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

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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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MANUSCRIPT

Our recent paper[1] examined the type-specific associations between sports and all cause and cardiovascular disease (CVD) mortality. Among the wide media attention,[2] CNN reported our finding as ‘Swimming, aerobics, racquet sports slash risk of death[3] and those three sports that showed the largest reductions in mortality risk (as indicated by the hazard ratio value).[4] Running and football (soccer)/rugby [5] 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[2] was consumed with aetiological explanations[3 5 6 7] 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[1] we adjusted for educational attainment only, although occupation is generally considered a better indicator of current socioeconomic circumstances especially from mid-life onwards[8].

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[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[1] was excluded (all-cause mortality analyses n=52,031; CVD mortality analyses n= 48,965). Despite this substantial loss of participants, characteristics (*Table 1*) were very similar to the full sample[1]. Similarly to previous published data[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 socioconomic 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[1] 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.

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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 explanations 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.

LICENCE

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

	ALL-CAUSE MORTALITY (n=52,031)			CVD MORTALITY[i] n= 48,965		
	Deaths/n	Model 1[f] HR (95% CIs)	Model 2[h] HR (95% CIs)	Deaths/n	Model 1[g] HR (95% CIs)	Model 2[h] HR (95% CIs)
Cycling[a]						
None	4047/46980	1.00	1.00	890/44006	1.00	1.00
Any	145/5051	0.80 (0.68 - 0.95)	0.80 (0.67 – 0.94)	39/4959	1.00 (0.72 – 1.39)	0.99 (0.71 – 1.37)
p		*0.011*	*0.008*		*1.000*	*0.955*
Swimming						
None	4014/44892	1.00	1.00	891/41982	1.00	1.00
Any	178/7139	0.74 (0.64 – 0.86)	0.75 (0.64- 0.87)	38/6983	0.76 (0.55 – 1.06)	0.77 (0.55- 1.07)
p		*<0.001*	*<0.001*		*0.101*	*0.114*
Running[b]						
None	4156/49174	1.00	1.00	924/46125	1.00	1.00
Any	36/2857	1.05 (0.75 – 1.47)	1.06 (0.76 – 1.48)	5/2840	0.82 (0.34 – 1.99)	0.84 (0.34 – 2.04)
p		*0.763*	*0.736*		*0.659*	*0.692*
Football[c]						
None	4167/50312	1.00	1.00	922/47262	1.00	1.00
Any	25/1719	1.10 (0.74 – 1.65)	1.10 (0.74 – 1.64)	7/1703	1.71 (0.80 – 3.65)	1.72 (0.81 – 3.67)
p		*0.626*	*0.628*		*0.163*	*0.160*
Racquet Sports[d]						
None	4161/50062	1.00	1.00	926/47016	1.00	1.00
Yes	31/1969	0.63 (0.44 – 0.90)	0.64 (0.45 – 0.92)	3/1949	0.29 (0.09 – 0.89)	0.29 (0.09 – 0.91)
p		*0.011*	*0.015*		*0.030*	*0.034*
Aerobics[e]						
None	4119/48711	1.00	1.00	920/45736	1.00	1.00

Any	73/3320	0.67 (0.53 – 0.84)	0.67 (0.53 –0.85)	9/3229	0.40 (0.21 – 0.77)	0.40 (0.21 –0.78)
p		*0.001*	*0.001*		*0.006*	*0.007*

[a] For any purpose. [b] Running/jogging. [c] Football/rugby. [d] Badminton/ tennis/ squash. [e] Aerobics/keep fit/gymnastics/dance for fitness. [f] 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); [g] 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); [h] Model also adjusted for social class and equivalised household income; i Excludes those with prevalent cardiovascular disease (IHD, angina, stroke) *HR=Hazard Ratio, CIs=Confident intervals*