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The Impact of Muscular Strength on Cardiovascular Disease Risk Factors

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INTRODUCTION

Cardiovascular disease (CVD) is the number one cause of death in America, accounting for more than 600,000 deaths annually,[1] especially in those older than 55[2]. The ACSM uses 9 risk factors to determine CVD risk: age, family history, smoking, sedentary lifestyle, BMI, hypertension, total cholesterol, blood glucose, and HDL cholesterol.[3] It has been suggested that muscular strength has some protective effect against CVD risk factors.[4] but this has not been examined over all 9 risk factors in a nationally representative sample of Americans aged 55 and older.

PURPOSE: This study examined the associations between isokinetic leg muscular strength and cardiovascular disease risk factor characterization in Americans aged 50 and older within the NHANES 1999-2002 data set.

METHODS

PARTICIPANTS: This study consisted of a cross-sectional, observational analysis of National Health and Nutrition Examination Survey (NHANES) data, covering 1999-2002. Muscle strength and CVD risk factor data were available on 10,858 male (n=6,080; BMI 27.9 ± 4.5; age 64.9 ± 9.8) and female (n=4,778; BMI 28.4 ± 5.9; age 68.3 ± 8.5) participants.

PROCEDURES:

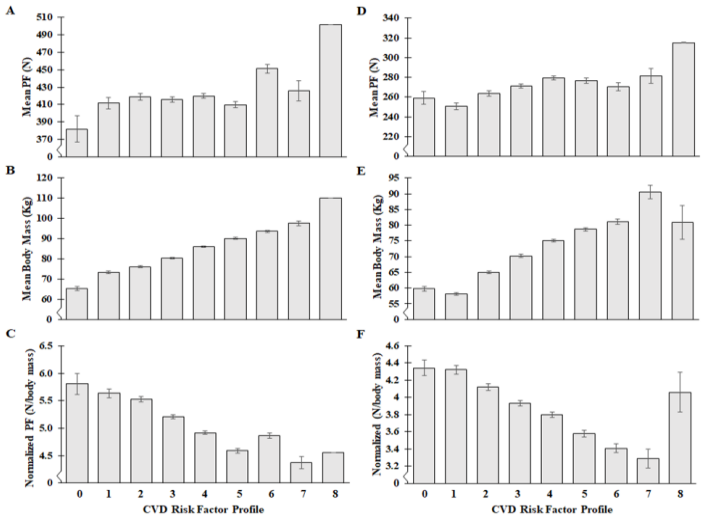
- The population-representative estimates are achieved through stratified, multistage (counties, segments, households, individuals), probability-based sampling.
- Measurements were taken in a mobile examination center for height, weight, muscular strength, waist circumference, blood pressure, and blood glucose. A questionnaire self-report was used to determine age, family history, and sedentary lifestyle. Cholesterol and smoking status were determined through blood draws.
- Isokinetic muscular strength was measured as the peak force (PF) of the quadriceps at the speed 60 deg·s^{-1}. Normalized muscular strength (nPF) was determined by dividing PF by mass (kg).

RESULTS

Table 1: Subject Characteristics

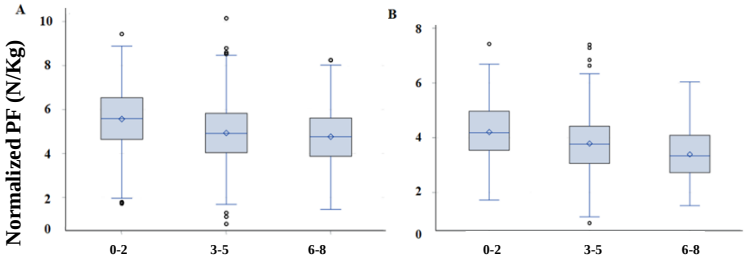
Characteristic	Category	All	Male	Female
Sample size		10858	6080	4778
Age (years)		66.4 (9.4)	64.9 (9.8)	68.3 (8.5)
Race/ethnicity (%)				
	Mexican American	19.1%	18.5%	19.8%
	Other Hispanic	3.9%	3.5%	4.5%
	Non-Hispanic white	59.4%	61.3%	57.1%
	Non-Hispanic black	15.2%	14.7%	15.8%
	Other race/ethnicity	2.4%	2.1%	2.8%
Poverty income ratio (%)				
	< 1.5	28.3%	25.3%	32.2%
	1.5 to < 3.5	34.7%	32.7%	37.2%
	≥ 3.5	37.0%	42.0%	30.6%
CVD History				
	Previous Incidence of CVD	12.7%	14.8%	9.1%
	No Previous Incidence of CVD	87.3%	85.2%	90.9%

Figure 1: CVD Risk Factor Profiles



RESULTS (CONT.)

Figure 3: CVD Risk Factor Characterizations



CONCLUSION

These findings indicate that individuals over the age of 55 with greater normalized muscular strength may exhibit fewer CVD risk factors than those with lower normalized muscular strength.

PRACTICAL APPLICATIONS

As both muscle mass and strength are known to decrease starting in the fifth decade, interventions focusing on increasing normalized isokinetic strength, not just muscle mass or raw strength, are needed within the general population. Interventions focused on decreasing body fat or overall weight could be necessary alongside resistance training interventions to effectively increase normalized strength.

REFERENCES

1. Pagidipati NJ, Gaziano TA. Estimating deaths from cardiovascular disease: a review of global methodologies of mortality measurement. Circulation. 2013;127(6):749-56.
2. Yazdanyar A, Newman AB. The burden of cardiovascular disease in the elderly: morbidity, mortality, and costs. Clinics in geriatric medicine. 2009;25(4):563-77.
3. Medicine ACoS. ACSM's guidelines for exercise testing and prescription. Lippincott Williams & Wilkins; 2013.
4. Artero EG, Lee D-c, Lavie CJ et al. Effects of muscular strength on cardiovascular risk factors and prognosis. Journal of cardiopulmonary rehabilitation and prevention. 2012;32(6):351-8.