Lavie et al., J Glycomics Lipidomics 2012, 2:2
DOI: 10.4172/2153-0637.1000e104

Journal of Glycomics & Lipidomics

ISSN: 2153-0637

Editorial Open Access

Physical Fitness-An Often Forgotten Cardiovascular Risk Factor

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Deaths due to Cardiovascular Disease (CVD) in the United States (US) have reached a plateau during the last four decades and have actually declined slightly in the past two decades; however, CVD remains the leading cause of morbidity and mortality in both women and men in the US and most of the Westernized world [1]. The projected total cost of CVD in the US is over $500 billion dollars (using 2008 dollars) annually and is expected to more than double during the next two decades [1]. Therefore, the prevention and treatment of CVD is of critical importance in the US and worldwide from a medical and economic perspective [1,2].

Considering the staggering fiscal burden of CVD and, especially, Coronary Heart Disease (CHD), most medical treatments are directed at the major CHD risk factors, including obesity and Type 2 Diabetes Mellitus (T2DM) and their epidemics, as well as Hypertension (HTN), dyslipidemia, and smoking. Physical inactivity and, more importantly, physical fitness, defined as a combination of Cardiorespiratory (CRF) and muscular fitness, are often neglected in the equation of major CHD and CVD risk [3]. Substantial evidence supports that physical fitness is one of the most potent predictors of an individual's future health status [3]. More recently, musculoskeletal fitness, along with CRF, have been increasingly recognized to synergistically play major roles in the pathogenesis and prevention of chronic diseases [3-6]. Although we and others have indicated the benefits of muscular strength and muscular fitness on subsequent CVD and total mortality risk, [3,7] as well as the importance of resistance training to improve CVD surrogate outcomes (e.g., improving glucose control in T2DM) [8], most of the emphasis in the area of physical fitness continues to be directed toward improving levels of CRF [4,6,9].

The gold standard for the assessment of CRF has typically been considered to be peak oxygen consumption measured by respiratory gas exchange [10]. However, the majority of fitness data from major epidemiological studies that demonstrate reduced CVD and all cause-mortality risk at higher levels of CRF is derived from estimated exercise capacity. This is typically calculated from test duration and maximal workload on a treadmill or stationary bicycle and is expressed as estimated Metabolic Equivalents (METs), which is the typical way exercise workloads and exercise capacity are defined clinically and in epidemiological research [4-6,9,11-14]. In a recent major analysis of 33 studies (102,980 participants with 6,910 deaths and 84,323 participants and 4,485 cases of CHD/CVD events), Kodama et al. [9] demonstrate that for every one MET increase in CRF, all-cause mortality is reduced by 13% and CHD and CVD events are reduced by 15%. In addition, a one MET increase in CRF on 2 maximal tests separated by an average of 6.3 years is associated with a reduction in all-cause and CVD mortality of 15% and 19%, respectively [4], suggesting that increasing CRF through more physical activity has a beneficial impact on CVD risk.

High levels of CRF remain very protective and largely negate the adverse affects of traditional CHD risk factors on subsequent CVD and total mortality even in patients with multiple CHD risk factors, including overweightness/obesity, metabolic syndrome/T2DM, and HTN [7,13,15-19]. In most circumstances, patients with these major CHD risk factors and high CRF have lower mortality than do patients without these CHD risk factors but with low CRF [11-19]. Considering this, low levels of CRF may be the strongest risk factor for CVD and total mortality. In addition, high levels of CRF have been associated with other favorable outcomes, such as reduced rates of depression and dementia [20,21], and their related mortality risk [22-25], as well as reduced rates of mortality from various cancers, especially of the breast and colon/digestive tract [26,27]. Therefore, efforts from clinicians are needed to promote increased physical activity and exercise training in their patients in order to improve levels of CRF irrespective of baseline status. However, it should be emphasized that most of the increased risk is clustered in the subgroup in the lowest levels of CRF (generally considered as the bottom quintile of CRF) [28]. For individuals within this lowest quintile, even small improvements in levels of CRF are associated with marked reductions in overall CVD and total mortality risk [9,28].

Most of this editorial has focused on the importance of CRF, which can be greatly improved by aerobic exercise training. We have also recently emphasized the important effects of muscular strength and muscular fitness, which can be improved with resistance training, on CVD risk factors and prognosis, including all-cause and CVD mortality [3]. In a recent randomized controlled trial in patients with T2DM, we demonstrated that improvement of glucose control (glycosylated hemoglobin) occurred with combined treatment with aerobic exercise training and resistance training [8]. In another recent study of over 1,500 men with HTN, mortality during an over 18 year average follow-up was significantly affected by both CRF and muscular fitness. In fact, participants in the upper third of both CRF and muscular strength had the lowest mortality, and both CRF and muscular fitness were independent predictors of survival [7]. Additionally, resistance training is also important to reduce sarcopenia (age–related decline in muscular strength) and is also important for maintaining bone strength and preventing musculo-skeletal complications, fractures, and declines in quality of life in the elderly [3,29]. Together, these data reinforce the importance of resistance training in improving health outcomes with respect to maintaining or increasing overall physical fitness.

Considering that the 2012 American Heart Association (AHA) update points out that < 40% of the US adults met the AHA 2020 physical activity goals for achieving ideal CVD-related health [1], efforts

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Received June 08, 2012; **Accepted** June 11, 2012; **Published** June 13, 2012

Citation: Lavie CJ, Swift DL, Johannsen NM, Arena R, Church TS (2012) Physical Fitness-An Often Forgotten Cardiovascular Risk Factor. J Glycomics Lipidomics 2:e104. doi:10.4172/2153-0637.1000e104

to improve CRF are urgently needed. Additionally, when considering assessments of other CVD risk factors (e.g., lipids, HTN, T2DM, etc) and their contribution to overall health, greater consideration of physical fitness, including both CRF and muscular fitness, is warranted.

References

1. Roger VL, Go AS, Lloyd-Jones DM, Benjamin EJ, Berry JD, et al. (2012) Heart disease and stroke statistics--2012 update: a report from the American Heart Association. Circulation 125: e2-2e220.
2. Artero EG, España-Romero V, Lee DC, Sui X, Church TS, et al. (2012) Ideal cardiovascular health and mortality: the Aerobics Center Longitudinal Study (ACLS). Mayo Clin Proc.
3. Artero EG, Lee DC, Lavie CJ, Espana-Romero V, Sui X, et al. (2012) Muscular strength and cardiovascular prognosis and survival. J Cardiopulm Rehabil Prev.
4. Lee DC, Sui X, Artero EG, Lee IM, Church TS, et al. (2011) Long-term effects of changes in cardiorespiratory fitness and body mass index on all-cause and cardiovascular disease mortality in men: the Aerobics Center Longitudinal Study. Circulation 124: 2483-2490.
5. Lee DC, Sui X, Church TS, Lavie CJ, Jackson AS, et al. (2012) Changes in fitness and fatness on the development of cardiovascular disease risk factors hypertension, metabolic syndrome, and hypercholesterolemia. J Am Coll Cardiol 59: 665-672.
6. Gupta S, Rohatgi A, Ayers CR, Willis BL, Haskell WL, et al. (2011) Cardiorespiratory fitness and classification of risk of cardiovascular disease mortality. Circulation 123: 1377-1383.
7. Artero EG, Lee DC, Ruiz JR, Sui X, Ortega FB, et al. (2011) A prospective study of muscular strength and all-cause mortality in men with hypertension. J Am Coll Cardiol 57: 1831-1837.
8. Church TS, Blair SN, Cocreham S, Johannsen N, Johnson W, et al. (2010) Effects of aerobic and resistance training on hemoglobin A_{1c} levels in patients with type 2 diabetes: a randomized controlled trial. JAMA 304: 2253-2262.
9. Kodama S, Saito K, Tanaka S, Maki M, Yachi Y, et al. (2009) Cardiorespiratory fitness as a quantitative predictor of all-cause mortality and cardiovascular events in healthy men and women: a meta-analysis. JAMA 301: 2024-2035.
10. Balady GJ, Arena R, Sietsema K, Myers J, Coke L, et al. (2010) Clinician's Guide to cardiopulmonary exercise testing in adults: a scientific statement from the American Heart Association. Circulation 122: 191-225.
11. Blair SN, Kohl HW 3rd, Paffenbarger RS Jr, Clark DG, Cooper KH, et al. (1989) Physical fitness and all cause mortality. A prospective study of healthy men and women. JAMA 262: 2395-2401.
12. Blair SN, Kohl HW 3rd, Barlow CE, Paffenbarger RS Jr, Gibbons LW, et al. (1995) Changes in physical fitness and all-cause mortality. A prospective study of healthy and unhealthy men. JAMA 273: 1093-1098.
13. Blair SN, Kampert JB, Kohl HW 3rd, Barlow CE, Macera CA, et al. (1996) Influences of cardiorespiratory fitness and other precursors on cardiovascular disease and all-cause mortality in men and women. JAMA 276: 205-210.
14. Blair SN, Church TS (2004) The fitness, obesity, and health equation: is physical activity the common denominator? JAMA 292: 1232-1234.
15. Lyerly GW, Sui X, Church TS, Lavie CJ, Hand GA, et al. (2008) Maximal exercise electrocardiography responses and coronary heart disease mortality among men with diabetes mellitus. Circulation 117: 2734-2742.
16. Lyerly GW, Sui X, Church TS, Lavie CJ, Hand GA, et al. (2010) Maximal exercise electrocardiographic responses and coronary heart disease mortality among men with metabolic syndrome. Mayo Clin Proc 85: 239-246.
17. Lyerly GW, Sui X, Lavie CJ, Church TS, Hand GA, et al. (2009) The association between cardiorespiratory fitness and risk of all-cause mortality among women with impaired fasting glucose or undiagnosed diabetes mellitus. Mayo Clin Proc 84: 780-786.
18. Church TS, Cheng YJ, Earnest CP, Barlow CE, Gibbons LW, et al. (2004) Exercise capacity and body composition as predictors of mortality among men with diabetes. Diabetes Care 27: 83-88.
19. Church TS, LaMonte MJ, Barlow CE, Blair SN (2005) Cardiorespiratory fitness and body mass index as predictors of cardiovascular disease mortality among men with diabetes. Arch Intern Med 165: 2114-2120.
20. Sui X, Laditka JN, Church TS, Hardin JW, Chase N, et al. (2009) Prospective study of cardiorespiratory fitness and depressive symptoms in women and men. J Psychiatr Res 43: 546-552.
21. Ahlskog JE, Geda YE, Graff-Radford NR, Petersen RC (2011) Physical exercise as a preventive or disease-modifying treatment of dementia and brain aging. Mayo Clin Proc 86: 876-884.
22. Liu R, Sui X, Laditka JN, Church TS, Colabianchi N, et al. (2012) Cardiorespiratory fitness as a predictor of dementia mortality in men and women. Med Sci Sports Exerc 44: 253-259.
23. Milani RV, Lavie CJ (2007) Impact of cardiac rehabilitation on depression and its associated mortality. Am J Med 120: 799-806.
24. Milani RV, Lavie CJ (2009) Reducing psychosocial stress: a novel mechanism of improving survival from exercise training. Am J Med 122: 931-938.
25. De Schutter A, Lavie CJ, Milani RV (2011) Relative importance of comorbid psychological symptoms in patients with depressive symptoms following phase II cardiac rehabilitation. Postgrad Med 123: 72-78.
26. Holmes MD, Chen WY, Feskanich D, Kroenke CH, Colditz GA (2005) Physical activity and survival after breast cancer diagnosis. JAMA 293: 2479-2486.
27. Peel JB, Sui X, Matthews CE, Adams SA, Hébert JR, et al. (2009) Cardiorespiratory fitness and digestive cancer mortality: findings from the aerobics center longitudinal study. Cancer Epidemiol Biomarkers Prev 18: 1111-1117.
28. Franklin BA, McCullough PA (2009) Cardiorespiratory fitness: an independent and additive marker of risk stratification and health outcomes. Mayo Clin Proc 84: 776-779.
29. Williams MA, Haskell WL, Ades PA, Amsterdam EA, Bittner V, et al. (2007) Resistance exercise in individuals with and without cardiovascular disease: 2007 update: a scientific statement from the American Heart Association Council on Clinical Cardiology and Council on Nutrition, Physical Activity, and Metabolism. Circulation 116: 572-584.