Physical Activity Does Not Reduce Aortic Valve Stenosis Incidence

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Background: Physical activity is associated with lower risk of coronary and cerebrovascular disease but its potential role in prevention of aortic valve stenosis (AVS) is unclear.

Methods and Results: We investigated whether physical activity influences AVS risk in a cohort of 69,288 adults. During a mean follow-up of 15.3 years, 1,238 AVS cases were diagnosed. No associations were observed between AVS and walking/bicycling (≥1 h/day vs. almost never: hazard ratio 0.92, 95% CI 0.74–1.15) or exercise (≥4 hs/week vs. <1 h/week: hazard ratio 1.18, 95% CI 0.97–1.43).

Conclusions: Physical activity did not reduce the incidence of AVS.

Key Words: Aortic valve stenosis; Physical activity; Prospective studies
Walking/bicycling and exercise were mutually adjusted by inclusion of both variables in the same multivariable model. We had 80% and 100% power to detect hazard ratios of 0.8 and 0.7, respectively, for the highest vs. lowest categories.

### Results

Participants reporting more dedication towards physical activity were more likely to have a postsecondary education, had lower BMI and drank less alcohol, and were less likely to smoke and to have a history of comorbidities compared with inactive individuals (Table S1).

During a mean follow-up of 15.3 years (1,059,122 person-years), 1,238 AVS cases were diagnosed. No significant associations were observed across categories of walking/bicycling and exercise and AVS incidence (Table). In the most fully adjusted model, the hazard ratios (95% confidence interval) comparing the highest and lowest categories of physical activity were 0.92 (0.74–1.15) for walking/bicycling and 1.18 (0.97–1.43) for exercise. There was a small, but significant increase in AVS risk in the group exercising 1 h/week. Results were similar for AVS requiring aortic valve replacement (Table) and in both cohorts.

### Discussion

In this study, we found that physical activity defined as either walking/bicycling or leisure-time exercise did not decrease the risk of AVS overall or of AVS requiring aortic valve replacement. Our finding was consistent with results from a cohort study of 3,273 Norwegian adults followed up by echocardiography showing no significant association between physical activity (assessed by questionnaire) and AVS risk. We observed a barely significant increase in AVS risk among participants who exercised ≥1 h/day, which should be interpreted as a statistical anomaly as there were no significant differences in AVS incidence in the other categories.

The protective effects of physical activity on other cardiovascular outcomes may relate to modest reductions in inflammation and blood pressure and enhanced endothelial function, all of which have been implicated in AVS. Improvements in those factors would thus be expected to be beneficial also in AVS. Although exercise has also been associated with a positive effect on blood lipids, potential differences in lipid-attributable risk between, for example, atherosclerosis and AVS have been suggested.

In addition, there are no intervention studies showing that exercise influences inflammatory markers, blood pressure or endothelial function in AVS patients. Finally, because obesity and diabetes are risk factors for AVS, additional benefit would be expected if physical activity leads to weight loss and reduced risk of diabetes. Nevertheless, we observed no association between physical activity and risk of AVS in the model that was not adjusted for potential intermediates, including BMI and history of diabetes, hypertension, and hypercholesterolemia.

A strength of this study is the large number of AVS events, ensuring sufficient statistical power to draw meaningful conclusions. Moreover, we could assess associations of both less strenuous and more strenuous physical activity.
with AVS incidence and adjust for other potential risk factors. Physical activity was assessed before the diagnosis of AVS, thereby reducing reverse causation bias. The questionnaire has been validated and showed adequate validity. The inverse association between moderate physical activity and risk of other cardiovascular diseases in this population indicates that the questionnaire can capture potential causal associations between physical activity and disease.

A limitation is the possibility of recall bias because participants were asked to report their level of physical activity by themselves. Another shortcoming is that we might have missed asymptomatic cases not diagnosed with AVS. It can therefore not be excluded that physically active individuals were more prone to experience symptoms from AVS and therefore seek medical care detecting AVS.

In conclusion, findings from this large cohort study provided no support that physical activity may reduce AVS incidence.

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Declaration of Conflict of Interest
The authors have no conflicts of interest to declare.

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Supplementary Files
Supplementary File 1

Figure S1. Flow chart of study participants.
Table S1. Baseline characteristics of participants by categories of walking/bicycling and exercise.

Please find supplementary file(s):
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