Physical activity prescription a pragmatic guide to adopting current recommendations.

Meredith Janelle*, David Ginn

Department of Internal Medicine VA Bldg, East Tennessee State University, United States

Abstract

Physical activity, once seen as an elective adjunct to a healthy life, is now the standard of preventative care and the anecdote to one of the greatest global health risks, the sedentary lifestyle. Low cardiorespiratory fitness is nearly equivalent to smoking as an independent risk factor for mortality and the world health organization (who) estimates that physical inactivity accounts for 3.2 million deaths globally. Yet, only about 20% of Americans meet the recommendations for exercise and less than 20% of physicians provide written exercise prescriptions. The following review will highlight patient preparation and guideline recommendations to help general practitioners adopt physical activity prescription.

Keywords: Physical activity prescription, exercise prescription, exercise, preventative health, primary care.

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Introduction

A recent update in physical activity (PA) recommendations may have caught your attention and sparked interest in your patients. In April 2018, the American Heart Association issued a statement in the journal Circulation recommending the routine assessment and promotion of physical activity [1-4]. Among their suggestions is making PA assessment a part of every visit, the use of a standardized screening tool, and the recognition of dynamic behavioural progression toward personal change (2018). The AHA statement notes the global trend towards sedentary lifestyles with increasing health and economic burdens. Some estimates quantify the healthcare costs of physical inactivity in the US alone at $120 billion per year (2018).

One solution to low physical activity levels is to adopt physical activity prescriptions (PAP) in your practice. PAP are written instructions for one or more physical activity including the frequency, intensity, time, type, volume and progression (FITT-VP) and should reflect the American College of Sports Medicine recommendations [5] . PAP has been shown to be more effective at increasing physical activity than verbal advice alone and has been studied in healthy patients, frail elderly, diabetics, and those with cardiovascular disease [6-9]. Adding PAP to your arsenal of chronic disease management will improve patient outcomes, as PA has been noted to be effective in the prevention and management of over 40 diseases including CVD, obesity, diabetes, mellitus, cancer, depression, Alzheimer disease, arthritis, and osteoporosis.

Patient Assessment

The 2018 AHA recommendations for routine assessment and promotion of physical activity include the adoption of a standardized tool for assessing PA [10]. An optimal tool would be objective and integrated into the current EHR. However, without a current ideal tool, the AHA recommends a simple one question tool "On average, how many days per week do you engage in moderate or greater intensity physical activity (like a brisk walk)?" or "On average, how many minutes do you engage in this physical activity on those days?" (2018). Although this tool leaves a lot uncovered, it initiates the larger conversation and opens the door for recommendations. Wearable devices are another source of PA information but have not yet provided metrics that translate to the American College of Sports Medicine recommendations or transmissible information to the EHR.

After initiating the conversation about physical activity, you will need to evaluate where your patient is in their adoption of physical activity. Physical activity prescription, like all prescriptions, should be considered only after a shared-decision making conversation with the patient. This conversation should be initiated after the clinician makes a clear recommendation about behaviour change backed by supporting evidence [11]. After stating your concerns and recommendations, the patient's readiness to change should be evaluated. Six stages of behaviour change have been described in the Trans theoretical Model or Stages of Change Model: Precontemplation, Contemplation, Preparation, Action, Maintenance, and Relapse [12]. During each stage the clinician should use open-ended and scaling questions to assess conviction, confidence, and importance to promote change. Furthermore, motivational interviewing techniques can be used to resolve patient ambivalence and change the patient's goals through guided self-realization (2014). Refer to Table 1 for examples of motivational interviewing approaches to promote physical activity in the six stages of change.

Prescreening

Once you have identified a patient who is ready for action you will need to take into consideration their unique medical situation before prescribing physical activity. In 2015, the American College of Sports Medicine (ACSM) revised its recommendations for exercise preparticipation health screening with the goal of utilizing new evidence and decreasing unnecessary barriers to physical activity. In the past, patients

***Table 1**. Examples of stages of change and motivational interviewing techniques (Adapted from O'Connell 2014).*

Stage	Characteristics	Clinical Strategy
Precontemplation	Reluctance to discuss physical activity, denies negative consequences associated with sedentary lifestyle, shows reactance when pressured about starting physical activity.	Start by asking permission to discuss physical activity. Inquire about their thoughts and clarify discrepancies. Assign homework to think, read, and talk to others about the risks of a sedentary lifestyle and the benefits of initiating physical activity.
Contemplation	Displays willingness to learn about how a sedentary lifestyle is a significant health risk and even dabbles in action. This stage can be prolonged by paralytic perfectionism.	Ask the patient's perspective. Identify the risks and benefits of initiating physical activity. Scale confidence and assess factors that would increase confidence.
Preparation	Initiation of specific goals, plans, methods, and timeframe. Actively visualizes success.	Validate the patient's rationale for change. Agree on a start date and encourage the patient publicly announce their plans. Arrange close follow-up
Action	Able to describe their physical activity plan in detail and follows the plan regularly. Demonstrates resistance to obstacles	Show interest in their physical activity plan and efforts. Create anticipatory planning for slips or relapses and contingency plans for adjusting their plans when necessary.
Maintenance	Consistently engaged in regular physical activity. May have varying levels of insight into silent health benefits.	Share admiration and joy with the patient! Identify slips or signs of wavering and create action plan. Validate adopting physical activity as a new lifestyle, not a temporary fix.

were often faced with various obstacles, including office visits with co-pays and costly diagnostic tests, before physical activity was recommended by their physician. This is due to the small, but real, increase in sudden cardiac death (SCD) and acute myocardial infarction (AMI) during vigorous physical activity compared to the resting state. The Physicians' Health Study and Nurses' Health Study reports that SCD occurs every 1.5 million episodes of vigorous physical exertion in men and every 36.5 million hours of moderate-to-vigorous exertion in women [13-15]. It's important not to overemphasize the risks associated with physical activity because the health benefits of regular physical activity far outweigh the risks and the decrease with habitual exercise [15].

The new ACSM guidelines evaluate patients using their current known risk factors, symptoms of undiagnosed risk factors, and whether they are already tolerating physical activity.

Groups that do not need medical clearance before initiating light to moderate intensity physical activity are people without known cardiovascular, renal, or metabolic diseases and those without symptoms of CV, renal, or metabolic diseases [15]. Patients with known CV, renal, or metabolic diseases who are already tolerating light to moderate intensity exercise during initial evaluation and are asymptomatic may continue exercise without medical clearance (2015). Patients experiencing symptoms during exercise, those with known CV, renal, or metabolic diseases, and those with symptoms of CV, renal, or metabolic diseases should undergo medical clearance before continuing or initiating exercise (2015). Progression to higher intensity physical activity should be gradual and patients with CV, renal, or metabolic diseases tolerating moderate intensity exercise still require medical clearance before initiating high intensity exercise (2015).

"Medical clearance" is an unfortunately vague term used by the ACSM due to lack of consensus among expert groups regarding preparticipation health screening recommendations. Namely, the American College of Cardiology/American Heart Association, the United States Preventive Services Task Force, and the Department of Health and Human Services Physical Activity Guidelines Advisory Committee conflict on when or how a patient should be screened before initiating physical activity. Their recommendations have been summarized in Table 2. Whenever expert recommendations fall short of obvious its best practice to discuss the clinical ambiguities with your patient in a frank consent-like conversation including the risks, benefits, and alternatives to testing to help guide an informed decision. We recommend stress testing and cardiology referral in patients with alarm symptoms during exertion. Most patients can trial a light exercise program after being educated on alarm symptoms and when to stop exercise. All patients with cardiovascular, renal, or metabolic diseases should have close follow-up after physical activity prescription.

In addition to the above recommendation, the ACSM provides their own general recommendations for the reduction of cardiovascular events during PA. They recommend careful attention to the FITT-VP (frequency, intensity, time, type, volume and progression) model of prescription promoting gradual progression over transition phases lasting 2-3 months (2015). Patients should be advised to make warm-ups and cool-downs part of their exercise routine and all patients should be educated on warning signs that warrant discontinuation of PA and medical attention (2015). Lastly, physically inactive patients should avoid sudden bouts of vigorous activity (2015).

Guidelines

Four major organizations give guidance on exercise recommendations, the American College of Sports Medicine (ACSM), the American Heart Association (AHA), the US Dept. Health and Human Services (HHS), and the World Health Organization (WHO). For the healthy adult, all the organizations recommend: 5 days per week of moderate aerobic exercise (150 min total) or 3 days per week vigorous aerobic exercise (75 min total) with 2-3 days per week of resistance training of varying intensity per age group [15-18]. Additionally, the ACSM recommends 2-3 days per week of flexibility and neuromotor training. Each of the organization's websites offers patient hand outs and more information on their recommendations.

Exercise intensity can be a subjective experience and may lead to patient and provider confusion, but you can help your patients understand exercise intensity in several different ways. The first, and more complicated method, is the Borg Rating of Perceived Exertion (RPE). During this method the patient will rate their perceived exertion on a scale of 0-20, whereby 0 is no exertion and 20 is maximal exertion. Multiplying their RPE by 10 will result in a number that should approximate their heart rate during that activity. On this scale, moderate activity falls around a RPE of 11-14 and vigorous activity

Table 2. *Recommendations for preparticipation health screening (Adapted from Riebe et al. 2015).*

Organization	Recommendation
ACC/AHA	Exercise testing before engaging in moderate- or vigorous-intensity exercise when the risk of CVD is increased
Physical Activity Guidelines Advisory Committee (HHS)	Recommend that people with CVD, DM, and other chronic conditions wishing to participate in vigorous physical activity make a physical activity plan with their healthcare provider
USPSTF	Recommends against the use of routine diagnostic resting or exercise electrocardiography as a screening tool in asymptomatic individuals who are at low risk of CVD due to insufficient evidence to evaluate the benefits and harm of exercise testing before initiating a PA program

at 17-19 [17]. There are numerous pitfalls to this method including medications that slow heart rate and the subjective unit of measure. This would work best as a hand out along with education. A simpler method of measuring intensity is the "talk test" [19]. In this method a patient measures their ability to talk or sing during an activity. In moderate intensity activity, you can talk, but cannot sing. Whereas in vigorous activity you cannot say more than a few words without stopping for a breath (2015). Lastly, you can prescribe activities that fall into "moderate" or vigorous" intensity categories. Examples of moderate intensity activity are walking briskly (3 miles per hour or faster, but not race-walking), water aerobics, bicycling slower than 10 miles per hour, tennis (doubles), ballroom dancing, and general gardening (2015). Vigorous intensity activities include race walking, jogging, running, swimming laps, tennis (singles), aerobic dancing, bicycling 10 miles per hour or faster, jumping rope, heavy gardening (continuous digging or hoeing), and hiking uphill or with a heavy backpack (2015). The implementation of the ACSM's recommendation of 2-3 days per week of resistance training may also be met with some hesitation given most providers' limited knowledge and experience in resistance training. A quick reference for the initiation of a resistance strength program, The Basics of Starting and Progressing a Strength-Training Program, can be found on the ACSM website and makes a great patient hand out [20]. The article highlights beginner goals, exercise choice, and progression. A certified personal trainer is recommended for the initiation of strength training to establish good lifting technique and create a resistance routine (2016). Many people will find obtaining a certified personal trainer to be financially restrictive, for these patients we suggest a simple at-home resistance program. The ACSM provides a resource for at-home resistance training, A Strength Training Program for Your Home, located on their Public Information Articles page [1]. This article provides guidance for a healthy adult patient to adopt a simple at-home, total-body resistance program with limited equipment. Providers should review this article and pertinent supplemental material (like online videos) to prepare for anticipated patient questions.

Special Populations

The ACSM and the American Diabetes Association (ADA) provide detailed guidelines on the initiation of PA in patients with type II diabetes mellitus (T2DM). The ACSM pre-participation recommendations do not differ greatly from general recommendations in recommending a physician evaluation prior to initiation of any physical activity more strenuous than walking for the sedentary person. FITT-VP for diabetic patients are the same as the general population, but diabetic patients should attempt to take no more than 2 consecutive days off from PA to maximize the benefits of improved insulin action [21]. Hyperglycaemia should not be a barrier to PA in T2DM patients. The ACSM advises that PA is safe at blood glucose (BG)>300 mg·dL−1 (without ketosis) as long as the patient feels well and remains hydrated (2010). Patients with T2DM not on insulin or secretagogues usually do not have hypoglycaemia with PA and may even have hyperglycaemia after high intensity exercise. However, for patients with T2DM on insulin or secretagogues, the development of hypoglycaemia is a real and dangerous complication. Hypoglycaemia usually occurs within 6-15 hours post-exercise making nocturnal hypoglycaemia a particular concern after evening PA [22]. The ADA recommends "~20% reductions of daily basal insulin dose with reduced prandial bolus insulin and low glycaemic index carbohydrate feeding following evening exercise for those on MDI (multiple dose insulin)" (2016). During the initiation of PA with insulin adjustments, patients may also be advised to have a bedtime snack and perform a glucose check overnight (2016). Lastly, remind your patients with T2DM to check their feet daily and after PA to detect early onset of blistering or open areas.

Hypertension affects roughly 80 million Americans and physical activity is a key modifiable determinant of hypertension [23]. The AHA recommends "an average 40 minutes of moderate to vigorous-intensity aerobic activity 3 or 4 times per week" for the reduction of hypertension and cholesterol, but also notes that some physical activity is better than none [17]. However, a recent update on exercise prescription for hypertension adds additional clarity in recommending "a combination of 30 min or more per day of moderate intensity aerobic exercise on most, preferably all, days of the week and dynamic resistance exercise 2 to 3 days per week to total 150 min or more of exercise per week" [23]. Regular physical activity can reduce systolic and diastolic blood pressure by 5-10 mmHg, particularly in the 22 hours after exercise known as post-exercise hypotension (PEH) [24]. Patients should be instructed to check their blood pressure regularly while initiating PA and should have close follow-up for possible medication reduction.

Coronary artery disease (CAD) affects approximately 16 million Americans and is the cause of nearly half of a million deaths annually [25]. Physical activity is effective in the primary prevention of CAD, but also slows progression of disease and improves survival in patients with established CAD [26]. The 1994 ACSM guidelines on exercise for patients with coronary artery disease make note of the heterogeneity of conditions under the umbrella of CAD, thus limiting a broad statement guideline for all patients affected by CAD (The American College of Sports Medicine 1994). To safely initiate PA, patients with CAD should be evaluated by a physician, obtain physician approval, and be monitored during initiation [25]. Patients with recent percutaneous coronary intervention (PCI) or acute coronary syndrome (ACS) should be referred to a comprehensive outpatient cardiovascular rehabilitation program either prior to hospital discharge or during the first follow-up office visit

[27]. In addition, outpatients with the diagnosis of ACS, coronary artery bypass surgery or PCI, chronic angina, and/or peripheral artery disease within the past year should be referred to a comprehensive outpatient cardiovascular rehabilitation program (2011). Low risk patients can participate in a home-based cardiac rehabilitation program (2011). Greater than one year from the time of ACS, CABG, or PCI patients can be recommended to accumulate a minimum of 30 to 60 minutes of moderate physical activity four to five times per week, coupled with an increase in daily lifestyle activities [25]. Patients with a history of CAD should receive special education on proper warm-up and cool-downs, never exercising to the point of chest pain, staying within reach of emergency services, and red flag symptoms (2016).

In addition to pre-existing conditions evaluated by the ACSM, patients may have medical concerns not commented on by professional organizations. These may include peripheral neuropathy, degenerative joint disease, and chronic pain. In the absence of high-quality evidence based guidelines, each clinician should use their best clinical judgement to help patients overcome such barriers. For instance, in patients with peripheral neuropathy walking around an indoor track will likely be safer than on a trail or path with uneven surfaces. Non-weight bearing exercise (like cycling and water aerobics) may be easier for patients with degenerative joint disease than jogging and patients with chronic pain may require additional interventions after PA (like topical pain relievers).

Barriers to PA may include financial limitations, rural and urban settings, childcare, transportation, social isolation, fear of injury, and not sure what "public safety" means here public safety [28,29]. Each barrier to PA should be addressed before prescribing PA to maximize success. Compiling a local resource list of affordable gyms (including those that provide childcare), well-lit outdoor green spaces, low-cost group physical fitness activities, and transportation options will help the clinician be prepared for everyone's barriers to initiating PA [30-41].

Takeaway points

1. Prepare for PAP by reviewing guidelines, compiling local resources, and review the trans theoretical model of behaviour change.
2. Adopt PA assessment in your clinic with a standardized tool or single question tool.
3. Promote PA during visits.
4. Assess your patient's readiness using the Trans theoretical model of behaviour change.
5. Evaluate your patient's risks and consider additional testing per clinical judgement.
6. Prepare your patients with comorbidities like type II diabetes mellitus, hypertension, and chronic pain.
7. Collaborate with your patient to find the PA that is right for them and address socioeconomic barriers to PA.
8. Prescribe exercise using FITT-VP using gradual progression and interval follow-ups.
9. Help your patients maintain their new lifestyle and share in their accomplishments when they do.

Conclusion

PAP is effective in the prevention, treatment, and management of numerous chronic diseases that plague millions of people. Its few risks can be carefully navigated by most general clinicians and its benefits cannot be overstated. The adoption of PAP requires clinician preparation and dedication, but will improve patient outcomes, quality metrics, and professional satisfaction.

Referernces

1. Ball S. A Strength Training Program for Your Home. 2016.
2. Guo Y, Bian J, Leavitt T, et al. Assessing the Quality of Mobile Exercise Apps Based on the American College of Sports Medicine Guidelines: A Reliable and Valid Scoring Instrument. Journal of Medical Internet Research. 2017; 19:e67.
3. Petrella RJ, Lattanzio CN, Overend TJ. Physical Activity Counselling and Prescription among Canadian Primary Care Physicians. Arch Intern Med. 2007.
4. Lobelo F, Young DR, Sallis R, et al. Routine Assessment and Promotion of Physical Activity in Healthcare Settings: A Scientific Statement From the American Heart Association. Circulation. 2018.
5. Lundqvist S, Börjesson M, Larsson MEH, et al. Physical Activity on Prescription (PAP), in patients with metabolic risk factors. A 6-month follow-up study in primary health care. PLoS ONE 2017; 12:e0175190.
6. Rödjer L, Jonsdottir HI, Börjesson M. Physical activity on prescription (PAP): self-reported physical activity and quality of life in a Swedish primary care population, 2-year follow-up. Scandinavian Journal of Primary Health Care. 2016.
7. Bray NW, Smart RR, Jakobi JM, et al. Exercise prescription to reverse frailty. Applied Physiology, Nutrition, and Metabolism. 2016; 41:1112-16.
8. Joelsson M, Bernhardsson S, Larsson MEH. Patients with chronic pain may need extra support when prescribed physical activity in primary care: a qualitative study. Scandinavian Journal of Primary Health Care. 2017.
9. Dasgupta K, Rosenberg E, Joseph L, et al. Physician step prescription and monitoring to improve ARTERial health (SMARTER): A randomized controlled trial in patients with type 2 diabetes hypertension. Diabetes, Obesity & Metabolism. 2017.
10. Lobelo F, Young DR, Sallis R, et al. Routine Assessment and Promotion of Physical Activity in Healthcare Settings: A Scientific Statement From the American Heart Association. Circulation. 2018.
11. Fortin AH, Dwamena FC, Frankel R, et al. The End of the Interview. In: Smith's Patient-Centered Interviewing: An Evidence-Based Method, 3e New York, NY: McGraw-Hill; Chapter 6. 2012.

12. O'Connell D. Behavior Change. Behavioral Medicine: A Guide for Clinical Practice, 4e New York, NY: McGraw-Hill.

13. Albert CM, Mittleman MA, Chae CU, et al. Triggering of sudden death from cardiac causes by vigorous exertion. N Engl J Med. 2000; 343:1355-61.

14. Whang W, Manson JE, Hu FB, et al. Physical exertion, exercise, and sudden cardiac death in women. JAMA. 2006; 295:1399-403.

15. Riebe D, Franklin BA, Thompson PD, et al. Updating ACSM's Recommendations for Exercise Preparticipation Health Screening. Medicine & Science in Sports & Exercise. (2015); 47:2473-79.

16. WHO. "Physical Activity". 2017.

17. The American Heart Association. Moderate to Vigorous - What is your level of intensity? 2015.

18. WHO. "Global Health Risks- Mortality and burden of disease attributable to selected major risks"*2009.

19. Centres for Disease Control and Prevention. Measuring Physical Activity Intensity. Division of Nutrition, Physical Activity, and Obesity, National Centre for Chronic Disease Prevention and Health Promotion 2015.

20. Dunn-Lewis C, Kraemer W. The Basics of Starting and Progressing a Strength-Training Program 2016.

21. The American College of Sports Medicine and the American Diabetes Association. Exercise and Type 2 Diabetes: American College of Sports Medicine and the American Diabetes Association Joint Position Statement. 2010. Medicine & Science in Sports & Exercise. 2016; 42:2282-03.

22. Colberg SR, Sigal RJ, Yardley JE, et al. Physical Activity/ Exercise and Diabetes: A Position Statement of the American Diabetes Association. Diabetes Care. 39:2065-79.

23. Pescatello LS, MacDonald HV, Lamberti L, et al. Exercise for Hypertension: A Prescription Update Integrating Existing Recommendations with Emerging Research. Current Hypertension Reports 2015.

24. Headley S. Living with Hypertension. 2016.

25. Shipe M. Exercising with Coronary Heart Disease. 2016.

26. Winzer EB, Woitek F, Linke A. Physical Activity in the Prevention and Treatment of Coronary Artery Disease. Journal of the American Heart Association. 2018.

27. The American College of Sports Medicine and the American Diabetes Association. Exercise and Type 2 Diabetes: American College of Sports Medicine and the American Diabetes Association Joint Position Statement. Medicine & Science in Sports & Exercise. 2010; 42:2282-03.

28. Hege A, Christiana RW, Battista R, et al. Active living in rural Appalachia: Using the rural active living assessment (RALA) tools to explore environmental barriers. Preventive Medicine Reports. 2017.

29. Dutton GR, Johnson J, Whitehead D, et al. Barriers to Physical Activity among Predominantly Low-Income African- American Patients with Type 2 Diabetes. Diabetes Care. 2005; 28:1209-10.

30. Blair SN, Kampert JB, Kohl HW, et al. Influences of Cardiorespiratory Fitness and Other Precursors on Cardiovascular Disease and All-Cause Mortality in Men and Women. JAMA. 1996.

31. Boden WE, Franklin B, Berra K, et al . Exercise as a Therapeutic Intervention in Patients with Stable Ischemic Heart Disease: An Under filled Prescription. The American Journal of Medicine. 2014; 127: 905-11.

32. Carlson SA, Fulton JE. Inadequate Physical Activity and Health Care Expenditures in the United States. Progress in Cardiovascular Diseases. 2015; 57: 315-323.

33. Colditz GA, Philpott. The Impact of the Nurses' Health Study on Population Health: Prevention, Translation, and Control. American Journal of Public Health.2016; 106:1540-45.

34. Diaz KM, Shimbo. Physical Activity and the Prevention of Hypertension. Current Hypertension Reports.2013; 15:659-68.

35. Hajar R. Framingham Contribution to Cardiovascular Disease. Heart Views : The Official Journal of the Gulf Heart Association. 2016; 17:78-81.

36. Pedersen BK, Saltin B. Exercise as medicine – evidence for prescribing exercise as therapy in 26 different chronic diseases. Scand J Med Sci Sports. 2015; 25: 1-72.

37. Reiner M, Niermann C, Jekauc D, et al. Long-term health benefits of physical activity – a systematic review of longitudinal studies. BMC Public Health. 2013; 13:813.

38. Sesso HD, Paffenbarger RS, Lee I. Physical Activity and Coronary Heart Disease in Men. Circulation. 2000; 102:975-980.

39. Sesso HD, Paffenbarger RS, Lee I. Physical Activity and Coronary Heart Disease in Men. Circulation. 2000; 102:975-980.

40. Smith SC Jr, Benjamin EJ, Bonow RO, et al. AHA/ACCF Secondary Prevention and Risk Reduction Therapy for Patients With Coronary and Other Atherosclerotic Vascular Disease: Circulation. 2011; 124:2458-73.

41. U.S. Department of Health and Human Services. Physical Activity Guidelines for Americans. Washington (DC): U.S. Department of Health and Human Services; ODPHP Publication No. U0036. 2008.

***Correspondence to:**

Meredith Janelle
Department of Internal Medicine VA Bldg
East Tennessee State University
United States
Tel: + 5082720483
E-mail: m.m.janelle@gmail.com