https://doi.org/10.33591/sfp.50.9.u2

Unit No. 2

EXERCISE IS MEDICINE: INTEGRATING PHYSICAL ACTIVITY INTO HEALTH PROMOTION AND DISEASE PREVENTION

Dr Fadzil Hamzah

ABSTRACT

Regular physical activity and exercise has long been recognised as a cornerstone of optimal health, playing a crucial role in the prevention and treatment of numerous medical conditions. This article reviews the extensive benefits of exercise, outlines the steps for exercise pre-participation screening based on the latest American College of Sports Medicine (ACSM) guidelines, and emphasises the importance of medical clearance. It also discusses the general principles for exercise prescription and the exercise considerations, including the specific precautions for patients with multiple comorbidities, sedentary individuals, the severely overweight, and those with physical disabilities. Additionally, strategies for tailoring exercise advice for patients with low health literacy or motivation are provided. The goal is to integrate fitness into healthcare, particularly in the context of population health initiatives such as Healthier SG.[1] By establishing exercise as a standard component of medical care, we can significantly enhance individual and public health outcomes.

Keywords: Exercise, Physical activity, Health promotion, Disease prevention, Medical screening, Chronic diseases, Health literacy, Patient motivation

SFP2024; 50(9): 10-14

INTRODUCTION

Regular physical activity is essential for maintaining optimal health and is integral in the prevention and treatment of numerous medical conditions. Exercise enhances cardiovascular health, improves metabolic function, supports mental health, and reduces the risk of chronic diseases such as diabetes, hypertension, and obesity. The concept of "Exercise Is Medicine" (EIM) advocates for the integration of physical activity into the standard healthcare model. This article discusses the comprehensive benefits of exercise, the necessity of pre-participation screening, the principles of exercise prescription, and the provision of tailored exercise advice for diverse patient populations.

DR FADZIL HAMZAH
Senior Staff Physician,
Department of Sport and Exercise Medicine Centre, Changi General Hospital

Director (Community Programmes),
Exercise Is Medicine Singapore

BENEFITS OF REGULAR PHYSICAL ACTIVITY

The benefits of regular physical activity are well-documented and multifaceted.

Physical Health Benefits

Cardiovascular Health

Regular physical activity improves cardiovascular function, reduces blood pressure, and lowers the risk of coronary artery disease. Exercise enhances endothelial function and reduces markers of inflammation.[2,3]

Metabolic Health

Exercise enhances insulin sensitivity, aids in blood glucose control, and reduces the risk of type 2 diabetes. It also contributes to maintaining a healthy weight by increasing basal metabolic rate and promoting fat loss.[4,5]

Musculoskeletal Health

Weight-bearing and resistance exercises improve bone density, muscle strength, and joint function, reducing the risk of osteoporosis and sarcopenia.[6,7]

Cancer Prevention

Physical activity is associated with a reduced risk of certain cancers, including breast, colon, and endometrial cancers, due to its role in regulating hormones, improving immune function, and reducing inflammation.[8,9]

Mental Health Benefits

Mood Enhancement

Exercise stimulates the release of endorphins and other neurochemicals that improve mood and reduce symptoms of depression and anxiety.[10,11]

Cognitive Function

Regular physical activity is linked to improved cognitive function, reduced risk of cognitive decline, and a lower incidence of neurodegenerative diseases such as Alzheimer's.[12,13]

Social and Psychological Benefits

Social Interaction

Group exercise and sports provide opportunities for social engagement, reducing feelings of loneliness and social isolation.[14,15]

Self-esteem and Confidence

Achieving fitness goals and improving physical appearance can boost self-esteem and confidence.[16]

PHYSICAL ACTIVITY PRE-PARTICIPATION SCREENING AND MEDICAL CLEARANCE

Conducting an exercise pre-participation screening is essential in ensuring safety and optimising the benefits of physical activity. Pre-participation screening is critical in identifying individuals who might be at risk of adverse events during exercise. It ensures that exercise recommendations are safe and appropriate for each individual's health status and fitness level.[17]

Screening Tools

Get Active Questionnaire (GAQ)[18]

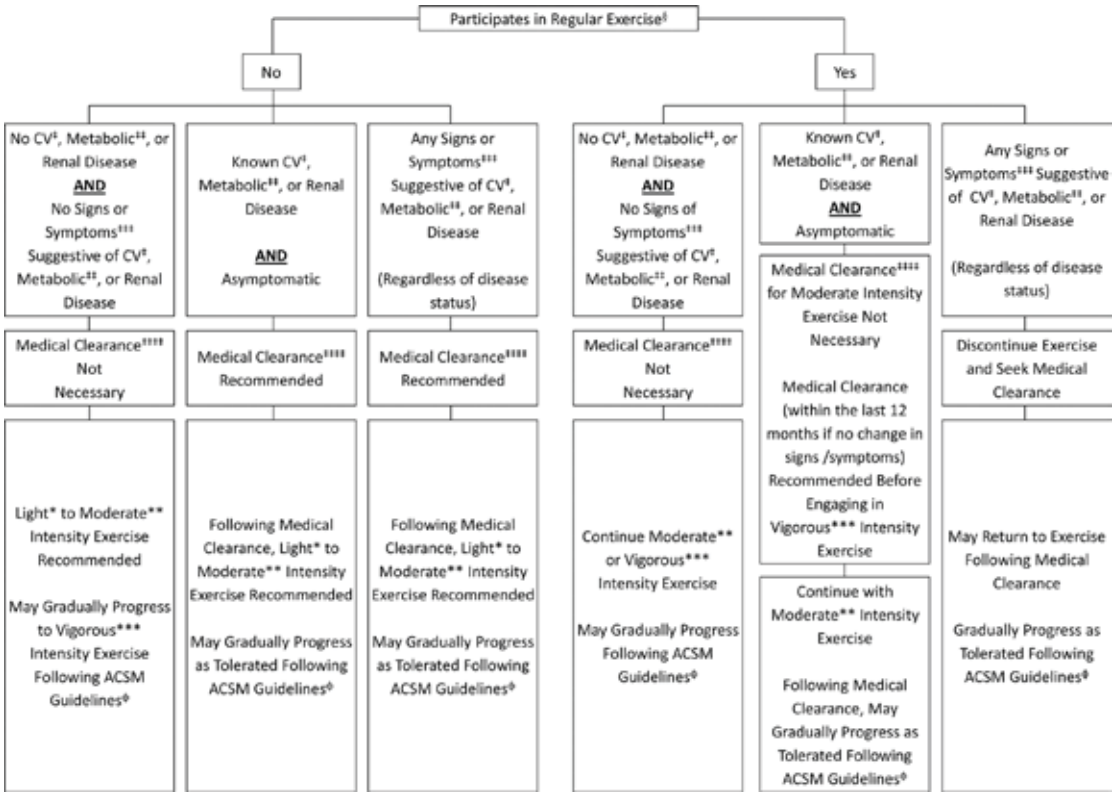
This is a self-administered questionnaire developed by the Canadian Society for Exercise Physiology (CSEP) to identify individuals who might need to consult a healthcare professional and/or a qualified exercise professional before exercising. Although useful for independent exercisers or for fitness facilities providing general supervision, self-guided questionnaires do not provide great value to physicians and qualified exercise professionals who require a more extensive health profile of their patients or clients with chronic medical conditions.

ACSM Pre-participation Screening Algorithm[19]

Developed by the American College of Sports Medicine, this algorithm (refer to **Figure 1**) helps healthcare professionals and qualified exercise professionals determine the patient's or client's need for medical clearance and further investigations. This is based on:

- The individual's current level of physical activity;
- The presence of major signs or symptoms of cardiovascular disease and/or known cardiovascular, metabolic or renal disease; and
- The desired exercise intensity.

Figure 1: 2015 ACSM Preparticipation Screening Algorithm[19]



§Exercise Participation Performing planned, structured physical activity at least 30 min at moderate intensity on at least 3 days per week for at least the last three months.

*Light Intensity Exercise: 30% to <40% HRR or VO2R, 2 to <3 METs, 9-11 RPE, an intensity that causes slight increases in HR and breathing

**Moderate Intensity Exercise: 40% to <60% HRR or VO2R, 3 to <6 METs, 12-13 RPE, an intensity that causes noticeable increases in HR and breathing

***Vigorous Intensity Exercise: ≥60% HRR or VO2R, ≥6 METs, ≥14 RPE, an intensity that causes substantial increases in HR and breathing

‡Cardiovascular (CV) Disease Cardiac, peripheral vascular, or cerebrovascular disease

‡‡Metabolic Disease Type 1 and 2 diabetes mellitus

‡‡‡Signs and Symptoms At rest or during activity; includes pain, discomfort in the chest, neck, jaw, arms, or other areas that may result from ischaemia; shortness of breath at rest or with mild exertion; dizziness or syncope; orthopnoea or paroxysmal nocturnal dyspnoea; ankle oedema; palpitations or tachycardia; intermittent claudication; known heart murmur; or unusual fatigue or shortness of breath with usual activities

‡‡‡‡Medical Clearance Approval from a healthcare professional to engage in exercise

♦ACSM Guidelines See ACSM's Guidelines for Exercise Testing and Prescription, 11th edition, 2020

Medical Evaluation

For individuals with signs and symptoms suggestive of cardiovascular, metabolic, and/or renal disease, a more comprehensive medical evaluation may be necessary. This can include a physical examination, exercise stress testing, and assessment of other risk factors such as family history and comorbid conditions.

Principles of Exercise Prescription

The FITT-VP principle (Frequency, Intensity, Time, Type, Volume, and Progression) provides a framework for designing exercise programmes that are safe, effective, and tailored to individual needs.[20]

Frequency

The number of exercise sessions per week. Generally, at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic activity per week is recommended.[21]

Intensity

The level of effort required during exercise. Intensity can be measured using heart rate, perceived exertion scales, or metabolic equivalents (METs).[22]

Time

The duration of each exercise session. Sessions should be at least 10 minutes long, with a goal of accumulating the recommended weekly amount of physical activity.[23]

Type

The mode of exercise, such as aerobic, resistance, flexibility, or balance training. A well-rounded programme includes a mix of these types.[24]

Volume

The total amount of exercise, calculated as the product of frequency, intensity, and time. It provides a measure of overall exercise dose.[25]

Progression

The gradual increase in exercise volume to continue achieving health benefits and improve fitness levels. Progression should be individualised and based on the participant's response to the exercise programme.[21]

EXERCISE CONSIDERATIONS FOR SPECIAL POPULATIONS

Patients with Multiple Medical Comorbidities

Exercise prescription for patients with multiple comorbidities, such as hypertension and diabetes, should be individualised. For patients with hypertension, aerobic exercises such as walking, cycling, and swimming are recommended, along with moderate-intensity resistance training. It is essential to avoid Valsalva manoeuvres, which can increase blood pressure, and to monitor blood pressure before, during, and after exercise.[26] Diabetic patients should engage in both aerobic exercises and resistance training, with careful monitoring of blood glucose levels before, during, and after exercise to prevent hypoglycaemia.[4]

Sedentary and Severely Overweight Patients

For sedentary and severely overweight patients, gradual progression is key. Starting with low-intensity exercises, such as walking or water aerobics, and gradually increasing the duration and intensity helps build endurance and reduce the risk of injury.[27] Introducing resistance training to build muscle mass and boost metabolic rate is beneficial. Emphasising non-weight-bearing activities, such as swimming or cycling, helps reduce joint stress and prevent injuries.[28]

Patients with Disabilities

Tailoring exercise programmes for patients with disabilities requires understanding their capabilities and limitations. Adaptive equipment, such as hand cycles, wheelchair-accessible machines, and resistance bands, can facilitate safe and effective workouts. Modifying exercises to accommodate physical limitations while focusing on maintaining flexibility, strength, and cardiovascular fitness is crucial. Collaboration with physiotherapists or occupational therapists can enhance programme design and implementation, ensuring exercises are safe and beneficial.[29]

Tailoring Advice for Patients with Low Health Literacy or Motivation

Effective communication and education are vital for patients with low health literacy. Simplifying information and using visual aids, diagrams, and practical demonstrations can enhance understanding.[30] Motivational interviewing techniques can help identify and address barriers to physical activity, fostering a supportive environment that encourages behaviour change.[31] Setting realistic goals, providing regular feedback, and offering positive reinforcement can help maintain motivation and adherence to exercise programmes.[32]

CONCLUSION

Integrating exercise into healthcare is essential for improving population health and mitigating the burden of chronic diseases. Regular physical activity offers extensive benefits, from enhancing cardiovascular and metabolic health to supporting mental well-being. Implementing thorough pre-participation screenings and tailoring exercise recommendations for special populations are essential steps in promoting safe and effective physical activity. Addressing the needs of patients with low health literacy or motivation further ensures that exercise advice is accessible and actionable for all.

REFERENCES

1. https://www.healthiersg.gov.sg/resources/white-paper/
2. Joyner MJ, Green DJ. Exercise protects the cardiovascular system: effects beyond traditional risk factors. J Physiol. 2009 Dec 1;587(Pt 23):5551-8. doi: 10.1113/jphysiol.2009.179432. Epub 2009 Sep 7. PMID: 19736305; PMCID: PMC2805367.
3. Nystoriak MA, Bhatnagar A. Cardiovascular Effects and Benefits of Exercise. Front Cardiovasc Med. 2018 Sep 28;5:135. doi: 10.3389/fcvm.2018.00135. PMID: 30324108; PMCID: PMC6172294.
4. Colberg SR, Sigal RJ, Yardley JE, et al. Physical Activity/Exercise and Diabetes: A Position Statement of the American Diabetes Association. Diabetes Care. 2016 Nov;39(11):2065-2079. doi: 10.2337/dc16-1728. PMID: 27926890; PMCID: PMC6908414.
5. Kirwan JP, Sacks J, Nieuwoudt S. The essential role of exercise in the management of type 2 diabetes. Cleve Clin J Med. 2017 Jul;84(7 Suppl 1):S15-S21. doi: 10.3949/ccjm.84.s1.03. PMID: 28708479; PMCID: PMC5846677.
6. Carter MI, Hinton PS. Physical activity and bone health. Mo Med. 2014 Jan-Feb;111(1):59-64. PMID: 24645301; PMCID: PMC6179512.
7. Montero-Odasso M, van der Velde N, Martin FC, et al. World guidelines for falls prevention and management for older adults: a global initiative. Age Ageing. 2022 Sep 2;51(9):afac205. doi: 10.1093/ageing/afac205. Erratum in: Age Ageing. 2023 Sep 1;52(9):afad188. doi: 10.1093/ageing/afad188. Erratum in: Age Ageing. 2023 Oct 2;52(10):afad199. doi: 10.1093/ageing/afad199. PMID: 36178003; PMCID: PMC9523684.
8. Moore SC, Lee IM, Weiderpass E, et al. Association of Leisure-Time Physical Activity With Risk of 26 Types of Cancer in 1.44 Million Adults. JAMA Intern Med. 2016 Jun 1;176(6):816-25. doi: 10.1001/jamainternmed.2016.1548. PMID: 27183032; PMCID: PMC5812009.
9. McTiernan A, Friedenreich CM, Katzmarzyk PT, et al. Physical Activity in Cancer Prevention and Survival: A Systematic Review. Med Sci Sports Exerc. 2019 Jun;51(6):1252-1261. doi: 10.1249/MSS.0000000000001937. PMID: 31095082; PMCID: PMC6527123.
10. Schuch FB, Vancampfort D, Firth J, et al. Physical Activity and Incident Depression: A Meta-Analysis of Prospective Cohort Studies. Am J Psychiatry. 2018 Jul 1;175(7):631-648. doi: 10.1176/appi.ajp.2018.17111194. Epub 2018 Apr 25. PMID: 29690792.
11. Stubbs B, Vancampfort D, Rosenbaum S, et al. An examination of the anxiolytic effects of exercise for people with anxiety and stress-related disorders: A meta-analysis. Psychiatry Res. 2017 Mar;249:102-108. doi: 10.1016/j.psychres.2016.12.020. Epub 2017 Jan 6. PMID: 28088704.
12. Ahlskog JE, Geda YE, Graff-Radford NR, Petersen RC. Physical exercise as a preventive or disease-modifying treatment of dementia and brain aging. Mayo Clin Proc. 2011 Sep;86(9):876-84. doi: 10.4065/mcp.2011.0252. PMID: 21878600; PMCID: PMC3258000.
13. Liu-Ambrose T, Donaldson MG. Exercise and cognition in older adults: is there a role for resistance training programmes? Br J Sports Med. 2009 Jan;43(1):25-7. doi: 10.1136/bjsm.2008.055616. Epub 2008 Nov 19. PMID: 19019904; PMCID: PMC5298919.
14. Holt-Lunstad J, Smith TB, Layton JB. Social relationships and mortality risk: a meta-analytic review. PLoS Med. 2010 Jul 27;7(7):e1000316. doi: 10.1371/journal.pmed.1000316. PMID: 20668659; PMCID: PMC2910600.
15. Shvedko A, Whittaker AC, Thompson JL, Greig CA. Physical activity interventions for treatment of social isolation, loneliness or low social support in older adults: A systematic review and meta-analysis of randomised controlled trials. Psychology of Sport and Exercise. 2018;34:128-137. https://doi.org/10.1016/j.psychsport.2017.10.003
16. Craft LL, Perna FM. The Benefits of Exercise for the Clinically Depressed. Prim Care Companion J Clin Psychiatry. 2004;6(3):104-111. doi: 10.4088/pcc.v06n0301. PMID: 15361924; PMCID: PMC474733.
17. Arena R, Myers J, Williams MA, et al. Assessment of functional capacity in clinical and research settings: a scientific statement from the American Heart Association Committee on Exercise, Rehabilitation,and Prevention of the Council on Clinical Cardiology and the Council on Cardiovascular Nursing. Circulation. 2007 Jul 17;116(3):329-43. doi: 10.1161/CIRCULATIONAHA.106.184461. Epub 2007 Jun 18. PMID: 17576872.
18. http://csep.ca/2021/01/20/pre-screening-for-physical-activity/
19. Riebe D, Franklin BA, Thompson PD, et al. Updating ACSM's Recommendations for Exercise Preparticipation Health Screening. Med Sci Sports Exerc. 2015 Nov;47(11):2473-9. doi: 10.1249/MSS.0000000000000664. Erratum in: Med Sci Sports Exerc. 2016 Mar;48(3):579. PMID: 26473759.
20. Liguori G, American College of Sports Medicine. ACSM's guidelines for exercise testing and prescription. Eleventh edition. USA: Lippincott Williams & Wilkins; 2021.
21. Garber CE, Blissmer B, Deschenes MR, et al. American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. Med Sci Sports Exerc. 2011 Jul;43(7):1334-59. doi: 10.1249/MSS.0b013e318213fefb. PMID: 21694556.
22. Fletcher GF, Ades PA, Kligfield P, et al. Exercise standards for testing and training: a scientific statement from the American Heart Association. Circulation. 2013 Aug 20;128(8):873-934. doi: 10.1161/CIR.0b013e31829b5b44. Epub 2013 Jul 22. PMID: 23877260.
23. Haskell WL, Lee IM, Pate RR, et al. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Med Sci Sports Exerc. 2007 Aug;39(8):1423-34. doi: 10.1249/mss.0b013e3180616b27. PMID: 17762377.
24. Cavill N, Kahlmeier S, Racioppi F, editors. Physical Activity and Health in Europe: Evidence for Action. Denmark: World Health Organization; 2012.
25. Bouchard C, Blair SN, Haskell WL, editors. Physical Activity and Health. 2nd ed. Human Kinetics; 2012.
26. Pescatello LS, MacDonald HV, Lamberti L, Johnson BT. Exercise for Hypertension: A Prescription Update Integrating Existing Recommendations with Emerging Research. Curr Hypertens Rep. 2015 Nov;17(11):87. doi: 10.1007/s11906-015-0600-y. PMID: 26423529; PMCID: PMC4589552.
27. Jakicic JM, Powell KE, Campbell WW, et al. Physical Activity and the Prevention of Weight Gain in Adults: A Systematic Review. Med Sci Sports Exerc. 2019 Jun;51(6):1262-1269. doi: 10.1249/MSS.0000000000001938. PMID: 31095083; PMCID: PMC6527311.
28. Swift DL, McGee JE, Earnest CP, Carlisle E, Nygard M, Johannsen NM. The Effects of Exercise and Physical Activity on Weight Loss and Maintenance. Prog Cardiovasc Dis. 2018 Jul-Aug;61(2):206-213. doi: 10.1016/j.pcad.2018.07.014. Epub 2018 Jul 9. PMID: 30003901.
29. Rimmer JH, Marques AC. Physical activity for people with disabilities. Lancet. 2012 Jul 21;380(9838):193-5. doi: 10.1016/S0140-6736(12)61028-9. PMID: 22818934.
30. Cornett, S.J. (2009). Assessing and Addressing Health Literacy. OJIN: The Online Journal of Issues in Nursing.
31. Miller WR, Rollnick S. (2013). Motivational Interviewing: Helping People Change. 3rd ed. Guilford Press; 2012.
32. Tulloch H, Sweet SN, Fortier M, Capstick G, Kenny GP, Sigal RJ. Exercise facilitators and barriers from adoption to maintenance in the diabetes aerobic and resistance exercise trial. Can J Diabetes. 2013 Dec;37(6):367-74. doi: 10.1016/j.jcjd.2013.09.002. Erratum in: Can J Diabetes. 2014 Feb;38(1):70. Sigal, Ronal J [corrected to Sigal, Ronald J]. PMID: 24321716.

LEARNING POINTS

- **Regular physical activity significantly enhances cardiovascular, metabolic, musculoskeletal, and mental health. It also plays a critical role in preventing chronic diseases such as diabetes, hypertension, and certain cancers, making it a foundational element of overall health and well-being.**
- **Conducting thorough exercise pre-participation screenings, as recommended by the American College of Sports Medicine (ACSM), is essential in ensuring safety, particularly for individuals with existing medical conditions. This process helps in tailoring exercise prescriptions to individual health profiles, minimising the risk of adverse events.**
- **Exercise prescriptions must be customised for special populations, including those with multiple comorbidities, sedentary individuals, severely overweight patients, and those with disabilities. The FITT-VP principle (Frequency, Intensity, Time, Type, Volume, and Progression) provides a framework for developing safe and effective exercise programmes for these groups, ensuring they reap the full benefits of physical activity while minimising risks.**