physical activity, participant can raise their endurance, which in turn allows them to participate in other activities, as well as boosting their functional status and quality of life [5].

Current studies have shown that the evidence enhancing the importance of structured physical activity, i.e., participating in health clubs to reduce the effects of a sedentary lifestyle. Studies point out that almost 40-47% of adults and teens in Pakistan involve in organized physical activities through health clubs. The trend is the same in other regions of the world. Health clubs have emerged as central institutions to improve daily physical activity., offering a list of exercise interventions that target endurance, functional status, and fitness [5]. The significance of maintaining a physically active lifestyle is more highlighted in current guidelines that suggest at least 150 minutes of moderate-intensity activity or 75 minutes of high-intensity exercise per week, along with muscle-strengthening exercises on two or more days [6]. These guidelines elaborate that regular physical activity significantly boost both physical and holistic health approach, raise energy levels, and boost longevity [7]. Health clubs offer variable variety of exercise programs tailored to many fitness needs. These contain aerobic sessions, dance classes like Zumba, and high-intensity workouts such as CrossFit [8]. These acts provide pleasurable and engaging ways to reduce inactivity. Zumba, for example, combines rhythmic movements with music to enhance aerobic capacity and psychological health. CrossFit, on the other hand, enhance functional movements through a combo of cardio, weightlifting, and bodyweight exercises, increasing both strength and endurance [9].These programs play a vital role in promoting health, certainly in an age of increasing sedentary lifestyles [9].

The fitness industry has shown markable growth over the last ten years, with a yearly growth rate of 20%, as reported by the Association of Fitness Professionals. This expansion has concluded that increasing in many fitness-related options, including studios, academies, and health clubs. Instead of this growth, there is a significant gap in research, particularly regarding the exercise modes of health club members and the impact of these behaviors on their physical activity levels and overall health results [10].

This research aims to fill this gap by conducting a comparative analysis of the effects of many exercise programs on physical activity, endurance, and functional status within health arena. By evaluating these variables, the study seeks to provide insights into how physical activity array within these clubs can improve individual health outcomes and promote a holistic approach to fitness.

Methodology

This study is a cross-sectional research design to analyze the physical activity, endurance, and functional condition of male and female participates from various health clubs. The health clubs selected for this research include UMT Sports Club, Maulana Johar Ali Sports Complex, Fitness Health Club, Irtiqa Fitness Club, and LDA Sports Clubs [11,12]. Ethical

approval for this study was obtained from the Institute Research Board (IRB) and the UMT ethics committee, with the reference number RE-049-2024.

The participants included in this study were those of age 18 to 35, of both genders, and active members of a health club for the last 12 months. The participants were expected with well-rounded fitness routine, participating in the gym at least three times per week. Each session was arranged to last two hours, including a combination of cardiovascular exercises, strength training, flexibility exercises, and warm-up and cool-down periods aimed at regulating performance and minimizing injury risk.

Participants who failed to sign the consent form were excluded. Moreover, participant with systemic illnesses, acute musculoskeletal injuries, or those feeling unwell on the day of assessment were excluded from the study. Players recently undergoing any form of rehabilitation were also not permitted to participate to make sure that the program was conducted safely and effectively for all involved.

Data Collection Tools

Physical Activity Measurement

The International Physical Activity Questionnaire (IPAQ) used to check the participants' physical activity status. This tool evaluates different intensities and modes of physical activities (e.g., walking, moderate, and vigorous activities), along with time spent sitting, to evaluate total physical activity in MET-minutes per week. The IPAQ provides a comprehensive measure of physical activity in different domains of routine, offering a specific method for assessing activity levels in populations [13].

Endurance Assessment

To calculate endurance, the Harvard Step Test was performed. This simple and widely used test gauges aerobic fitness by predicting VO2 max, a critical indicator of cardiovascular efficiency. Participants were addressed to step up and down at a rate of 30 steps per minute for 5 minutes or till exhaustion. The Harvard Step Test was selected because of its direct administration and less equipment requirements, making it a practical tool for evaluating endurance in health club settings [14].

Functional Status Evaluation

The Functional Movement Screen (FMS) was performed to assess participants' functional status. The FMS assesses movement patterns and helps point out limitations and asymmetries that can affect functional movement quality. It is known for its high reliability, with an interrater reliability coefficient of 0.81 (95% CI, 0.69-0.92), making it an effective tool for assessing participants' physical performance and functional movement capacity [15].

Statistical analysis

All data gathered were entered and analyzed by using SPSS version 25. Descriptive statistics were applied to sum up the demographic characteristics of the participants. Frequencies were calculated to obtain gym attendance patterns and the total time spent on physical activities. To analyze associations between variables, the Chi-square test was plotted, providing results of correlations between physical activity, endurance, and functional status.

Results

The demographic analysis of the study sample N = 282, as calculated by WHO, showed that participants were predominantly within the 24-29 age group, representing 46.5% of the total sample, followed by the 18-23 age group at 29.1% and the 30-35 age group at 24.5%. The gender distribution was skewed towards males, who comprised 67.4% of the participants, while females made up 32.6%. In terms of BMI, 52.1% of participants were classified as overweight, 40.8% had a normal BMI, 5.0% were underweight, and 2.1% fell into the Obesity Class 1 category as shown in Table 1.

Table 1. Descriptive statistics of demographics.

Variable	Category	Frequency	Percent
Age	18-23	82	29.1%
	24-29	131	46.5%
	30-35	69	24.5%
	Total	282	100.0%
Gender	Male	190	67.4%
	Female	92	32.6%
	Total	282	100.0%
BMI	Below 18.5 (Underweight)	14	5.0%
	18.5-24.9 (Normal weight)	115	40.8%
	25.0-29.9 (Overweight)	147	52.1%
	30.0-34.9 (Obesity Class 1)	6	2.1%
	Total	282	100.0%

Cardiovascular fitness, as measured by the Harvard Step Test for VO2 Max, showed that the majority of participants (54.6%) were categorized as having "Good" fitness (VO2 Max 83-96), followed by 32.6% who were classified as "Low Average" (54-67). Only 5.0% of participants had an "Average" score (68-82), while 4.3% were categorized as "Excellent" (above 96), and 3.5% fell into the "Poor" category (below 54).

Regarding physical activity levels assessed through the International Physical Activity Questionnaire (IPAQ), 82.3% of participants were "HEPA Active" (Health-Enhancing Physical Activity), indicating high levels of physical activity. In contrast, 15.6% were "Minimally Active" and 2.1% were classified as "Inactive."

The Functional Movement Screen (FMS) results indicated that 92.9% of participants exhibited no functional disability (score 15-21), while 4.3% were at increased risk of injury (score 13), and 2.8% were at reduced risk of injury (score 14) as shown in Table 2.

The chi-square analysis revealed gender differences in the relationships between physical fitness and movement variables. For the relationship between the FMS and the Harvard Step Test, a significant association was found only in females (Pearson Chi-Square = 8.608, $p < 0.05$). However, significant associations were observed for both males (Pearson Chi-Square = 115.008, $p < 0.05$) and females (Pearson Chi-Square = 65.500, $p < 0.05$) in the relationship between IPAQ and Harvard Step Test, suggesting a strong link between physical activity

Table 2. Frequency Distribution of various variables.

Variable	Category	Frequency	Percent
Harvard Step Test for VO2 Max	< 54 (Poor)	10	3.5%
	54-67 (Low Average)	92	32.6%
	68-82 (Average)	14	5.0%
	83-96 (Good)	154	54.6%
	> 96 (Excellent)	12	4.3%
	Total	282	100.0%
International Physical Activity Questionnaire	Inactive	6	2.1%
	Minimally Active	44	15.6%
	HEPA Active (Health Enhancing Physical Activity)	232	82.3%
	Total	282	100.0%
Functional Movement Screen Questionnaire	15-21 (No Functional Disability)	262	92.9%
	13 (Increased Risk of Injury)	12	4.3%
	14 (Reduced Risk of Injury)	8	2.8%
	Total	282	100.0%

levels and cardiovascular fitness in both genders. Similarly, significant relationships were observed between IPAQ and FMS for both males (Pearson Chi-Square = 29.071, $p < 0.05$) and females (Pearson Chi-Square = 32.900, $p < 0.05$), indicating a strong association between physical activity levels and functional movement ability across genders as shown in Table 3.

Table 3. Results for Chi square

Gender	Test	FMS * Harvard Step Test	IPAQ * Harvard Step Test	IPAQ * FMS
Male	Pearson Chi-Square	.a	115.008a	29.071a
	Likelihood Ratio		93.475	21.637
	Linear-by-Linear Association		64.897	22.147
	N of Valid Cases	190	190	190
Female	Pearson Chi-Square	8.608b	65.500b	32.900b
	Likelihood Ratio	5.929	52.829	22.231
	Linear-by-Linear Association	1.800	44.050	2.219
	N of Valid Cases	92	92	92

Lastly, bar chart illustrates the relationships between physical activity levels, functional movement quality, and cardiovascular fitness across male and female participants. In Figure 1, the majority of both males (87.4%) and females (89.1%) were classified as HEPA Active.

Among this group, 81.6% of males and 75% of females demonstrated No Functional Disability, as indicated by their Functional Movement Screen (FMS) scores. A smaller proportion of participants in both groups showed Increased or Reduced Risk of Injury, with minimally active individuals also displaying relatively good movement quality. Inactive participants, a small fraction in both genders, still exhibited No Functional Disability.

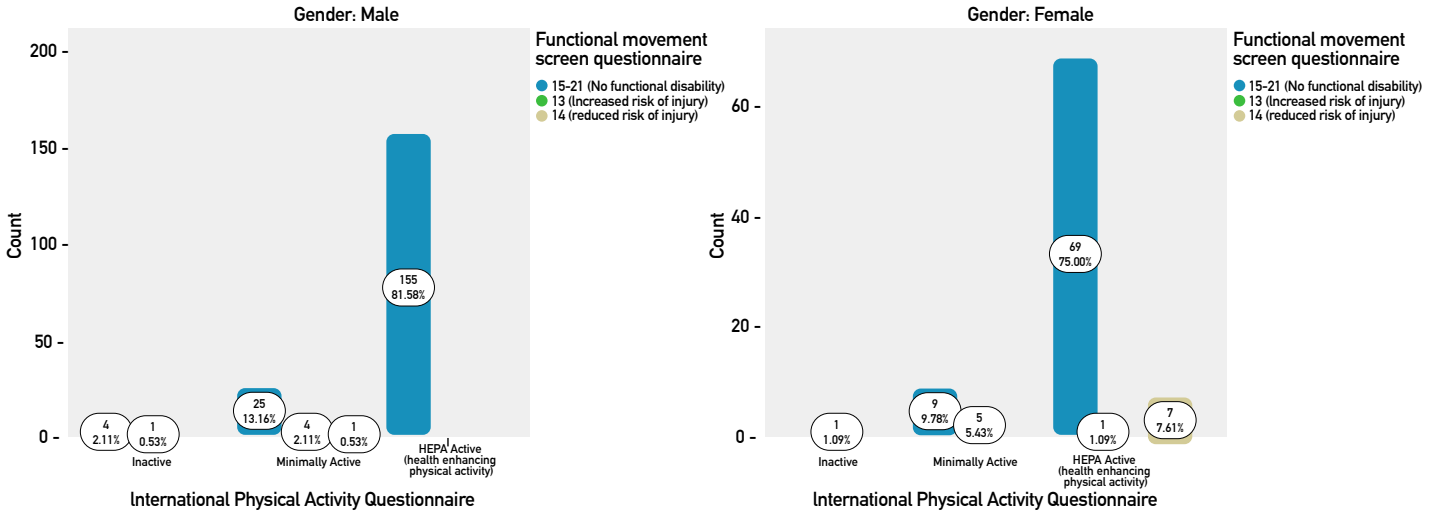

Figure 1. International Physical Activity Questionaries.

In Figure 2, cardiovascular fitness, measured by the Harvard Step Test for VO2 Max, was strongly associated with physical activity levels. The majority of HEPA Active males (83.2%) and females (79.3%) achieved Good fitness levels (VO2 Max 83-96). However, a notable percentage of both genders showed Low Average fitness (VO2 Max 54-67), particularly within the minimally active and inactive groups. Only a few individuals achieved Excellent or Poor fitness levels.

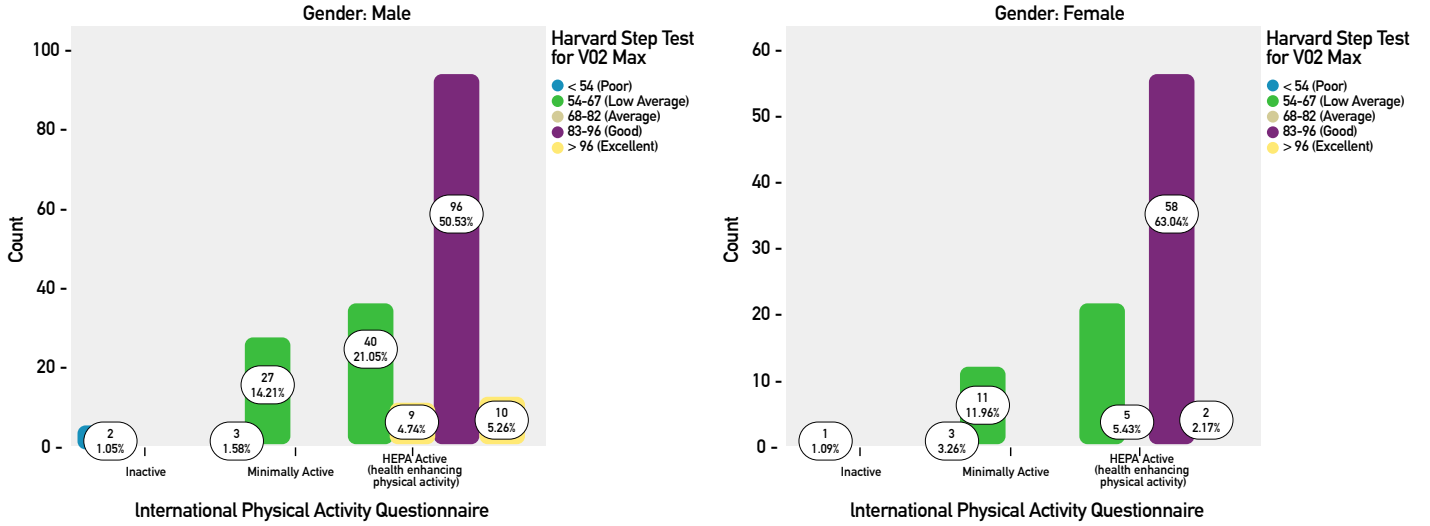

Figure 2. Harvard step test.

Figure 3 shows the relationship between VO2 Max and FMS scores. Among males, 50.53% with Good fitness demonstrated better movement quality and lower injury risks. Similarly, 50% of females with Low Average fitness also displayed better movement patterns. Despite some individuals achieving Poor or Excellent VO2 Max scores, most participants in these categories still maintained good movement quality and lower injury risks across both genders.

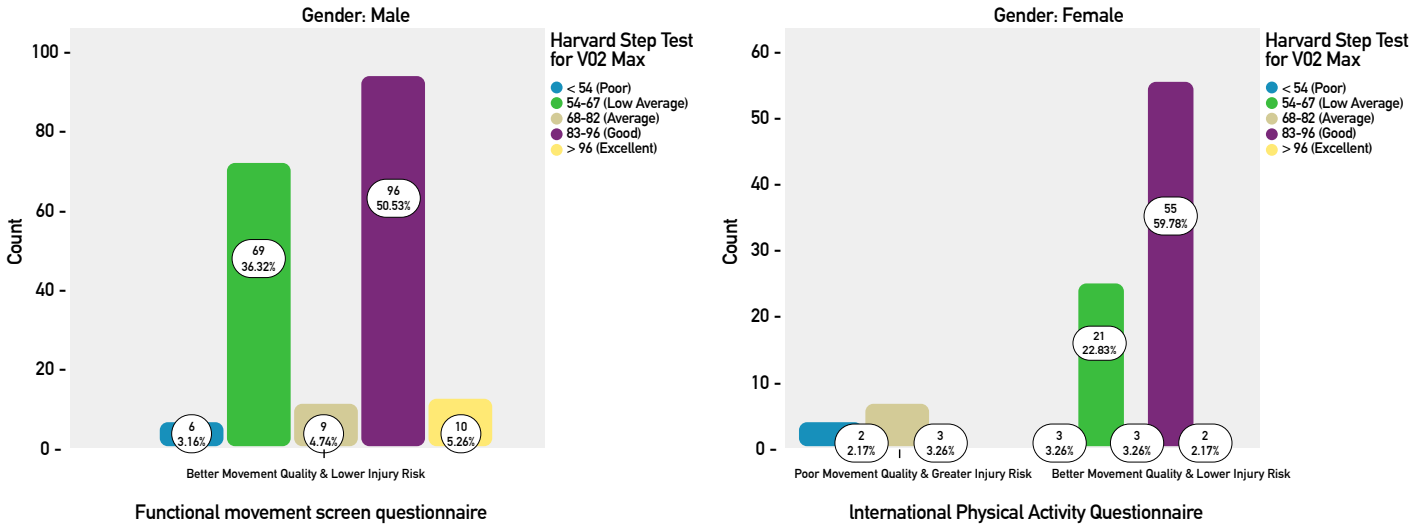

Figure 3. Functional movement questionnaire.

In summary, these results demonstrate that higher physical activity levels are associated with better aerobic fitness and functional movement in both genders. However, the link between movement quality and aerobic fitness varies by gender, with no significant relationship found in females and no variability in FMS scores preventing analysis in males.

Discussion

The findings of this study align with previous research, highlighting the importance of physical fitness in daily activities and overall well-being. Physical fitness, especially cardiorespiratory endurance, plays a vital role in multiple activities such as running and gymnastics. Improved physical fitness is known to reduce the risk of cardiovascular diseases, along with mitigating mental health issues such as depression, anxiety, and mood swings [16].

The primary objective of this study was to assess physical activity, endurance, and functional status among health club participants, with both male and female individuals included. Based on their BMI scores, many participants were overweight (52.1%) or of normal weight (40.78%). Physical fitness and movement quality were measured using the Harvard Step Test and the Functional Movement Screen (FMS) questionnaire, respectively [17].

The Harvard Step Test results demonstrate that out of 282 participants, 82.62% had Low Average fitness levels, 12.06% showed Average results, and only 0.35% gained Good fitness scores. In comparison, the FMS questionnaire demonstrated that 92.91% of participants displayed No Functional Disability, only 4.26% at an Increased Risk of Injury and 2.04% at a Reduced Risk of Injury. Moreover, according to the International Physical Activity Questionnaire (IPAQ), 82.27% of individuals were HEPA Active, 15.60% were Minimally Active, and only 2.13% were Inactive [18].

These conclusions align with past studies that find a positive relationship between physical activity, cardiorespiratory fitness, and functional movement quality. For instance, a study on the cardiorespiratory fitness of physiotherapy students indicates that CRF scores were average among 40 students, with a positive correlation between Physical Fitness Index and VO2 Max [19]. Likely, research on sports club members demonstrate that physically active youngsters, especially those engaged in health-enhancing physical activity, had better HRQoL (Health-Related Quality of Life) than their fewer active peers [20].

The data from this study elaborates these findings, as those classified as HEPA Active have better cardiovascular fitness and movement quality. Both male and female participants in the HEPA Active category achieved higher VO2 Max scores. Based on their FMS scores, the majority of participants in this group were evaluated with No Functional Disability. In contrast, the Minimally Active and Inactive participants generally exhibited lower fitness levels and higher risks of functional movement impairments, although a few still managed to demonstrate good fitness levels [20].

The comparison of genders showed minimal differences in movement quality and cardiovascular fitness. For instance, previous studies on medical students have shown that males tend to have higher CRF scores than females [20]. While other research on Ghanaian physiotherapists suggested that physical fitness tends to decline with age and decreased exercise participation, with poor physical fitness being observed among older physiotherapists compared to their younger peers [21]. This trend was also observed in a comparative cross-sectional study on older adults, where lower levels of physical activity were negatively associated with both BMI and balance/agility [22].

A cross-sectional study demonstrated that moderate-to-vigorous physical activity (MVPA) is positively correlated with vital capacity and aerobic fitness in both genders, though MVPA was negatively associated with vital capacity in males and positively in females [23]. These gender-specific trends in the relationship between physical activity and fitness levels are consistent with the findings of this study, where both males and females demonstrated similar trends in physical activity, movement quality, and cardiovascular fitness [24].

Studies have used accelerometers to estimate VO2 Max by measuring daily activity patterns and using algorithms that estimate energy expenditure. They reported a moderate correlation ($r = 0.68$) between accelerometer-based activity levels and treadmill-assessed VO2 Max, suggesting that accelerometers can provide a reliable estimate, though they may still underestimate VO2 Max compared to direct measurement methods. Our study reliance on self-reported IPAQ data could lead to biases related to over-reporting physical activity levels. However, our study correlation between IPAQ and VO2 Max aligns with other studies that show a strong link between physical activity levels and fitness outcomes [24].

A study reported that treadmill VO2 Max tests are highly reliable, with minimal estimation error compared to submaximal methods like the Harvard Step Test. This is because treadmill tests measure the subject's maximum effort, making them more precise in assessing aerobic fitness. The Harvard Step Test offers accessible and scalable method, especially for large population studies. The higher proportion of fitness levels observed in our study may be an artifact of using a submaximal test, which typically doesn't stress the cardiovascular system to its maximal limit as treadmill tests do [25].

The young age group and HEPA (health enhancing physical activity) active lifestyle in our study likely resulted in better cardiovascular fitness (as measured by VO2 Max) compared to populations which were with higher average ages or lower activity levels. The gender skew

towards males, who generally have higher VO2 Max values, also influenced the higher overall fitness levels in study sample [26].

A study conducted on athletes found that athletes who engaged in higher levels of physical activity, including sport-specific training, demonstrated better cardiovascular fitness and functional movement scores. The outcomes of the study showed that athletes who were classified as "highly active" in sports training (comparable to the HEPA Active group in this study) were more likely to achieve higher VO2 Max levels and exhibit better movement patterns as assessed by the Functional Movement Screen (FMS) [27].

Overall, the results show the significance of regulating physical activity for improved movement quality and cardiovascular health. The vast majority of participants who were HEPA Active displayed better movement quality and reduced risk of injury, highlighting the positive impact of consistent, health-enhancing physical activity. This finding supports the recommendations of the American College of Sports Medicine (ACSM) and the American Heart Association (AHA), which indicates that adults involves in moderate-intensity exercise for 30 minutes five times per week or vigorous-intensity exercise for 20 minutes three times per week to maintain optimal physical fitness. Athletes, in particular, must recognize the importance of maintaining and improving both physical and cardiorespiratory fitness to enhance performance and reduce injury risk. By adhering to these guidelines, individuals can reduce the risks of cardiovascular diseases, improve their mental health, and enhance their overall quality of life.

Limitation and Recommendation

This study had several limitations. The cross-sectional design restricted the ability to draw causal conclusions. Additionally, the study only asked participants whether they belonged to a sports club without specifying the type of sport they were involved in. Data were collected exclusively from fitness clubs in Lahore, which introduces the potential for selection bias. Furthermore, the limited time frame was a primary constraint.

To address these limitations, future research should employ longitudinal and experimental designs to provide more comprehensive insights. Expanding the analysis to include the types of physical activities through detailed questionnaires is recommended. Increasing the sample size would also allow for a deeper exploration of the relationships between different weight statuses, physical fitness levels, and the interaction between strength and endurance, thereby enhancing the overall relevance and accuracy of the findings.

One limitation of this study is the use of the International Physical Activity Questionnaire (IPAQ) to measure physical activity levels. While the IPAQ is a widely accepted tool, it relies on self-reported data, which may lead to overestimation of activity levels due to recall bias and subjective reporting. For more accurate and objective measurement, future studies could consider using accelerometers to quantify physical activity levels.

Conclusion

The assessment reveals that the cardiorespiratory fitness of both male and female athletes is currently at a satisfactory level, meaning their cardiovascular and respiratory systems are functioning well in relation to their physical activity.

However, to preserve and further improve their health, it is essential for these athletes to keep up with their regular training routines and adopt healthy lifestyle habits. This ongoing commitment will help them maintain their fitness levels and overall well-being, supporting a balanced and healthy life.

References

1. Schroeder EC, Welk GJ, Franke WD, Lee D-c. Associations of health club membership with physical activity and cardiovascular health. PloS one [Internet]. 2017;12(1):e0170471. doi: https://doi.org/10.1371/journal.pone.0170471

2. Xu Y, Mei M, Wang H, Yan Q, He G. Association between weight status and physical fitness in Chinese mainland children and adolescents: a cross-sectional study. Int J Environ Res Public Health [Internet]. 2020;17(7):1-10. doi: https://doi.org/10.3390/ijerph17072468

3. Bueno-Antequera J, Munguía-Izquierdo D. Physical Inactivity, Sedentarism, and Low Fitness: A Worldwide Pandemic for Public Health. In Rezaei N, editor. Integrated Science of Global Epidemics [Internet]. Stockholm: Springer; 2023. p. 429-47. doi: https://doi.org/10.1007/978-3-031-17778-1_19

4. Çiftçi M, Usgu S. The effect of traditional mat exercises versus reformer pilates and hammock yoga on pain, endurance, balance, disability, and quality of life in individuals who had chronic back pain. Karya Journal of Health Science [Internet]. 2024;5(1):1-7. doi: https://doi.org/10.52831/kjhs.1384349

5. Karabulut M, Esparza B, Dowllah IM, Karabulut U. The impact of low-intensity blood flow restriction endurance training on aerobic capacity, hemodynamics, and arterial stiffness. J Sports Med Phys Fitness [Internet]. 2020;61(7):877-84. doi: https://doi.org/10.23736/S0022-4707.20.11526-3

6. Anokye NK, Trueman P, Green C, Pavey TG, Taylor RS. Physical activity and health related quality of life. BMC public health [Internet]. 2012;12:1-8. doi: https://doi.org/10.1186/1471-2458-12-624

7. Xiao W, Soh KG, Wazir MRWN, Talib O, Bai X, Bu T, et al. Effect of functional training on physical fitness among athletes: a systematic review. Front Physiol [Internet]. 2021;12:738878. doi: https://doi.org/10.3389/fphys.2021.738878

8. da Costa TS, Louzada CTN, Miyashita GK, da Silva PHJ, Sungaila HYF, Lara PHS, et al. CrossFit®: Injury prevalence and main risk factors. Clinics [Internet]. 2019;74:e1402. doi: https://doi.org/10.6061/clinics/2019/e1402

9. Gribble PA, Brigle J, Pietrosimone BG, Pfile KR, Webster KA. Intrarater reliability of the functional movement screen. J Strength Cond Res [Internet]. 2013;27(4):978-81. doi: https://doi.org/10.1519/JSC.0b013e31825c32a8

10. Eather N, Morgan PJ, Lubans DR. Effects of exercise on mental health outcomes in adolescents: Findings from the CrossFit™ teens randomized controlled trial. Psychology of Sport and Exercise [Internet]. 2016;26:14-23. doi: https://doi.org/10.1016/j.psychsport.2016.05.008

11. Ahmed K, Parveen S, Arooj A, Ali M, Khalid S, Aamir S. Functional Disability and Pain among Football Players Suffering from Ankle Sprain at Club Level; A Cross-sectional Survey. Ankle Sprain in Football Players. THJ [Internet]. 2023;3(6):627-35. Available from: https://thehealerjournal.com/index.php/templates/article/view/168

12. Tahir S, Ahmed K, Parveen S, Khalid S, Javed H, Sadiq A. Comparison of Thrust Manipulation versus Non-Thrust Mobilization on Functional Deficit in Athletes with Chronic Ankle Sprain; A Randomized Clinical Trial. Manual Therapy in Athletes with Ankle Sprain. THJ [Internet]. 2022;2(3):190-6. doi: https://doi.org/10.55735/hjprs.v2i3.91

13. Sember V, Meh K, Sorić M, Starc G, Rocha P, Jurak G. Validity and reliability of international physical activity questionnaires for adults across EU countries: systematic review and meta analysis. Int J Environ Res Public Health [Internet]. 2020;17(19):1-23. doi: https://doi.org/10.3390/ijerph17197161

14. Łyp M, Rosiński M, Chmielewski JP, Czarny-Działak MA, Osuch M, Urbańska D, et al. Effectiveness of the Functional Movement Screen for assessment of injury risk occurrence in football players. Biol Sport [Internet]. 2022;39(4):889-94. doi: https://doi.org/10.5114/biolsport.2022.107482

15. Martland RN, Ma R, Paleri V, Valmaggia L, Riches S, Firth J, et al. The efficacy of physical activity to improve the mental wellbeing of healthcare workers: a systematic review. Mental Health and Physical Activity [Internet]. 2024;26:100577. doi: https://doi.org/10.1016/j.mhpa.2024.100577

16. Polevoy G. The influence of speed and strength training at school on the indicators of attention switching in children aged 13-14 years with different typologies. J Educ Health Promot [Internet]. 2022;11(1):23. doi: https://doi.org/10.4103/jehp.jehp_413_21

17. Deelen I, Ettema D, Kamphuis CB. Sports participation in sport clubs, gyms or public spaces: How users of different sports settings differ in their motivations, goals, and sports frequency. PloS one [Internet]. 2018;13(10):e0205198. doi: https://doi.org/10.1371/journal.pone.0205198

18. Schoenfeld BJ, Contreras B, Krieger J, Grgic J, Delcastillo K, Belliard R, et al. Resistance training volume enhances muscle hypertrophy but not strength in trained men. Med Sci Sports Exerc [Internet]. 2019;51(1):94-103. doi: https://doi.org/10.1249/MSS.0000000000001764

19. Tangen EM, Gjestvang C, Stensrud T, Haakstad LAH. Is there an association between Total physical activity level and VO_{2max} among fitness Club members? A cross-sectional study. BMC Sports Sci Med Rehabil [Internet]. 2022;14(1):109. doi: https://doi.org/10.1186/s13102-022-00503-4

20. Barbry A, Carton A, Ovigneur H, Coquart J. Relationships between sports club participation and health determinants in adolescents and young adults. Fronts Sports Act Living [Internet]. 2022;4:918716. doi: https://doi.org/10.3389/fspor.2022.918716

21. Andrieieva O, Yarmak O, Kashuba V, Drozdovska S, Ginevičienė V, Blagii O, et al. Efficiency of a combined fitness program for improving physical condition in young women. Teor metod fiz vihov [Internet]. 2020;20(4):195-204. doi: https://doi.org/10.17309/tmfv.2020.4.01

22. Zhang C, Liu Y, Xu S, Sum RK-W, Ma R, Zhong P, et al. Exploring the level of physical fitness on physical activity and physical literacy among Chinese university students: a cross-sectional study. Front Psychol [Internet]. 2022;13:833461. doi: https://doi.org/10.3389/fpsyg.2022.833461

23. Cugusi L, Manca A, Bergamin M, Di Blasio A, Yeo TJ, Crisafulli A, et al. Zumba fitness and women's cardiovascular health: a systematic review. J Cardiopulm Rehabil Prev [Internet]. 2019;39(3):153-60. doi: https://doi.org/10.1097/HCR.0000000000000326

24. Yi X, Fu Y, Burns R, Ding M. Weight status, physical fitness, and health-related quality of life among Chinese adolescents: A cross-sectional study. Int J Environ Res Public Health [Internet]. 2019;16(13):1-11. doi: https://doi.org/10.3390/ijerph16132271

25. Crowley E, Powell C, Carson BP, Davies RW. The effect of exercise training intensity on VO_2max in healthy adults: an overview of systematic reviews and meta-analyses. Transl Sports Med [Internet]. 2022;2022:9310710. doi: https://doi.org/10.1155/2022/9310710

26. Koons NJ, Suresh MR, Schlotman TE, Convertino VA. Interrelationship between sex, age, blood volume, and Vo_{2max}. Aerosp Med Hum Perform [Internet]. 2019;90(4):362-8. doi: https://doi.org/10.3357/AMHP.5255.2019

27. Wang X, Soh KG, Samsudin S, Deng N, Liu X, Zhao Y, et al. Effects of high-intensity functional training on physical fitness and sport-specific performance among the athletes: A systematic review with meta-analysis. Plos one [Internet]. 2023;18(12):e0295531. doi: https://doi.org/10.1371/journal.pone.0295531