The associations between participation in certain sports and lower mortality are not explained by affluence and other socioeconomic factors.

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| Complete List of Authors: | Stamatakis, Emmanuel; Charles Perkins Centre, Prevention Research Collaboration, Sydney School of Public Health, University of Sydney, Charles Perkins Centre  
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Oja, Pekka; Ukk Instituutti |
| Keywords:         | Physical activity, Public health, Cohort study, Sports, Society |
Editorial

Title: The associations between participation in certain sports and lower mortality are not explained by affluence and other socioeconomic factors

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Key words: sports, physical activity, public health, cohort study, epidemiology
7 references, 2 tables

Word count: 766
MANUSCRIPT

Our recent paper examined the type-specific associations between sports and all cause and cardiovascular disease (CVD) mortality. Among the wide media attention, CNN reported our finding as ‘Swimming, aerobics, racquet sports slash risk of death’ and those three sports that showed the largest reductions in mortality risk (as indicated by the hazard ratio value). Running and football (soccer)/rugby showed limited beneficial associations with mortality. While it was beyond the capacity and scope of our research to undertake comparisons between different sports and explain why these three specific types of sports were associated with the largest reductions in risk, much of the media commentary was consumed with aetiological explanations of the beneficial associations that participation in certain sports conferred. On the other hand, an alternative explanation is that our findings of lower mortality did not reflect the health attributes of the examined sports but, instead, they were related to socioeconomic characteristics of the participants of certain sports. For example, as football is perceived to be lower social status sports, the smaller association with mortality could be seen as an indication that our models were not adequately adjusted for socioeconomic status and affluence. Racquet sports, aerobics, and swimming usually involve paying for participation and/or equipment and as such may indicate membership of a higher socioeconomic group.

In our study we adjusted for educational attainment only, although occupation is generally considered a better indicator of current socioeconomic circumstances especially from mid-life onwards.

New analyses for income and occupational social class
We have now repeated all our main analyses using an identical method to that described in
the full paper\textsuperscript{1} with additional adjustments for income and occupational social class.

Occupational social class was determined using the Registrar General’s classification and
was grouped as I (professional), II (managerial/technical), III (skilled) non-manual, III
(skilled) manual, IV (semi-skilled manual) and V (unskilled manual). Income was converted
to equivalised annual household income that is adjusted for the number of persons in the
household. Due to missing income data approximately 35-40\% of the full sample\textsuperscript{1} was
excluded (all-cause mortality analyses n=52,031; CVD mortality analyses n= 48,965).

Despite this substantial loss of participants, characteristics (Table I) were very similar to the
full sample\textsuperscript{1}. Similarly to previous published data\textsuperscript{9} we observed a direct socioeconomic
gradient for participation across all sport groupings, e.g. football/rugby participation
decreased from 5.7\% in occupational class I and 4.2\% in class II, to 2.4\% in class IV and
1.4\% in class V. Equivalent participation figures for running were 10.5\%, 8.0\%, 3.2\%, and
1.7\%; for swimming 20.2\%, 18.2\%, 14.4\%, 9.3\%, and 6.6\%; and for racquet sports 8.2\%,
5.9\%, 1.7\%, and 0.9\%. Results of the expanded prospective analyses are presented in
Table 2. Compared to the analysis with adjustment for education only (Model 1), there were
no or minimal changes when income and occupational social class were taken into account
(Model 2) across all sports. Since the inclusion of highly correlated socioeconomic covariates
may bias mortality risk estimates, we also carried out separate analyses with income only and
social class only as covariates but there were no appreciable differences compared to the data
presented in Table 1 (data not shown). We also repeated analyses using less conventional
markers of socioeconomic status as covariates such as economic activity, number of cars, and
number of bedrooms but none of these influenced the results (data not shown).

We urge readers that the analyses described in Table 2 solely serve the purpose of comparing
the estimates between Model 1 and Model 2 (prior to vs after adjustment for income and
social class). The most robust and accurate estimates describing the associations between
each sport type and mortality are those presented in the main study that utilised the maximal
possible sample size and largest number of events.

In conclusion, the data presented here suggest that despite the direct socioeconomic gradient
in participation, the type-specific beneficial associations between sports and all-cause and
CVD mortality are not explained by socioeconomic confounding. Socioeconomic factors do
not seem to explain the lack of associations between football/rugby and running and mortality
either. Instead, these null associations could be due to the younger baseline age of the
participating groups, and due to participants perhaps retiring from these activities as they get
older, and losing the health enhancing effects.

The key messages of our study remains that: a) we need to develop and promote health-
enhancing sport programmes to reach more people from all ages across all socioeconomic
groups; and b) when sports participation is not a possibility to support opportunities to adopt
new active choices both in everyday life and during recreation.

ACKNOWLEDGEMENTS & FUNDING

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Senior Research Fellowship.

COMPETING INTERESTS
None.

KEY MESSAGES

1. Recent data suggest that participation in sports that usually involve monetary expenditure (swimming, racquet sports and aerobics) is consistently associated with reduced all-cause and cardiovascular mortality. Sports that involve less expenditure (running) or are associated with lower social class (football(soccer)/rugby)) showed no such associations.

2. We expanded on the above analyses by paying closer attention to socioeconomic factors as an explanation for the observed associations.

3. Consideration of a range of socioeconomic factors including household income and occupational social class had minimal or no impact on the observed associations. It is unlikely that the type-specific associations between sports and mortality are explained by socioeconomic factors.

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LICENCE

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REFERENCES

Table 2: Associations between sports participation and all-cause and CVD mortality in adults aged ≥ 30 years with additional adjustments for socioeconomic status indicators

<table>
<thead>
<tr>
<th></th>
<th>ALL-CAUSE MORTALITY (n=52,031)</th>
<th>CVD MORTALITY (^i) n= 48,965</th>
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<tr>
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<td>Deaths/n</td>
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<tr>
<td>p</td>
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*For any purpose, Running/jogging, Football/rugby, Badminton/tennis/squash. *Aerobics/keep fit/gymnastics/dance for fitness. *Model adjusted for age, sex, survey year, long-standing illness, alcohol drinking frequency, psychological distress (GHQ score), BMI, smoking status, education level, prevalent cardiovascular disease (IHD, angina, stroke), prevalent cancer, and other weekly physical activity volume (MET-hrs, excluding the volume of sport that is the main exposure in the corresponding model); *Model adjusted for age, sex, survey year, long-standing illness, alcohol drinking frequency, psychological distress (GHQ score), BMI, smoking status, education level, and other weekly physical activity volume (MET-hrs, excluding the volume of sport that is the main exposure in the corresponding model); *Model also adjusted for social class and equivalised household income; Excludes those with prevalent cardiovascular disease (IHD, angina, stroke). HR = Hazard Ratio, CIs = Confident intervals.