golak. Analysis and interpretation of data: Weiss-Smith, Deshpande, and Golak. Drafting of the manuscript: Weiss-Smith and Deshpande. Critical revision of the manuscript for important intellectual content: Smith, Chung, and Golak. Statistical analysis: Deshpande and Golak. Obtained funding: Weiss-Smith. Administrative, technical, and material support: Chung. Study supervision: Weiss-Smith and Golak.

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Physical Functional Health and Risk of Future Cardiovascular Disease: The Scottish Health Survey

Measures of self-rated health are powerful predictors of objective health outcomes, although these measures generally do not differentiate between specific domains of functional health. This information is critical to inform future interventions for prevention. In particular, the association between self-reported physical functional health and future risk of cardiovascular disease (CVD) in the general population has received limited attention. In the present study we used the Physical Component Summary (PCS) score from the 12-Item Short-Form Survey Instrument (SF-12) to examine associations with incident CVD events and all-cause mortality in a sample of adults without overt CVD from the general population.

Methods. The sample included 4780 adults 35 years and older (mean [SD] age, 52.2 [4.5] years; 56.4% female) measured in the 2003 Scottish Health Survey; 77% of eligible households took part in the survey. Participants gave full informed consent to participate in the study, and ethical approval was obtained from the London Research Ethics Council. We linked these data to records of hospital admissions and mortality with follow-up until December 2007; thus, the analyses were based on a prospective cohort design, as described previously. The main exclusion criterion for the present analysis was a history of clinically confirmed CVD, which was identified from retrospective patient hospital records. Survey interviewers visited eligible households and collected data on demographics and lifestyle (eg, smoking, alcohol, physical activity) variables, measured height and weight, and administered the SF-12 for functional health status and has demonstrated strong validity and reliability. We used one of the SF-12 subscales (PCS) as an indicator of physical functional health; the raw scores are transformed into a scale of 0 to 100, representing poor to good health, respectively. On a separate visit, nurses collected clinical data (medical history, medication, and seated blood pressure readings).

Results. Compared with those in the top quartile, participants in the lowest quartile of physical function were older (62.2 vs 49.4 years; *P* <.001) and more likely to

<table>
<thead>
<tr>
<th>PCS Category</th>
<th>No. of Events/ No. of Adults</th>
<th>Adjusted HR (95% CI)</th>
<th>Age and Sex</th>
<th>Multivariateb</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVD Eventsa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (&lt;41.4, lowest function)</td>
<td>157/1074</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>2 (41.4-52.5)</td>
<td>68/1211</td>
<td>0.51 (0.38-0.69)</td>
<td>0.60 (0.44-0.80)</td>
<td></td>
</tr>
<tr>
<td>3 (52.5-55.5)</td>
<td>46/1257</td>
<td>0.37 (0.27-0.52)</td>
<td>0.47 (0.33-0.66)</td>
<td></td>
</tr>
<tr>
<td>4 (55.5, highest function)</td>
<td>26/1238</td>
<td>0.27 (0.18-0.42)</td>
<td>0.40 (0.26-0.62)</td>
<td></td>
</tr>
<tr>
<td>P value for trend</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All-Cause Death</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (&lt;41.4, lowest function)</td>
<td>118/1074</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>2 (41.4-52.5)</td>
<td>37/1211</td>
<td>0.48 (0.33-0.70)</td>
<td>0.55 (0.38-0.82)</td>
<td></td>
</tr>
<tr>
<td>3 (52.5-55.5)</td>
<td>22/1257</td>
<td>0.35 (0.22-0.56)</td>
<td>0.44 (0.27-0.70)</td>
<td></td>
</tr>
<tr>
<td>4 (55.5, highest function)</td>
<td>12/1238</td>
<td>0.29 (0.16-0.54)</td>
<td>0.35 (0.19-0.66)</td>
<td></td>
</tr>
<tr>
<td>P value for trend</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; CVD, cardiovascular disease; PCS, Physical Component Summary (from the 12-Item Short-Form Survey Instrument). Includes CVD death, nonfatal myocardial infarction, coronary artery bypass, percutaneous transluminal coronary angioplasty, stroke, and heart failure. Multivariate model contains adjustment for age, sex, social status (using the Registrar General Classification); III professional/intermediate, III skilled nonmanual/skilled manual, IVV part-skilled/unskilled), smoking (never, ex-smoker, current), physical activity tertiile (low, medium, high), alcohol (none, moderate up to 21 U/wk, heavy above 21 U/wk), body mass index (<25, 25-30, and >30 [calculated as weight in kilograms divided by height in meters squared]), hypertension (physician diagnosed or blood pressure >140/90 mm Hg), and CVD medication (β-blockers, diuretics, angiotensin-converting enzyme inhibitors, calcium blockers, and lipid-lowering medications).

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smoke (26.2% vs 21.1%; P < .001), be in the lowest tertile of physical activity (62.4% vs 27.1%; P < .001), come from lower social strata (IV/ V part skilled/unskilled; 27.6% vs 20.8%; P < .001), be obese (30.7% vs 13.7%; P < .001), and have hypertension (43.8% vs 15.8%; P < .001). Over a mean 4.3-year follow up, there were 297 incident CVD events (hospital admissions and deaths combined) and 189 total deaths. In Cox proportional hazards models, there was a linear association between PCS score and risk of CVD (P value for trend, < .001) (Table), with none of the 95% confidence intervals (CIs) containing unity. Participants in the highest quarter of physical function had a 60% (95% CI, 38%-74%) reduced risk after adjustment for potential confounders. Similar associations were observed for all-cause mortality. Adjusting for a wide range of potential covariates resulted in only modest attenuation of risk estimates. When we limited the analyses to younger participants (younger than 60 years, n = 3232) we observed similar associations for CVD (hazard ratio in the highest quartile, 0.26; 95% CI, 0.13-0.54).

Comment. In this geographically representative cohort of healthy individuals, we observed a robust, stepwise association between physical functional health, as indicated by the PCS, and incident CVD events and all-cause mortality. Although physical function was strongly associated with a number of modifiable risk factors, such as physical activity, the associations of PCS and CVD appeared to be largely independent of these factors. These findings support the few previous studies in this area2,3 and underline the importance of physical function as a risk marker for future health. It has been suggested that measures of self-reported health status, such as the SF-12, capture the subclinical stage of a condition before it can be detected by objective clinical measures. Indeed, we recently demonstrated an association between gait speed on a short-distance walking test and subclinical coronary atherosclerosis in seemingly healthy individuals.6 In conclusion, the present findings suggest that self-rated physical function is a robust predictor of future CVD risk and may, therefore, be usefully incorporated into a standard physician's medical examination.

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Author Contributions: Dr Hamer had full access to the data and takes responsibility for the integrity of the data and accuracy of the data analyses. Study concept and design: Hamer, Kivimaki, and Stamatakis. Acquisition of data: Stamatakis. Analysis and interpretation of data: Hamer and Batty. Drafting of the manuscript: Hamer and Stamatakis. Critical revision of the manuscript for important intellectual content: Hamer, Batty, Kivimaki, and Stamatakis. Statistical analysis: Hamer, Kivimaki, and Stamatakis. Obtained funding: Kivimaki.

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COMMENTS AND OPINIONS

LESS IS MORE

PSA: Possible Surgery Avoidance With Use of Free PSA

S hao and colleagues' report that even with prostate-specific antigen (PSA) values below 4.0 ng/mL (to convert PSA to micrograms per liter, multiply by 1.0) there is a risk of prostate cancer, but detecting these cancers by lowering the PSA threshold might lead to over-diagnosis and overtreatment. They conclude that PSA level is not a sufficient basis for treatment decisions. In an accompanying Invited Commentary, Hoffman and Zeliadt agree that the health care challenge is to discover biomarkers that better identify the patients most likely to benefit from treatment.

Free PSA, already available and being used, could be used more advantageously as one of those biomarkers.