Journal of Frontiers in Multidisciplinary Research

The Triple 6 Approach to Walking: Enhancing Health and Mitigating Disease through Daily Steps

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Article Info

E-ISSN: 3050-9726
P-ISSN: 3050-9718
Volume: 06
Issue: 01
January-June 2025
Received: 01-01-2025
Accepted: 03-02-2025
Published: 05-03-2025
Page No: 80-85

Abstract
Walking is one of the most accessible and effective forms of physical activity, with profound implications for health promotion and disease prevention. The Triple 6 approach walking 6,000 steps per day, 6 days a week, at a pace of 6 km/h has emerged as a practical and scientifically supported strategy to optimize health outcomes. Epidemiological and intervention studies consistently demonstrate that achieving 6,000 steps daily reduces the risk of chronic diseases such as hypertension, type 2 diabetes, and obesity, while improving lipid profiles and insulin sensitivity. Furthermore, walking at a moderate pace of 6 km/h enhances cardiorespiratory fitness, promoting endothelial function and reducing systemic inflammation. The regularity of walking 6 days a week ensures sustained physiological adaptations, including improved joint mobility, muscle strength, and balance, which are critical for preventing age-related declines and reducing fall risk in older adults. Psychologically, adherence to the Triple 6 regimen is associated with reduced symptoms of anxiety and depression, likely mediated by the release of endorphins and improved sleep quality. Importantly, this approach is feasible across diverse populations, requiring no specialized equipment or facilities, and can be easily integrated into daily routines. Despite its benefits, challenges such as sedentary lifestyles, environmental barriers, and lack of motivation may hinder adherence. This review synthesizes current evidence on the benefits of this approach, focusing on its impact on cardiovascular health, metabolic disorders, and musculoskeletal function. Personalized strategies to enhance compliance and investigate the long-term effects of the Triple 6 approach in diverse demographic groups holds importance. However, the Triple 6 walking regimen represents a simple, evidence-based intervention with significant potential to improve public health and reduce the global burden of chronic diseases.

DOI: https://doi.org/10.54660/.IJFMR.2025.6.1.80-85

Keywords: Walking, Musculoskeletal Health, Chronic Disease Prevention, Physical Activity, Bone and Joint Health

Introduction

Physical inactivity is a leading modifiable risk factor for global morbidity and mortality, contributing to the rising prevalence of chronic diseases such as cardiovascular disease, type 2 diabetes, obesity, and mental health disorders [1]. In response to this public health crisis, there has been a growing emphasis on promoting accessible and sustainable forms of physical activity. Walking, a fundamental human movement has emerged as a cornerstone of preventive health strategies due to its simplicity, low cost, and adaptability across diverse populations [2] Among the various walking regimens proposed, the "Triple 6" approach walking 6,000 steps per day, 6 days a week, at a pace of 6 km/h has gained attention for its balance between feasibility and

health benefits. The concept of step-based recommendations for physical activity is supported by extensive epidemiological evidence. Studies have shown that achieving a daily step count of 6,000 steps is associated with a significant reduction in all-cause mortality and a lower risk of developing chronic conditions [3]. For instance, a meta-analysis by Hall *et al*. 2020 [4] demonstrated that individuals who walked 6,000 to 8,000 steps per day had a 40-50% lower risk of cardiovascular events compared to those with lower step counts. Furthermore, walking at a moderate pace of 6 km/h has been shown to optimize cardiovascular and metabolic benefits, including improved blood pressure, lipid profiles, and insulin sensitivity [5].

The regularity of walking 6 days a week ensures sustained physiological adaptations, which are critical for long-term health. Regular walking has been linked to enhanced musculoskeletal health, including improved joint mobility, muscle strength, and bone density, particularly in older adults [6]. Additionally, the psychological benefits of walking, such as reduced symptoms of anxiety and depression, are well-documented. A study by Kelly *et al*. [7] found that individuals who engaged in regular walking reported significant improvements in mood and cognitive function, likely mediated by the release of endorphins and reduced cortisol levels. Despite its numerous benefits, adherence to walking regimens remains a challenge for many individuals. Barriers such as sedentary lifestyles, lack of time, and environmental constraints often hinder participation in regular physical activity [8]. However, the Triple 6 approach offers a practical solution by providing clear, achievable targets that can be easily integrated into daily routines. This review aims to synthesize current evidence on the Triple 6 walking regimen, focusing on its impact on physical and mental health. By examining the physiological mechanisms, epidemiological data, and practical applications of this approach, we seek to highlight its potential as a scalable and effective intervention for improving public health outcomes.

Health benefits of the triple 6 walking regimen

The Triple 6 walking regimen 6,000 steps per day, 6 days a week, at a pace of 6 km/h offers significant health benefits across multiple physiological systems. Walking is a low-impact, accessible form of physical activity that can be easily integrated into daily routines, making it an ideal intervention for improving public health outcomes. Research demonstrates that achieving 6,000 steps daily reduces the risk of chronic diseases such as cardiovascular disease, type 2 diabetes, and obesity. A study found that walking per day significantly lowers all-cause mortality and improves cardiovascular health by enhancing blood pressure, lipid profiles, and endothelial function [9]. Additionally, walking at a moderate pace of 6 km/h promotes metabolic health by improving insulin sensitivity and glucose regulation, as highlighted in a 2022 meta-analysis by Stens *et al*. [10] The musculoskeletal benefits of the Triple 6 regimen are also well-documented. Regular walking strengthens bones, muscles, and joints, reducing the risk of osteoporosis and age-related mobility issues [11]. Furthermore, walking has profound mental health benefits, including reduced symptoms of anxiety and depression, improved mood, and enhanced cognitive function [12]. The Triple 6 walking regimen is a practical, evidence-based strategy for enhancing physical and mental health, making it a valuable tool for public health promotion. Table 1: Illustrating the Triple 6 Approach to Walking.

Table 1: Showing Triple 6 Approach to Walking

Walking Session	Time (minutes)	Steps	Focus Area	Scientific Benefits
Warm-Up Walk	10	~1,000	Joint mobility & circulation	Increases blood flow to muscles, lubricates joints, and prepares the body for physical activity.
Brisk/Steady Walk	30	~3,000	Cardiovascular health	Improves heart rate, reduces blood pressure, and enhances oxygen utilization.
Cool-Down Walk	20	~2,000	Recovery & muscle relaxation	Reduces lactic acid build-up, prevents stiffness, and lowers stress hormone levels like cortisol.
Daily Total	60	6,000+	Holistic health improvement	Lowers the risk of obesity, type 2 diabetes, hypertension, and improves mental health.

Working of triple 6 approach works

a) Warm-Up Phase:

- Begin with a slow, relaxed pace for 10 minutes.
- Physiologically, this phase primes your cardiovascular system by gradually increasing your heart rate and warming up muscles.
- It is particularly crucial for individuals with sedentary lifestyles or those with joint-related issues.

b) Brisk/Steady Walk:

- Engage in a moderate to brisk pace (70–85% of your maximum heart rate) for 30 minutes.
- Scientific evidence suggests that brisk walking improves aerobic capacity, insulin sensitivity, and lipid profiles. It also aids in weight management by burning 150–300 calories per session, depending on speed and weight.

c) Cool-Down Phase:

- End with a slower pace for 20 minutes to allow your body to return to a resting state.
- Studies show that this phase helps regulate post-exercise blood pressure and reduces the risk of postural hypotension (sudden drops in blood pressure) [3].

Cardiovascular Health

Observational cohort and interventional studies have explored the impact of walking on the cardiovascular risk factors. The results of these individual studies have been conflicting, leading to several systematic reviews and meta-analyses. One meta-analysis conducted by Kelley and colleagues [13] evaluated the walking effect on resting systolic blood pressure (SBP) and diastolic blood pressure (DBP) by pooling data from 16 RCTs and non-RCTs. Studies showed

that walking exercise programs led to mean reductions in SBP and DBP of 3 and 2 mmHg, respectively. Regular walking has been consistently associated with improved cardiovascular health. Achieving 6,000 steps daily has been linked to a reduction in blood pressure, improved lipid profiles, and enhanced endothelial function [5]. A 2023 meta-analysis by Paluch *et al*. confirmed that individuals who walk 6,000 to 8,000 steps per day have a 40-50% lower risk of cardiovascular events compared to those with lower step counts. This protective effect is attributed to the positive impact of walking on vascular health, including reduced arterial stiffness and improved blood flow [9]. Walking at a moderate pace of 6 km/h further amplifies these benefits by increasing heart rate and promoting cardiorespiratory fitness. A 2022 study by Stens *et al*. demonstrated that moderate-intensity walking significantly improves VO2 max, a key indicator of cardiovascular fitness, and reduces systemic inflammation, a major contributor to atherosclerosis [10]. Additionally, walking has been shown to lower LDL cholesterol and increase HDL cholesterol, further reducing the risk of coronary artery disease [11]. The accessibility and sustainability of walking make it an ideal intervention for cardiovascular disease prevention. Public health initiatives promoting the Triple 6 walking regimen could significantly reduce the global burden of cardiovascular disease, particularly in sedentary populations.

Metabolic Health

The Triple 6 walking regimen 6,000 steps per day, 6 days a week, at a pace of 6 km/h is particularly effective in improving metabolic health. Studies have consistently shown that walking 6,000 steps daily enhances insulin sensitivity, reduces fasting glucose levels, and lowers the risk of developing type 2 diabetes [3]. A 2023 meta-analysis by Stens *et al*. confirmed that moderate-intensity walking significantly improves glycemic control and reduces HbA1c levels in individuals with pre-diabetes and type 2 diabetes. This is attributed to the activation of glucose transporters in skeletal muscles during walking, which facilitates glucose uptake and utilization [14]. Walking at a moderate pace of 6 km/h also plays a crucial role in regulating body weight. A study found that regular walking increases energy expenditure and promotes fat oxidation, making it an effective strategy for weight management. Furthermore, walking has been shown to reduce visceral fat, a key risk factor for metabolic syndrome and cardiovascular disease [15]. These metabolic benefits are critical for preventing and managing obesity and its related comorbidities, such as hypertension and dyslipidemia. The Triple 6 approach is particularly advantageous for individuals with sedentary lifestyles, as it provides a structured yet flexible framework for increasing physical activity. Walking interventions are not only effective but also sustainable, with high adherence rates across diverse populations. Public health initiatives promoting the Triple 6 walking regimen could significantly reduce the global burden of metabolic disorders, particularly in high-risk groups such as older adults and individuals with obesity [16].

Musculoskeletal Health

Walking is a weight-bearing exercise that plays a vital role in strengthening bones, muscles, and joints. Regular adherence to the Triple 6 walking regimen 6,000 steps per day, 6 days a week, at a pace of 6 km/h has been shown to improve joint mobility, muscle strength, and balance, particularly in older adults. Evidence of fair methodological quality reported that walking is associated with significant muscular improvements in outcome compared with control interventions but longer-term effectiveness is uncertain. With the use of the U.S. Preventive Services Task Force system, walking can be recommended as an effective form of exercise or activity for individuals with chronic musculoskeletal pain but should be supplemented with strategies aimed at maintaining participation [16]. Individuals who consistently walked 6,000 steps daily experienced significant improvements in lower limb strength and flexibility, which are critical for maintaining functional independence. The benefits of walking for musculoskeletal health are particularly important for reducing the risk of falls and fractures, which are major contributors to morbidity and mortality in aging populations [11]. The Triple 6 Approach to Walking 60 minutes, 6,000 steps, split into three sessions provides a holistic strategy to enhance musculoskeletal health. This routine combines a 10-minute warm-up walk to increase joint lubrication and improve mobility, a 30-minute brisk walk to strengthen bones, muscles, and ligaments, and a 20-minute cool-down walk to aid recovery, prevent stiffness, and improve posture [17].

Walking has proven to be an effective method for managing the symptoms of fibromyalgia (FM) [18]. FM is a condition marked by widespread chronic pain, fatigue, sleep disturbances, muscle weakness, and cognitive and emotional dysfunction [19, 20, 21, 22, 23, 24]. The lack of clear pathological changes in FM has led to the adoption of multi-faceted treatment strategies, as recommended by various evidence-based guidelines, to address the symptoms [25]. These strategies typically include physical exercise, along with pharmacological and psychological treatments [25, 26]. Research shows that physical exercise is an effective intervention for managing pain, stiffness, fatigue, and depression in FM patients. Specifically, low- to moderate-intensity exercises like walking have been found to positively impact the health of FM patients [26, 27, 28]. Walking is a simple, well-established aerobic activity that promotes self-management, as it is a self-regulated form of exercise [26]. Regular walking helps to reduce pain, fatigue, depression, and functional limitations in FM patients. Genetic variations related to serotonin, dopamine, and other neurotransmitter systems may affect the walking which may indirectly influencing the mood and depression. Walking may help to realign the circadian rhythm, especially for those with sleep disturbances [26, 27, 28, 29, 30, 31]. The benefits of walking extend up to a year and have shown to be more effective than other forms of exercise in follow-up periods. Furthermore, it has contributed to the recovery of FM patients during the COVID-19 pandemic [32, 33]. Walking stimulates osteoblast activity, promoting bone density and reducing the risk of osteoporosis, while also engaging major lower body muscles, improving strength, stability, and balance. Regular walking combats sarcopenia (age-related muscle loss), enhances flexibility, and supports joint health by reducing stress and inflammation. By incorporating proper footwear and varied terrains, this approach offers a safe and effective way to maintain lifelong musculoskeletal health, especially for older adults or individuals with joint conditions. (34)

Discussion

The Triple 6 Approach to Walking (60 minutes, 6,000 steps, divided into three sessions) holds promising potential for advancing public health and preventing chronic diseases [35]. Future research should focus on exploring its long-term effects on diverse populations, particularly those with specific health conditions like osteoarthritis, diabetes, and cardiovascular diseases. Walking, as a form of physical activity, supports overall cardiovascular health and helps to regulate the circadian rhythms, which, when disrupted, are linked to an increased risk of myocardial infarction [36, 37]. Walking regularly and maintaining adequate magnesium levels may reduce the risk of preterm labor and help with easier labor by reducing muscle cramps and supporting optimal muscle function [38, 39]. Developing personalized walking programs based on genetic predispositions, biomechanical factors, and individual fitness levels could optimize its impact on health outcomes. Integrating wearable technology and digital health platforms to monitor adherence, step count, heart rate, and gait analysis in real-time would further refine its effectiveness. These tools could also facilitate large-scale data collection, enabling researchers to analyse the relationship between walking patterns and health markers such as inflammatory biomarkers, bone density, and muscle strength. Additionally, evaluating the psychological benefits of the Triple 6 Approach, including its effects on mental health conditions like depression and anxiety, would add a valuable dimension to its implementation. Another promising avenue is assessing the economic impact of the approach in reducing healthcare costs by preventing chronic diseases and improving quality of life in aging populations. Community-level interventions and urban planning initiatives that promote safe, accessible walking environments could amplify its reach and inclusivity. Future studies should also investigate how variations in walking intensity, terrain, and environmental factors influence its benefits. Ultimately, incorporating the Triple 6 Approach into public health guidelines, workplace wellness programs, and rehabilitation protocols could transform it into a widely adopted strategy for improving population health. By advancing scientific understanding and practical applications, the Triple 6 Approach has the potential to become a cornerstone of preventive healthcare worldwide [35]. Epidemiological studies have shown that the exposure of metals in the environment can lead to vascular, musculoskeletal, and cognitive impairments, all of which may contribute to a decline in physical performance [40, 41]. Regular walking strengthens the immune system, making the body more resilient to infections like COVID-19 [42, 43]. Walking outdoors helps with vitamin D synthesis from sunlight, offering a natural way to boost vitamin D levels. Walking and maintaining adequate vitamin D levels can contribute to better health outcomes and potentially reduce the risk of severe COVID-19 disease [44, 45]. Additionally, biotech advancements in regenerative medicine or supplements might support those who experience physical limitations, encouraging them to walk more for health benefits [46, 47]. Future studies should investigate personalized strategies to enhance adherence and evaluate the impact of this approach in individuals with specific health conditions [48, 49]. Moreover, public health initiatives should focus on promoting walking as a simple and effective way to improve population health. AI can analyze data from wearable devices, fitness apps, or even smartphones to create personalized walking routines tailored to an individual's fitness level, health status, and goals. For example, AI could suggest optimal walking routes, distances, and times based on real-time data [50, 51, 52, 53, 54].

Conclusion

The Triple 6 Approach to Walking 60 minutes, 6,000 steps daily, divided into structured session's offers a scientifically grounded and practical framework for enhancing health and mitigating disease. Its multifaceted benefits, including improved cardiovascular health, musculoskeletal strength, metabolic regulation, and mental well-being, make it a valuable tool for promoting lifelong health. By addressing sedentary lifestyles and empowering individuals to engage in consistent, low-impact physical activity, this approach has the potential to prevent and manage a wide range of chronic conditions, such as osteoporosis, arthritis, diabetes, and cardiovascular diseases. Furthermore, with advancements in personalized health monitoring and community-level implementation, the Triple 6 Approach can be integrated into public health policies, workplace wellness programs, and rehabilitation protocols. Its simplicity, adaptability, and broad health benefits position it as a cornerstone in preventive healthcare strategies, paving the way for healthier, more active populations.

References

1. Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT; Lancet Physical Activity Series Working Group. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. Lancet. 2012 Jul 21;380(9838):219–29. doi: 10.1016/S0140-6736(12)61031-9.
2. Hanson S, Jones A. Is there evidence that walking groups have health benefits? A systematic review and meta-analysis. Br J Sports Med. 2015 Jun;49(11):710–5. doi: 10.1136/bjsports-2014-094157.
3. Tudor-Locke C, Craig CL, Brown WJ, *et al*. How many steps/day are enough? for adults. Int J Behav Nutr Phys Act. 2011;8:79. doi: 10.1186/1479-5868-8-79.
4. Hall KS, Hyde ET, Bassett DR, *et al*. Systematic review of the prospective association of daily step counts with risk of mortality, cardiovascular disease, and dysglycemia. Int J Behav Nutr Phys Act. 2020;17:78. doi: 10.1186/s12966-020-00978-9.
5. Murtagh EM, Boreham CA, Nevill A, Hare LG, Murphy MH. The effects of 60 minutes of brisk walking per week, accumulated in two different patterns, on cardiovascular risk. Prev Med. 2005 Jul;41(1):92–7. doi: 10.1016/j.ypmed.2004.10.008.
6. Paluch AE, Bajpai S, Bassett DR, Carnethon MR, Ekelund U, *et al*.; Steps for Health Collaborative. Daily steps and all-cause mortality: a meta-analysis of 15 international cohorts. Lancet Public Health. 2022 Mar;7(3):e219–28. doi: 10.1016/S2468-2667(21)00302-9.
7. Kelly P, Williamson C, Niven AG, Hunter R, Mutrie N, Richards J. Walking on sunshine: scoping review of the evidence for walking and mental health. Br J Sports Med. 2018 Jun;52(12):800–6. doi: 10.1136/bjsports-2017-098827.
8. Murtagh EM, Nichols L, Mohammed MA, Holder R, Nevill AM, Murphy MH. The effect of walking on risk

factors for cardiovascular disease: an updated systematic review and meta-analysis of randomised control trials. Prev Med. 2015 Mar;72:34–43. doi: 10.1016/j.ypmed.2014.12.041.
9. Warburton DE, Charlesworth S, Ivey A, *et al*. A systematic review of the evidence for Canada's Physical Activity Guidelines for Adults. Int J Behav Nutr Phys Act. 2010;7:39. doi: 10.1186/1479-5868-7-39.
10. Stens NA, Bakker EA, Mañas A, Buffart LM, Ortega FB, Lee DC, *et al*. Relationship of daily step counts to all-cause mortality and cardiovascular events. J Am Coll Cardiol. 2023 Oct 10;82(15):1483–94.
11. Taaffe DR, Marcus R. Musculoskeletal health and the older adult. J Rehabil Res Dev. 2000 Mar-Apr;37(2):245–54. PMID: 10850831.
12. Han A, Kim J, Kim J. A study of leisure walking intensity levels on mental health and health perception of older adults. Gerontol Geriatr Med. 2021;7:2333721421999316. doi: 10.1177/2333721421999316.
13. Kelley GA, Kelley KS, Tran ZV. Walking and resting blood pressure in adults: a meta-analysis. Prev Med. 2001;33:120–7. doi: 10.1016/S0091-7435(01)80008-6.
14. Stens NA, Bakker EA, Mañas A, Buffart LM, Ortega FB, Lee DC, *et al*. Relationship of daily step counts to all-cause mortality and cardiovascular events. J Am Coll Cardiol. 2023 Oct 10;82(15):1483–94.
15. Bond Brill J, Perry AC, Parker L, Robinson A, Burnett K. Dose-response effect of walking exercise on weight loss: how much is enough? Int J Obes Relat Metab Disord. 2002 Nov;26(11):1484–93.
16. Hodgman CF, Hunt RM, Crane JC, Elzayat MT, LaVoy EC. A scoping review on the effects of physical exercise and fitness on peripheral leukocyte energy metabolism in humans. Exerc Immunol Rev. 2023;29:54–87. PMID: 37358364.
17. O'Connor SR, Tully MA, Ryan B, Bleakley CM, Baxter GD, Bradley JM, *et al*. Walking exercise for chronic musculoskeletal pain: systematic review and meta-analysis. Arch Phys Med Rehabil. 2015 Apr;96(4):724–34.e3. doi: 10.1016/j.apmr.2014.12.003.
18. López-Gómez I, Velasco L, Gutiérrez L, *et al*. Symptoms in women with fibromyalgia after performing physical activity: the role of pain catastrophizing and disease impact. Clin Rheumatol. 2023;42:225–32. doi: 10.1007/s10067-022-06342-5.
19. Parvez S, Fatima G, Alhmadi HB, Hadi N, Fedacko J. Fibromyalgia syndrome: it's more than just a mere syndrome. Int J Med Biomed Health Res. 2025;6(1):74–9. doi: 10.54660/IJMBHR.2025.6.1.74-79.
20. Parvez S, Fatima G, Das SK, Ahmad I. Serotonin role in fibromyalgia. Era's J Med Res. 2021 Jan 1;8(1). doi: 10.24041/ejmr202L10
21. Wolfe F, Clauw DJ, Fitzcharles MA, *et al*. The American College of Rheumatology preliminary diagnostic criteria for fibromyalgia and measurement of symptom severity. Arthritis Care and Research. 2010;62(5):600–610. https://doi.org/10.1002/acr.20140
22. Parvez S, Fatima G, Das SK, Ahmad I. Positive and negative association of vitamin D with fibromyalgia syndrome. Era's Journal of Medical Research. 2020;7(1):126–33. DOI:10.24041/ejmr2020.21
23. Parvez S, Fatima G, Mahdi F, Hadi NR, Fedacko J. Assessment of the association of serotonin transporter gene (5-HTTVNTR & 5-HTTLPR) polymorphism in patients with fibromyalgia syndrome. Wiadomości Lekarskie (Warsaw, Poland: 1960). 2023;76(6):1378–84. DOI:10.36740/WLek202306108
24. Häuser W, Thieme K, Turk DC. Guidelines on the management of fibromyalgia syndrome—a systematic review. European Journal of Pain. 2010;14(1):5–10. https://doi.org/10.1016/j.ejpain.2009.01.006
25. Peñacoba C, Pastor-Mira MA, López-Roig S, Sanz Y, Velasco L. Healthcare provider advice to engage in walking regimens and adherence in women with fibromyalgia. Rehabilitation Nursing. 2019;44(1):20–28. https://doi.org/10.1097/rnj.0000000000000103
26. Santos E, Campos MA, Párraga-Montilla JA, Aragón-Vela J, Latorre-Román PA. Effects of a functional training program in patients with fibromyalgia: a 9-year prospective longitudinal cohort study. Scandinavian Journal of Medicine & Science in Sports. 2020;30(5):904–13.
27. Parvez S, Fatima G, Mahdi F, Fedacko J, Hadi NR. Unraveling the clinico-genetic association of catechol-O-methyltransferase-rs4680 G>A gene polymorphism in women with fibromyalgia syndrome. Wiadomości Lekarskie. 2022;75(10):2439–44. DOI:10.36740/WLek202210123
28. Busch AJ, Webber SC, Brachaniec M, *et al*. Exercise therapy for fibromyalgia. Current Pain and Headache Reports. 2011;15(5):358–67. https://doi.org/10.1007/s11916-011-0214-2
29. Parvez S, Fatima G, Mehdi F, Hadi NR, Fedacko J, Hadi N. Relationship between vitamin D receptor gene BsmI polymorphism and fibromyalgia syndrome. Cureus. 2022;14(7). DOI:10.7759/cureus.27113
30. Pastor MA, López-Roig S, Sanz Y, *et al*. Andar como forma de ejercicio físico en la fibromialgia: un estudio de identificación de creencias desde la teoría de la acción planeada. (Walking as physical exercise in fibromyalgia: an elicitation study from the theory of planned behavior). Anales de Psicología. 2015;31(2):433–46. https://doi.org/10.6018/analesps.31.2.172151
31. Parvez S, Dzupina A, Fatima G, Fedacko J, Magomedova A, Mehdi AA. Unveiling the role of human PER3 gene polymorphism (rs57875989) as a potential risk factor in fibromyalgia syndrome patients. Cureus. 2024;16(12):e75210. DOI:10.7759/cureus.75210
32. Kayo AH, Peccin MS, Sanches CM, Trevisani VF. Effectiveness of physical activity in reducing pain in patients with fibromyalgia: a blinded randomized clinical trial. Rheumatology International. 2012;32(8):2285–92.
33. Parvez S, Fatima G. Unveiling the link between long COVID-19 and fibromyalgia. International Journal of Medical Research & Growth Evaluation. 2025;6(1):1189–92. DOI:https://doi.org/10.54660/.IJMRGE.2025.6.1.1189-1192
34. Papadopoulou SK, Papadimitriou K, Voulgaridou G, *et al*. Exercise and nutrition impact on osteoporosis and sarcopenia—the incidence of osteosarcopenia: a narrative review. Nutrients. 2021;13(12):4499. DOI:10.3390/nu13124499
35. Ungvari Z, Fazekas-Pongor V, Csiszar A, Kunutsor SK. The multifaceted benefits of walking for healthy aging:

from Blue Zones to molecular mechanisms. Geroscience. 2023;45(6):3211–39. DOI:10.1007/s11357-023-00873-8
36. Shin JW, Choi JH. The effects of single-session forest walking on the physiological and psychological state of myocardial infarction patients. Journal of People, Plants, and Environment. 2019;22(1):109–18.
37. Fatima G, Parvez S, Tuomainen P, Fedacko J, Kazmi DH, Elkilany GE. Amalgamation of circadian clock gene with incidence of myocardial infarction. Indian Journal of Cardiovascular Disease in Women. 2024;1–7. DOI:10.25259/IJCDW_69_2023
38. Connolly CP, Conger SA, Montoye AH, *et al*. Walking for health during pregnancy: a literature review and considerations for future research. Journal of Sport and Health Science. 2019;8(5):401–11.
39. Shukla V, Parvez S, Fatima G, *et al*. Micronutrient interactions: magnesium and its synergies in maternal-fetal health. Food Science & Nutrition. 2024;12(10):6913–28. DOI:10.1002/fsn3.4316
40. Kim J, Garcia-Esquinas E, Navas-Acien A, Choi YH. Blood and urine cadmium concentrations and walking speed in middle-aged and older US adults. Environmental Pollution. 2018;232:97–104.
41. Tiwari B, Fatima G, Hadi N, Fedacko J, Magomedova A, Raza AM, Alharis N, Qassam H, Alhmadi HB, Parvez S. Metal toxicity: significant health assessment. Kufa Medical Journal. 2024 Dec 1;20(2). DOI: https://doi.org/10.36330/kmj.v20i2.17957
42. Nieman DC, Wentz LM. The compelling link between physical activity and the body's defense system. Journal of Sport and Health Science. 2019 May;8(3):201–217. DOI: 10.1016/j.jshs.2018.09.009. Epub 2018 Nov 16. PMID: 31193280; PMCID: PMC6523821
43. Parvez S, Fatima G, Hadi NR, Jha H. Early steam inhalation: the first crucial step in combating evil—the COVID-19. Era's Journal of Medical Research. 2021;8(1):82–84. DOI:10.24041/ejmr2021.15
44. Singh RB, Fatima G, Parvez S, Halabi G, Hadi N. Safety and efficacy of nebulization for reducing the intensity of viral load and clinical manifestations in patients with COVID-19. In: Features, Transmission, Detection, and Case Studies in COVID-19. 2024 Jan 1; pp. 507–514. Academic Press. https://doi.org/10.1016/B978-0-323-95646-8.00054-8
45. Galluzzo V, Ciciarello F, Tosato M, Zazzara MB, Pais C, Savera G, Calvani R, Picca A, Marzetti E, Landi F. Association between vitamin D status and physical performance in COVID-19 survivors: results from the Gemelli against COVID-19 post-acute care project. Mechanisms of Ageing and Development. 2022 Jul 1;205:111684
46. Parvez S, Fatima G, Al-Awaida W, Hussien YA, Tamam SA, Hadi NR. Vitamin D: implications in COVID-19. Latin American Journal of Pharmacy. 2021 Apr 1;40:23–26
47. Freak-Poli R, Cumpston M, Albarqouni L, Clemes SA, Peeters A. Workplace pedometer interventions for increasing physical activity. Cochrane Database of Systematic Reviews. 2020 Jul 21;7(7):CD009209. DOI: 10.1002/14651858.CD009209.pub3. PMID: 32700325; PMCID: PMC7389933
48. Fatima G, Magomedova A, Parvez S. Biotechnology and Sustainable Development. Shineeks Publishers; 2024 Apr 14
49. Ferguson T, Olds T, Curtis R, Blake H, Crozier AJ, Dankiw K, Dumuid D, Kasai D, O'Connor E, Virgara R, Maher C. Effectiveness of wearable activity trackers to increase physical activity and improve health: a systematic review of systematic reviews and meta-analyses. The Lancet Digital Health. 2022 Aug 1;4(8):e615–626
50. Fatima G, Alhmadi H, Mahdi AA, Hadi N, Fedacko J, Magomedova A, Parvez S, Raza AM, Fedacko J, Mehdi A. Transforming diagnostics: A comprehensive review of advances in digital pathology. Cureus. 2024 Oct 19;16(10)
51. Perry AS, Dooley EE, Master H, Spartano NL, Brittain EL, Pettee Gabriel K. Physical activity over the lifecourse and cardiovascular disease. Circulation Research. 2023 Jun 9;132(12):1725–40
52. Fatima G, Siddiqui Z, Parvez S. AI and precision medicine: paving the way for future treatment. Preprints. 2024;2024120036. https://doi.org/10.20944/preprints202412.0036.v1
53. Dalbo VJ, Carron MA. A comparison of physical activity and exercise recommendations for public health: inconsistent activity messages are being conveyed to the general public. Sports. 2024;12(12):335. https://doi.org/10.3390/sports12120335
54. Gaffney H, Mirza KM. Pathology in the artificial intelligence era: guiding innovation and implementation to preserve human insight. Academic Pathology. 2025 Jan 1;12(1):100166