Muscular strength and physical function

BRILL, PATRICIA A.; MACERA, CAROLINE A.; DAVIS, DOROTHY R.; BLAIR, STEVEN N.; GORDON, NEIL

Abstract

BRILL, P. A., C. A. MACERA, D. R. DAVIS, S. N. BLAIR, and N. GORDON. Muscular strength and physical function. *Med. Sci. Sports Exerc.*, Vol. 32, No. 2, pp. 412-416, 2000.

Purpose: The purpose of this study was to evaluate the potential association of muscular strength and endurance at baseline with the prevalence of functional limitations at follow-up.

Methods: Study participants were 3,069 men and 589 women (30-82 yr) who received a clinical examination including a strength evaluation at the Cooper Clinic between 1980 and 1989 and responded to a 1990 mail-back survey. Participants also had to achieve at least 85% of their age-predicted maximal heart rate on a maximal exercise treadmill test and have no history of heart attack, stroke, diabetes, high blood pressure, cancer, or arthritis at their first visit. A strength index composite score (0-6) was calculated using age- and sex-specific tertiles from bench press, leg press, and sit-up tests. Those scoring 5 or 6 were categorized in the high strength group. Functional health status was assessed by responses to questions about the participant's ability to perform light, moderate, and strenuous recreational, household, daily living, and personal care tasks.

Results: After an average follow-up of 5 yr, 7% of men and 12% of women reported at least one functional limitation. A logistic regression model including age, aerobic fitness, body mass index, and new health problems at follow-up found that, relative to those with lower levels of strength, the odds of reporting functional limitations at follow-up in men and women categorized as having higher levels of strength were 0.56 (95%CI = 0.34, 0.93) and 0.54 (95%CI = 0.21, 1.39), respectively.

Conclusions: These findings, if replicated in other populations, suggest that maintenance of strength throughout the lifespan may reduce the prevalence of functional limitations.

Most of the research on the benefits of physical activity and health relates aerobic activity or aerobic fitness to some measure of health, often cardiovascular morbidity or mortality (2,3). Previously, our group found an inverse gradient of self-reported functional limitations across both physical activity and aerobic fitness categories in every age group for both men and women, particularly among those over age 55 (12). Considerable evidence suggests that the ability to perform a physical task is determined by a threshold level of muscular strength and endurance (4-6,8). Individuals lacking the requisite strength may not be able to perform various activities of daily living that are important determinants of independence. A decline in functional status is determined at least in part by muscle strength, flexibility, range of motion, physical fitness, and body composition (4,8,10,11,13,15,17). Those who already report some limitations are more likely to develop additional limitations over time (19). The changes leading to functional limitation do not generally occur suddenly and may have their origins in lifestyle habits developed over many years.

While the incidence of disability rises sharply with age, it is important to study functional limitations among adults of all ages because of the potential to prevent or minimize subsequent disability. However, in contrast to studies of physical activity and aerobic fitness, there is limited information on the association of muscular strength and endurance to functional limitations among relatively healthy adults under age 65. Thus, the purpose of this report is to examine these associations among healthy men and women aged 30-82.