

Review

Physical Activity, Sedentary Behaviours, and Cardiovascular Health: When Will Cardiorespiratory Fitness Become a Vital Sign?

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Although it is generally agreed upon that a physically active lifestyle and regular exercise are good for heart health, it is much less appreciated by the public that the prolonged hours of sedentary time resulting from sitting at work or screen time are also risk factors for cardiovascular outcomes and other cardiometabolic diseases. In this short narrative review, evidence is discussed and prudent recommendations are made in the context of the sedentary, affluent lifestyle that characterizes a large proportion of our population. It has become overwhelmingly clear that a sedentary lifestyle is a powerful risk factor for cardiovascular and other chronic diseases. In addition, vigorous physical activity and exercise is also associated with metabolic and cardiovascular adaptations that are compatible with cardiovascular health. In that regard, cardiorespiratory fitness, a reliable metric to assess the ability of the cardiovascular system to sustain prolonged physical work, has been shown to be the most powerful predictor of mortality and morbidity, way beyond classical cardiovascular disease (CVD) risk factors such as smoking, cholesterol, hypertension, and diabetes. On the basis of the evidence available, it is proposed that

RÉSUMÉ

Bien que de façon générale, un consensus existe sur le fait qu'un mode de vie physiquement actif et que la pratique régulière de l'exercice sont bons pour la santé cardiaque, le public est beaucoup moins conscient que les heures de sédentarité prolongées qui résultent du temps passé en position assise au travail ou devant un écran sont également des facteurs de risque d'événements cardiovasculaires et d'autres maladies cardiométaboliques. Dans cette courte revue narrative, nous discutons des données scientifiques et faisons des recommandations prudentes dans le contexte du mode de vie confortable et sédentaire qui caractérise une large proportion de notre population. Il est on ne peut plus clair qu'un mode de vie sédentaire est un puissant facteur de risque de maladies cardiovasculaires (MCV) et d'autres maladies chroniques. De plus, l'activité physique et l'exercice vigoureux sont également associés à des adaptations métaboliques et cardiovasculaires qui sont compatibles avec la santé cardiovasculaire. À cet égard, il a été démontré que la condition cardiorespiratoire, une mesure fiable pour évaluer la capacité du système cardiovasculaire à maintenir l'effort physique prolongé, est le plus

Although the beneficial effects of regular physical activity and exercise on cardiovascular disease (CVD) risk are recognized, there still remain questions about the amount and intensity associated with optimal cardiovascular protection. In this short narrative review, evidence is discussed and prudent recommendations are made in the context of the sedentary, affluent lifestyle that characterizes a large proportion of our population. It is also proposed that cardiorespiratory fitness (CRF) should be incorporated as a vital sign in CVD risk factor evaluation and management.

Physical Activity and CVD: The Pioneers

Many exercise physiology textbooks and review articles on physical activity or exercise refer to the Greek physician Hippocrates as one of the first, approximately 400 BC, to have suggested that physical activity, performed within reasonable limits, is good for health. Of course, other physicians in history have made such a connection between physical activity and health but it is really with the introduction of epidemiological methods and modern statistics that the link between physical activity and health outcomes began to be properly quantified.

Many physical activity or exercise experts give paternity of the concept that regular physical activity provides protection against coronary heart disease to Professor Jeremy Morris who reported that sedentary bus drivers were at increased coronary heart disease risk compared with the physically active conductors who spent their daily shifts collecting tickets and climbing the stairs of the double-decker busses.^{1,2} Although such findings were received with great skepticism at the time,

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both dimensions of overall physical activity level (reducing sedentary time and performing regular physical activity or endurance type exercise) should be targeted to reduce CVD risk. Finally, because of the robust evidence that poor cardiorespiratory fitness is an independent risk factor for CVD and related mortality, it is proposed that this simple physiological metric should be incorporated as a vital sign in CVD risk factor evaluation and management.

Morris had validated his hypothesis by studying other civil servants such as active postal service workers compared with sedentary clerks and telephone operators.¹

On the other side of the ocean, another physician and epidemiologist, Professor Ralph Paffenbarger, began reporting similar observations first in San Francisco longshoremen and later among Harvard alumni that the level of physical activity was indeed negatively related with mortality risk.^{3,4} During his career, Dr Paffenbarger also attempted to quantify the added value of vigorous compared with less vigorous physical activity and worked on identifying a threshold of physical activity associated with optimal health benefits.⁴ Among his numerous seminal contributions to physical activity and cardiovascular epidemiology, Dr Paffenbarger also reported that a physically active lifestyle was cardioprotective even in the presence of comorbidities such as obesity, hypertension, and diabetes.⁴ Morris and Paffenbarger are clearly considered as the 2 pioneers of modern epidemiology regarding physical activity and health.^{5,6} Since their early publications, numerous population studies conducted all over the world have secured the notion that a physically active lifestyle is associated with a reduced risk of comorbidities and related mortality.⁷⁻¹⁵ This relationship has been shown to be independent from all known and well established CVD risk factors. It is not the purpose of this article to extensively review these studies; the reader is referred to several extensive reviews on the topic.¹⁶⁻²² Rather, recent studies shedding some light on some remaining questions will be discussed and prudent recommendations will be made on the basis of the evidence currently available.

Physical Activity and CVD: How Long and How Hard?

Although it is recognized that physical activity reduces CVD risk (Fig. 1), how much of it is needed and the intensity that provides optimal cardiovascular protection are 2 questions for which there are still no definite answers. National and international guidelines recommend a weekly practice of either 150 minutes of moderate intensity physical activity, 75 minutes of vigorous intensity activity, or some combination of moderate or vigorous intensity activity.^{17,28,29} In addition, 2 sessions of resistance exercise per week are also recommended. Despite the fact that these recommendations are made on the basis of comprehensive literature reviews and are rather consensual all over the world, there is also robust evidence that a weekly physical activity level below these physical activity

puissant prédicteur de la mortalité et de la morbidité, et qu'elle dépasse de loin les facteurs de risque de MCV comme le tabagisme, le cholestérol, l'hypertension et le diabète. En s'appuyant sur les données scientifiques disponibles, il est proposé de cibler les deux dimensions du niveau global d'activité physique (la réduction de la sédentarité et la pratique régulière de l'activité physique ou de l'exercice en endurance) pour réduire le risque de MCV. Finalement, puisque des données scientifiques solides prouvent qu'une mauvaise condition cardiorespiratoire est un facteur de risque indépendant des MCV et de la mortalité associée, il est proposé que cette simple mesure physiologique fasse partie des signes vitaux lors de l'évaluation et de la prise en charge des facteurs de risque de MCV.

guidelines is nevertheless associated with reduced mortality (Fig. 2).³⁰⁻³² Thus, although experts continue to debate at conferences and in editorials about the optimal physical activity level required for cardioprotection, they are nevertheless quick to recognize that “moving a little” is better than doing nothing at all. This recommendation is particularly relevant considering the fact that the prevalence of physical inactivity

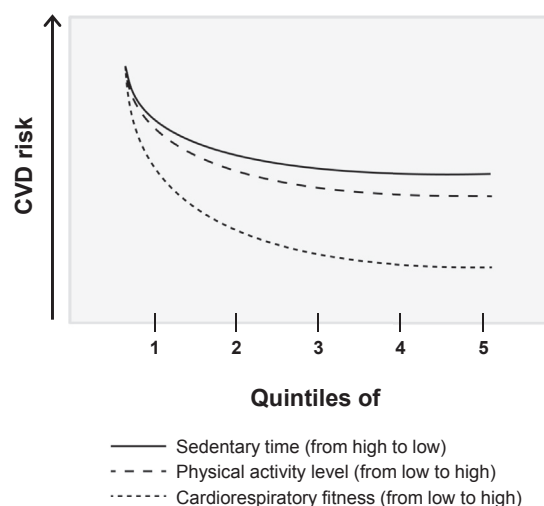


Figure 1. Schematic representation of the relationship between levels of sedentary time (from high to low), physical activity (from low to high), cardiorespiratory fitness (CRF) (from low to high), and cardiovascular disease (CVD) risk. Although optimal levels of sedentary time (as little as possible and interrupted by breaks in sedentary activities), physical activity, and CRF remain the topic of discussion and debate, it is fairly well established that getting individuals out of the highest risk group to the next would be associated with the greatest public health benefits. Thus, from a public health standpoint, attention should be given to the highest risk group of individuals who are poorly fit, very inactive, and devote a large proportion of their time to sedentary activities (sitting, screen time, etc). Because it remains uncertain whether sedentary time is an independent risk factor for CVD after proper control for physical activity and CRF, the illustration depicts a weaker relationship between sedentary time and CVD than the relationship between level of physical activity or CRF and CVD.^{23,24} Finally, because CRF is an objective physiological measurement whereas level of physical activity is most often reported and subjected to misclassification bias, the relationship between CRF and CVD has generally been reported to be stronger than the relationship between physical activity and CVD.²⁵⁻²⁷

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