The association among fitness, health, and longevity is probably as old as there are historical records. The writings of the classic Greek physicians Herodicus, Hippocrates, and Galen are replete with references to fitness, and each believed that a healthy body was a prerequisite for mental well-being. The US founding fathers were also conscious of the importance of fitness. Benjamin Franklin advocated 15 minutes of brisk stair climbing at intervals throughout the day, along with swimming and the use of dumbbells for health purposes. Thomas Jefferson recognized the need for fitness, although perhaps to an extreme, when he wrote, “Not less than 2 hours a day should be devoted to exercise and the weather shall be little regarded. If the body is feeble, the mind will not be strong.” Of course, none of these historical icons was cognizant that we would one day routinely measure an individual’s maximal physiological response to maximal exertion under controlled circumstances. Nor could they have imagined that the exercise test would be a valuable tool to predict the consequences of diseases related to 21st-century lifestyles.

The use of the exercise test to stratify risk and optimize clinical management for patients with cardiovascular disease (CVD) spans several decades. However, evidence of the importance of exercise capacity as a risk marker in patients with CVD is relatively recent, and clinical practice has yet to embrace this evidence. In a growing number of studies, exercise capacity has been shown to outperform traditional markers of risk (including clinical history, hypertension, obesity, hyperlipidemia, and other exercise test responses) in persons with and without CVD. In patients with chronic heart failure (CHF), exercise capacity has even been demonstrated to outperform invasive hemodynamic data (cardiac output, pulmonary wedge pressure, and ejection fraction) in stratifying risk. Because exercise capacity measured directly (using cardiopulmonary exercise testing techniques [CPX]) represents a precise, direct, and physiological measure of exercise capacity (expressed as peak VO\textsubscript{2}), it has become established as the standard index to estimate risk in patients with CHF. During the last 2 decades, numerous studies have demonstrated peak VO\textsubscript{2} to be a noninvasive index that powerfully predicts outcomes in CHF, and it has evolved to become a particularly important measurement for assessing the timing of cardiac transplantation.

Because CPX equipment is not always available and requires some technical expertise, it is not routinely performed in many centers. The question of when CPX techniques are most useful (and among which patients) has been asked for many years. In this issue of Circulation, Hsich at al\textsuperscript{6} studied 2231 patients with reduced systolic function who underwent CPX and followed the subjects for a mean of 5 years. The major objectives were to determine whether exercise capacity (as estimated from exercise time achieved using a Naughton protocol) predicts survival and whether exercise time adds prognostic information beyond that provided by peak VO\textsubscript{2} and other risk factors, which have long been established. End points included death and a composite outcome of death and United Organ Sharing Network status-1 heart transplantation. They observed that exercise time on the treadmill predicted death and the composite outcome in both women and men, even after accounting for peak VO\textsubscript{2} and other clinical factors, including cardiac history, body mass index, diabetes mellitus, medication use, and ejection fraction. Treadmill exercise time provided similar prognostic value to peak VO\textsubscript{2} in both high- and low-risk patients (peak VO\textsubscript{2} ≤14 and >14 mL · kg\textsuperscript{-1} · min\textsuperscript{-1}). They suggested that exercise capacity expressed as treadmill time is a valuable initial prognostic screening tool in patients with reduced systolic function.

Three salient issues are raised by this provocative study. The first issue is that exercise capacity, regardless of how it is measured, is a powerful and greatly underappreciated predictor of risk. The second issue involves a question that has long been debated, that is, should exercise capacity be measured directly (ie, with peak VO\textsubscript{2}), or is exercise capacity estimated from treadmill time or work rate achieved an adequate surrogate? If exercise time is an adequate surrogate for peak VO\textsubscript{2} in the particular patients studied by Hsich et al\textsuperscript{6} in what circumstances and in what populations should we advocate that exercise capacity be measured directly? The third issue is consideration of the maxim in the American Heart Association and other exercise testing guidelines to use “metabolic equivalents [METs] not minutes,” so that exercise capacity can be expressed interchangeably between different cycle ergometer or treadmill protocols.

The first issue, the fact that exercise capacity powerfully predicts outcomes, is not particularly new, but in my experience, it comes as a surprise to most clinicians when this is pointed out in lectures and meetings. In recent years, many groups have reported that exercise capacity outperforms traditional risk factors and other exercise test responses (including markers of ischemia) in terms of estimating risk. The prognostic power of exercise capacity has been
demonstrated in many different populations during the last decade, including asymptomatic subjects, patients with known coronary disease, those at high risk for CVD, patients with CHF, and those who are hypertensive, obese, or diabetic. Exercise capacity is often overlooked because clinicians tend to focus on fixing the coronary circulation and the potential need for revascularization. A related concept that remains largely unappreciated by the medical community is that relatively small increments in exercise capacity result in large health outcome benefits. The observation that each 1-minute reduction in exercise time (approximately 0.5 METs on the Naughton protocol) in the Hsich et al study provided a 7% increase in risk of death parallels many recent studies indicating that each 1-MET increment in exercise capacity is associated with roughly 10% to 25% reductions in mortality.

Getting patients out of the lowest fitness category (typically a quintile <5 or <6 METs) is particularly important because this shift alone is associated with >40% to 50% reductions in risk.

Low exercise capacity as a therapeutic target appears to be an investment that yields significant returns, but clinicians rarely discuss exercise with their patients. Targeting an improvement in exercise capacity to improve outcomes would entail encouraging patients to increase their activity level. Motivating habitually sedentary patients to make the changes necessary to increase their exercise capacity has unique challenges, but a few minutes spent discussing activity has been shown to result in significant increases in physical activity patterns. Meeting the minimal guidelines for activity (30 minutes of moderate activity most days of the week) has been associated with 20% to 40% reductions in all-cause and cardiovascular mortality. Exercise capacity needs to be considered at least as important as the traditional risk markers and other exercise test responses, including ischemia. A clear message from the Hsich et al study is that exercise capacity is a potent risk predictor in patients with CHF, as it is in other populations with and without CVD. Whether the test is performed to screen apparently healthy individuals, evaluate the severity of CHF, or to assess coronary disease, exercise capacity needs to be considered at least as important as the traditional risk markers and other exercise test responses, including ischemia. The study by Hsich et al
provides more support for health professionals to counsel patients on a health behavior that is vitally related not just to prognosis but overall health. Although the context has obviously changed, perhaps we can learn from the classic Greek physicians of more than 2000 years ago who held fitness in such high regard.1

Disclosures

None.

References

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