

Increased Longevity by Physical Activity

Fiziksel Aktiviteyle Yaşam Süresinin Uzatılması

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ABSTRACT Physical activity protects against the development of coronary heart disease, stroke, hypertension, obesity, NIDDM, osteoporosis, and some types of cancer. The majority of studies report significant risk reductions for physically active participants. Physical activity is associated with a risk reduction up to 33% for all-cause mortality. Longevity differences are reported to be between 1.5 to 2.1 years in four large scale studies. These differences emerged after taking into account mortality for age groups, and factors such as beginning level of physical activity, cigarette smoking, alcohol consumption, hypertension, chronic diseases, overweight, weight change since college, and early parental death. Physical active younger men followed up to 90 years of age would of course more benefit than their older counterparts, who would have less time to reach that age. Subjects who adopt moderately vigorous physical activity, quit cigarette smoking, and remain lean and normotensive, are expected to gain an extra four to ten years of life as contrasted with their counterparts.

Key Words: Physical activity, physical fitness, longevity, ageing, quality of life

ÖZET Fiziksel aktivite koroner kalp hastalıkları, hipertansiyon, şişmanlık, diyabet, osteoporoz ve bazı kanser türlerinin gelişmesine karşı koruyucu etkiye sahiptir. Bilimsel araştırmaların büyük çoğunluğu fiziksel olarak aktif kişilerde bu hastalıkların risklerinde anlamlı düşüş olduğunu rapor etmektedir. Fiziksel aktivite tüm ölüm nedenlerinde %33'e kadar düşüşle ilişkili bulunmuştur. Dört büyük ölçekli çalışmada, fiziksel açıdan aktif kişilerdeki yaşam süresindeki uzama 1.5-2.1 yıl olarak rapor edilmiştir. Bu farklılıklar; fiziksel aktivitenin başlangıç düzeyi, sigara ve alkol kullanımı, hipertansiyon, kronik hastalıklar, aşırı kilo, ailede erken ölümler, okul sonrası alınan kilolar ve yaşın ölümlerdeki etkileri hesap edilerek saptandı. Doksan yaşına kadar izlenecek genç fiziksel aktif kişiler, daha kısa sürede bu yaşa erişecek olan bireylere göre egzersizlerden şüphesiz daha fazla yararlanacaklardır. Orta derecede şiddetli fiziksel aktiviteyi benimsemiş bu kişiler; sigara içmezler, kilo almazlar ve normal kan basıncı değerlerini korurlarsa, diğerlerine göre 4-10 yaş daha fazla yaşayabilirler.

Anahtar Kelimeler: Fiziksel aktivite, fiziksel uygunluk, yaşam süresi, yaşlanma, yaşam kalitesi

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Physical inactivity is a modifiable risk factor for cardiovascular disease and a widening variety of other chronic diseases, including diabetes mellitus, cancer (colon and breast), obesity, hypertension, bone and joint diseases (osteoporosis and osteoarthritis), and depression.^{1,2} The prevalence of physical inactivity (among 51% of adult Canadians, 96 % of adult Turkey population) is higher than that of all other modifiable risk factors.³

Recent investigations have revealed even greater reductions in the risk of death from any cause and from cardiovascular disease. For instance, being fit or acti-

ve was associated with a greater than 50% reduction in risk.⁴ Furthermore, an increase in energy expenditure from physical activity of 1000 kcal (4200kJ) per week or an increase in physical fitness of 1 MET (metabolic equivalent) was associated with a mortality benefit of about 20%. Physically inactive middle-aged women (engaging in less than 1 hour of exercise per week) experienced a 52% increase in all-cause mortality, a doubling of cardiovascular related mortality and a 29% increase in cancer-related mortality compared with physically active women.⁵

Moreover, it appears that people who are fit yet have other risk factors for cardiovascular disease may be at lower risk of premature death than people who are sedentary with no risk factors for cardiovascular disease.⁶⁻⁸

An increase in physical fitness will reduce the risk of premature death, and a decrease in physical fitness will increase the risk.⁹⁻¹² The effect appears to be graded,^{9,10} such that even small improvements in physical fitness are associated with a significant reduction in risk. In one study,¹⁰ participants with the highest levels of physical fitness at baseline and who maintained or improved their physical fitness over a prolonged period had the lowest risk of premature death. Modest enhancements in physical fitness in previously sedentary people have been associated with large improvements in health status.¹³ For instance, in another study, people who went from unfit to fit over a 5-year period had a reduction of 44% in the relative risk of death compared with people who remained unfit.¹¹

Physical fitness refers to a physiologic state of well-being that allows one to meet the demands of daily living or that provides the basis for sport performance, or both. Health-related physical fitness involves the components of physical fitness related to health status, including cardiovascular fitness, musculoskeletal fitness, body composition and metabolism.

Physical fitness appears to be similar to physical activity in its relation to morbidity and mortality,⁹ but is more strongly predictive of health outcomes than physical activity.^{4,14,15} Most analyses have shown a reduction of at least 50% in mortality among highly fit people compared with low-fit people.⁴ In large epidemiologic investigations, physical activity and physical fitness are often used interchangeably, with fitness commonly being treated as a more accurate (albeit indirect) measure of physical activity than self-report.¹⁵

Favorable changes in physical activity and physical fitness patterns might be expected to improve quality of life and extend longevity. To explore one aspect of this hypothesis, investigators extended follow-up observation in the Aerobic Center Longitudinal Study to examine changes in physical fitness in relation to all cause mortality rates.¹⁶ A total of 9777 men, aged 20-82 years, received two preventive medical examinations between 1970-1989. The interval between examinations ranged from one to 18 years, with a mean of 4.9 years. Follow-up for mortality occurred after the second examination through 1989, mean follow-up being 5.1 years. Investigators used total treadmill test time from the first examination, specific for each age group, to classify men into fifths of physical fitness. Because previous findings had shown that mortality among the least fit 20% of men was substantially higher than that among men in the next fifth of men, unfit men were defined as those belonging to this least fit fifth; all others considered fit. Among 650 men who were unfit at the first clinical examination but became fit by the second examination 25 deaths occurred, however among 373 men who remained unfit 32 deaths occurred.

Lowest age-adjusted mortality rates occurred among men who were fit at both examinations. Men who changed in fitness, whether from unfit to fit or vice versa, experienced intermediate mortality rates that were similar. Investigators next examined men aged 20-39, 30-39, 50-69 and ≥ 60 years, separately, and observed the same pattern in age groups. They then examined the 6819 healthy and 2958 unhealthy men, separately, and standardized additionally for baseline fitness level, cigarette smoking, systolic blood pressure, blood cholesterol, glucose tolerance, weight, family history of coronary heart disease, and interval between examinations. For healthy men, each minute improvement in treadmill test time from the first to the second examination was associated with approximately 10% reduction in mortality. For unhealthy men, the corresponding risk reduction was about 6%, only marginally significant.

Finally, investigators compared the magnitude of benefit associated with lifestyle characteristics that predict altered risk of mortality. After standardizing for the characteristics listed above, as well as for health status, this magnitude was largest for favorable change in physical fitness (approximately 60% risk reduction), followed by quitting cigarette smoking (approximately 50% reduction). Favorable changes in systolic blood pressure, blood cholesterol or body index were not associated with

appreciable reductions in risk of dying during follow-up.

In a systematic MEDLINE search conducted in May 2007, the authors included cohort studies that assessed the primary preventive impact of physical activity on all-cause and cardiovascular mortality. The authors reported risk reductions on the basis of comparison between the least active and the most active population subgroups, with the least active population subgroup as the reference group. Random-effect models were used for meta-analysis. A total of 33 studies with 883,372 participants were included. Follow-up ranged from 4 years to over 20 years. The majority of studies reported significant risk reductions for physically active participants. Concerning cardiovascular mortality, physical activity was associated with a risk reduction of 35% (95% confidence interval, 30–40%). All-cause mortality was reduced by 33% (95% confidence interval, 28–37%). Studies that used patient questionnaires to assess physical activity reported lower risk reductions than studies that used more objective measures of fitness.¹⁷

Recent data suggest that the association between physical activity and mortality may be due to genetic selection. Using data on twins, the authors investigated whether genetic selection explains the association between physical activity and mortality. Data were based on a postal questionnaire answered by 13,109 Swedish twin pairs in 1972. The national Cause of Death Register was used for information about all-cause mortality ($n = 1,800$) and cardiovascular disease mortality ($n = 638$) during 1975–2004. The risk of death was reduced by 34% for men (relative risk $\frac{1}{4}$ 0.64, 95% confidence interval: 0.50, 0.83) and by 25% for women (relative risk $\frac{1}{4}$ 0.75, 95% confidence interval: 0.50, 1.14) reporting high physical activity levels. Within-pair comparisons of mo-

nozygotic twins showed that, compared with their less active co-twin, the more active twin had a 20% (odds ratio $\frac{1}{4}$ 0.80, 95% confidence interval: 0.65, 0.99) reduced risk of all-cause mortality and a 32% (odds ratio $\frac{1}{4}$ 0.68, 95% confidence interval: 0.49, 0.95) reduced risk of cardiovascular disease mortality. Results indicate that physical activity is associated with a reduced risk of mortality not due to genetic selection. This finding supports a causal link between physical activity and mortality.¹⁸

College alumni who expended ≥ 2000 kcal per week in recreational activities, walking, and stair climbing with men who expended ≤ 500 kcal per week in such activities, investigators found that more active alumni might live upwards of two years longer than those less active. This difference held after taking into account the force of mortality from age, cigarette smoking, hypertension, overweight for height, weight change since college, and early parental death.^{19,20} Similar added expectancy had been shown among Eastern Finland men who were aged 45–64 years in 1964 and were followed for all-cause mortality over a 20-year period. Taking habitual walking, cycling, and cross-country skiing into account, together with occupational assignments by gradient demands of energy expenditure, the population was classified into the 60% less active and the 40% more active. After standardizing for age, systolic blood pressure, serum cholesterol, and body mass, these investigators showed the more active men to live an extra 2.1 years.²¹ Younger men, of course, followed to age 90 years would benefit more than their older counterparts, who would less time to reach that age. The group of alumni who adopted moderately vigorous sports play, quit cigarette smoking, and remained lean and normotensive, might expect to have gained an extra four to 10 years of life as contrasted with their opposites.²²

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