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The influence of sport club participation on physical activity, fitness and body fat during childhood and adolescence: The LOOK Longitudinal Study

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ABSTRACT

Objectives: To investigate the longitudinal effect of sport participation in physical activity, fitness and body fat changes during childhood and adolescence.
Design: Longitudinal study (134 boys, 155 girls) of Australian youth aged 8–16 years.
Methods: Physical activity was assessed by pedometers and accelerometers, fitness by the 20 m shuttle-run, body fat by DEXA and club sport participation by questionnaire. Linear mixed models were used to determine the effects of sport participation and gender differences.
Results: Sports club participants were more physically active at all age groups than non-participants; boys took an extra 1800 steps ($p < 0.001$) and girls 590 steps per day ($p < 0.01$) and boys engaged in an extra 9 min and girls 6 min more moderate to vigorous PA per day (both $p < 0.05$). Fitness was higher among sports participants (boys 27% and girls 20% higher, both $p < 0.001$) and sport participant girls had 2.9% less body fat ($p < 0.05$). Higher fitness scores were maintained over time by sports participants but their greater PA diminished during adolescence, this being more evident among girls. Only 20% of sports club participants met the recommended daily average of 60 min MVPA.
Conclusions: Sport participants were more active, fitter and had less body fat (girls only) than non-sports participants. However, the associated benefits of sport with PA diminished during adolescence and the majority of sports participants did not meet recommended levels of PA. Strategies aiming to maximise the benefits of sports participation may be enhanced by providing special attention to the early adolescent period particularly among girls.

1. Introduction

Sport participation was recently identified by the International Society for Physical Activity and Health as "an investment that works" to promote physical activity.[1] In addition, a recent International Olympic Committee statement highlighted the important role of sport as a means to encourage behaviour change among youth to positively affect health.[2]

Given global appeal, sport seems an ideal vehicle to address reported low levels of physical activity (PA)[3,4] and high prevalence of obesity.[5] In Australia, sports club participation may become an increasingly important source of PA among youth, as in the school setting there is a growing trend towards allocating teaching time to academic pursuits,[6] which may be reducing time spent in physical education and sport in schools.

Cross-sectional studies indicate that youth sports club participants tend to have higher levels of PA[7,8] and cardio-respiratory fitness (CRF) compared to non-participants.[7,9] The role that sport plays in the prevention of overweight and obesity is somewhat clouded, with a recent review concluding that additional research

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is needed to understand how youth sport can help promote energy balance and healthy body weight.[10] Even so, the high reported sports participation rates in Australia are encouraging, with two-thirds of children aged 9–11 years participating in organised sports outside of school hours.[11]

An important consideration is that sports club participation rates tend to decline from childhood.[12] This decline emphasizes the need for longitudinal studies among youth to understand how sport impacts health over time. A longitudinal study of 7–12 year old British children[13] found sports club participation was associated with higher levels of PA and reduced adiposity at 12 but not 9 years of age. This study suggested that sports club participation may become an increasingly significant source of PA over late childhood and early adolescence, however the authors commented that these findings need to be replicated in other populations to improve the evidence base.

The aim of the current study was to examine the effect of sports club participation on objectively measured PA, CRF measured by 20 m shuttle run; and body composition measured using dual emission X-ray absorptiometry (DEXA). Data were collected annually from 8 to 12 years of age and again at age 16 years. To our knowledge this is the first study to examine how longitudinal changes in objectively measured PA, CRF and DEXA measured adiposity are associated with sports club participation over the important developmental period from childhood to mid-adolescence.

We tested the following hypotheses: (1) that youth sports club participants will have higher levels of PA, less percent body fat (%BF) and will be fitter than non-participants, (2) that the benefits of PA, CRF and %BF associated with sports club participation will persist with increasing age from childhood to adolescence, and (3) that sports club participation assists youth to meet recommended PA guidelines.

We define sports participation as youth who were members of a sports club outside of the school setting. Membership in a sports club is the typical avenue for youth in Australia to take part in extracurricular sport. Clubs are most commonly not for profit organisations that are run by volunteers through a community group or association. We use the abbreviation (SPORT) for sports club participants and (non-SPORT) for non-sports club participants.

2. Methods

This study is part of the multidisciplinary Lifestyle of our Kids (LOOK) project.[14] Grade 2 children attending government primary schools in Canberra, Australia were recruited from 29 schools and informed consent was received from parents for their child to participate from age 8 to 12 years. Both parental consent and child assent were obtained to participate in the study at 16 years. Participation was voluntary and participants could choose not to take part in any aspect of the study. The present investigation involved data collected at age 8, 9, 10, 11, 12 and 16 years from 2005 to 2013.

Questionnaires were completed by parents when their child was 8, 12 and 16 years of age. On each occasion, parents were asked the following question: In the last year, did your child belong to an organised sports club? If yes, which club? As the objective of the study was to compare SPORT and non-SPORT participants across time, subjects who changed their sport participation status were omitted from the longitudinal analysis.

Total daily physical activity (TPA) was measured annually from age 8 to 12 and again at 16 years using pedometers (Walk4Life, Plainfield, IL, USA) over seven days. From these data a physical activity index (TPAI) was derived as previously described.[15] Accelerometers (Actigraph GT1M, Pensacola, FL, USA) were used simultaneously with the pedometers at age 11, 12 and 16 years. Moderate and vigorous physical activity (MVPA) was defined as counts >2296 per minute and sedentary (SED) activity was defined as counts <100 per minute based on recommendations,[16] using an epoch length of 60 s. The first day's data were discarded to minimise reactivity and days of accelerometer data were included if there were 10 or more hours of activity, an hour being considered invalid if there were more than 30 zero counts in a row. Data were analysed using ActiLife version 6 software (Actigraph, Pensacola, FL, USA).

CRF was assessed in all measurement periods using the 20 m multistage run, a well-established field test with children.[17] Body composition was measured at age 8, 10, 12 and 16 years using DEXA (Hologic Discovery QDR-Series, Hologic, Bedford, MA, USA) and Hologic Software Version 12.4:7 used to calculate percent body fat.

As a proxy for socioeconomic status (SES), the Australian Bureau of Statistics index of socio-economic advantage and disadvantage of the school suburb was used.[18] This value is derived from income, educational attainment, and employment. The average SES index of the suburbs in our study (1085 ± SD 40 and range 982–1160) was higher than the average index Australia-wide (980 ± 84, 598–1251).

General linear mixed modelling[19] was used to determine the significance of the differences in characteristics of children (e.g. TPA, MVPA, SED, CRF, %BF) who were and were not involved in SPORT. These analyses included only subjects who maintained their sports participation status, that is, children who remained in a sports club across measurement time points (SPORT) or children who never participated in a sports club across measurement time points (non-SPORT). This allowed for the comparison of long term exposure of sports participation with long term non-sport participation. Separate models were fitted for boys and girls and each model included adjustment for repeated sets of data and socioeconomic status. Statistical significance of an effect was assessed by calculated adjusted Wald statistics.[20] Variables were scaled to meet linearity assumptions; for example, the square root of TPA was used to formulate the TPAI and the square roots of MVPA (sqrtMVPA), SED (sqrtSED) and CRF (sqrtCRF) were calculated prior to formal analysis. General model checking procedures were used to check the model assumptions. Statistical computation was undertaken using Genstat Version 16 (VSN International, Oxford, UK).

This study was approved by the Australian Capital Territory Health and Community Care Human Research Ethics Committee.

3. Results

Participant characteristics are shown in Table 1. There was a 43% study attrition rate for girls and 47% for boys from age 8 to 16 years, with no significant differences between study dropouts and those with complete data for gender, socio-economic status, sport participation (Chi square tests all $p > 0.05$), CRF, TPAI and %BF (*T*-tests all $p > 0.05$). There was however a difference in body weight between study dropouts (Mean = 29.2 kg, SD = 6.1) and non-dropouts (Mean = 28.2 kg, SD = 5.1) at the time of baseline measurement; $p = 0.03$.

SPORT participation was higher for boys at baseline (79% boys vs. 65% girls) and at age 16 years (71% boys vs. 59% girls). There was an 8% and 6% decline in SPORT participation in boys and girls respectively from age 8 to 16 years. Football club memberships (soccer, rugby or Australian Rules football) were most popular among boys (49%) followed by softball (8%), hockey (6%), swimming (6%), cricket (5%) and a range of minority sports, each with less than 5% participation. Among girls, swimming (12%) and netball (11%) were the most popular sports followed by softball (10%), athletics (10%),

Table 1
Medians (5th and 95th percentiles) for summary variables, shown for sport and non-sport participants, separated by gender.

Age	N[a]	Sports club members (%)	Percent body fat[b] (%)		Physical activity (steps/d)		Percent meeting step recommendations (%)		CRF (stages completed)		Moderate and vigorous physical activity (min/d)		Percent meeting MVPA recommendations (%)		Sedentary physical activity (min/d)	
			Sport	No sport	Sport	No sport	Sport	No sport	Sport	No sport	Sport	No sport	Sport	No sport	Sport	No sport
Girls																
8	134	65%	27.4 ± 6.5	28.6 ± 6.1	10,068 (7105, 14,059)	8497 (6118, 14,237)	25	21	3.6 (2.3, 6.2)	3.1 (2.1, 5.1)	...	...			...	...
9	127	...	...	...	8519 (5806, 11,990)	8082 (4083, 11,492)	12	10	4.0 (2.6, 7.1)	3.3 (2.3, 6.3)	...	...			...	...
10	125	...	27.8 ± 6.4	30.1 ± 6.9	9254 (6037, 12,860)	8782 (5586, 12,616)	15	18	4.5 (2.8, 7.7)	3.6 (2.5, 7.4)	...	...			...	...
11	102	...	...	...	9984 (6352, 14,311)	9137 (5445, 11,518)	29	8	5.5 (3.0, 8.5)	4.1 (2.2, 9.0)	38.2 (13.2, 88.1)	29.0 (10.3, 56.6)	30	10	355 (283, 477)	402 (292, 518)
12	130	69%	27.0 ± 6.1	29.5 ± 7.3	8716 (5961, 12,578)	7517 (4998, 10,756)	19	0	6.1 (3.3, 9.2)	4.8 (2.6, 8.9)	34.7 (11.7, 76.7)	28.5 (10.5, 52.1)	10	0	396 (287, 493)	431 (300, 513)
16	76	59%	29.7 ± 5.9	33.3 ± 6.7	8354 (5868, 12,634)	8225 (4330, 11,206)	10	6	7.1 (4.0, 9.9)	5.4 (2.13, 7.1)	19.3 (7.3, 42.2)	22.7 (6.5, 44.0)	0	0	481 (333, 597)	482 (333, 568)
Boys																
8	155	79%	21.8 ± 5.2	22.1 ± 5.2	11,898 (8281, 16,198)	9025 (7501, 14,499)	68	24	4.3 (2.2, 6.9)	2.9 (2.1, 6.5)	...	...			...	...
9	148	...	...	...	10,221 (6872, 14,665)	7656 (5446, 11,088)	35	4	5.4 (2.8, 8.3)	3.7 (2.1, 5.5)	...	...			...	...
10	140	...	23.8 ± 6.3	24.5 ± 6.2	10,793 (7800, 14,952)	8283 (5127, 12,814)	47	10	5.6 (3.1, 9.00)	4.4 (2.5, 6.4)	...	...			...	...
11	119	...	...	...	11,344 (7049, 15,131)	9082 (6691, 12,034)	54	10	6.1 (3.5, 9.8)	4.1 (2.5, 7.1)	46.3 (14.6, 92.2)	31.8 (17.7, 53.6)			367 (265, 466)	402 (263, 519)
12	148	84%	23.5 ± 6.8	26.0 ± 5.8	10,060 (6225, 13,712)	7832 (4676, 10,737)	33	9	7.1 (4.1, 10.5)	5.1 (2.1, 6.2)	49.9 (21., 102.1)	29.0 (14.0, 66.1)	32	16	390 (270, 477)	424.4 (239, 549)
16	81	71%	17.0 ± 6.4	19.4 ± 5.9	10,020 (6989, 13,877)	9428 (6529, 13,225)	30	10	10.1 (6.1, 13.1)	9.2 (6.0, 10.2)	27.9 (10.9, 56.8)	22.4 (5.5, 28.5)	3	0	447 (298, 543)	457 (395, 614)

[a] *N* indicates the number of physical activity (pedometer) observations and varies slightly with each variable measured due to participant availability.
[b] Percent body fat is presented as means and standard deviations. All other variables were not normally distributed and are presented as medians with 5th and 95th percentiles.

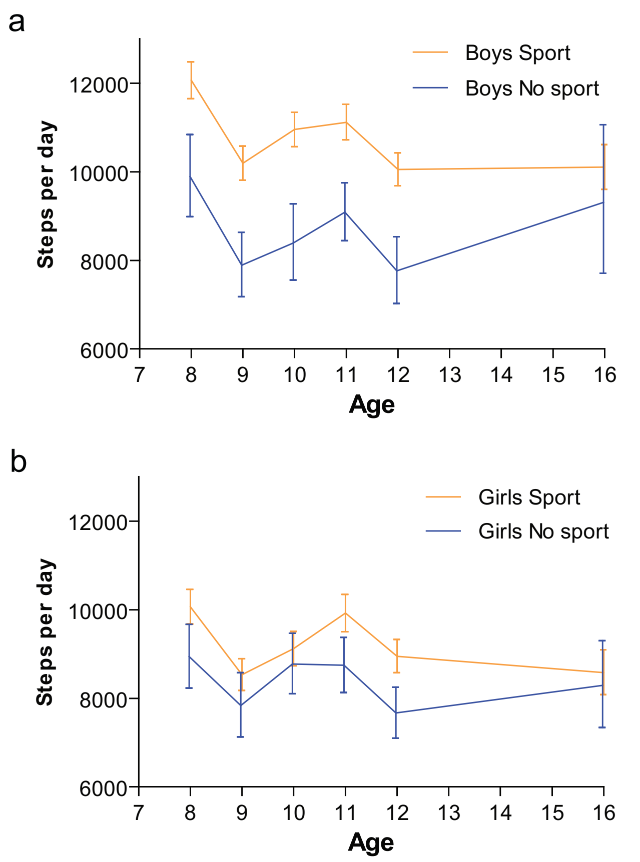

Fig. 1. (a) Adjusted means for boys' steps per day, classified by sport and non-sport participation with 95% confidence intervals. Overall, sports participants accumulated more steps per day ($p < 0.001$). The magnitude of differences in step counts between sport and non-sport participants varied with age ($p = 0.001$). (b) Adjusted means for girls' steps per day, classified by sport and non-sport participation with 95% confidence intervals. Overall, sports participants accumulated more steps per day ($p < 0.001$). The magnitude of differences in step counts between sport and non-sport participants varied with age ($p = 0.01$).

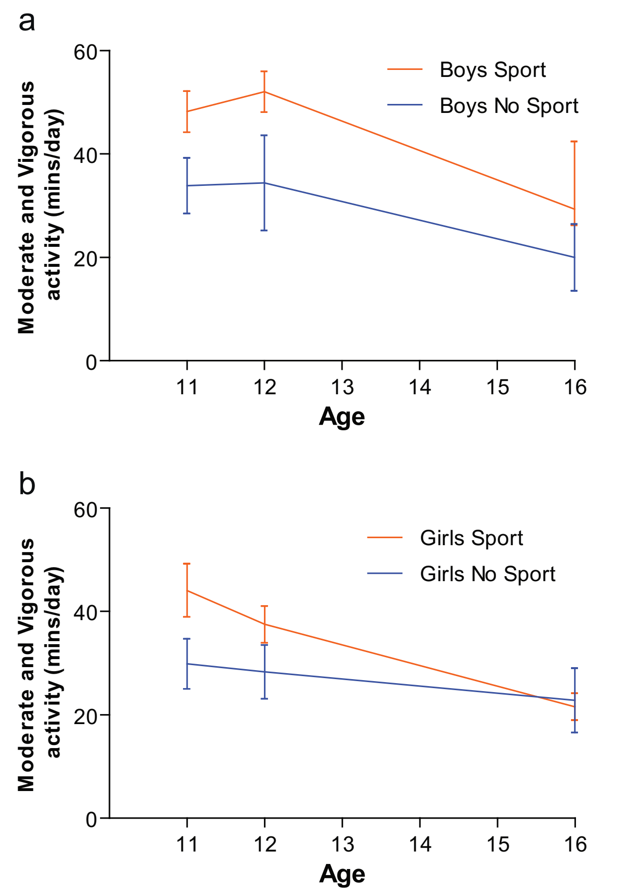

Fig. 2. (a) Adjusted means for boys' MVPA, classified by sport and non-sport participation with 95% confidence intervals. Overall, sports participants accumulated more MVPA ($p < 0.001$). (b) Adjusted means for girls' MVPA, classified by sport and non-sport participation with 95% confidence intervals. Overall, sports participants accumulated more MVPA per day ($p < 0.001$). The magnitude of differences in MVPA between sport and non-sport participants varied with age ($p = 0.053$).

football (10%), gymnastics (8%) and a range of minority sports that had less than 7% participation each.

To determine whether SPORT participants were more physically active than non-SPORT participants, linear mixed models were fitted for TPAI, sqrtMVPA and sqrtSED. Table 2 shows a summary of each model. Significant "Sport Status" effects provide support for a difference between SPORT and non-SPORT participants. Significant "Age.Sport Status" interaction effects provide support for non-consistent differences over time (with age) between SPORT and non-SPORT participants.

Significant sport status effects were found for TPA, MVPA and SED. The age profiles of these differences are shown in Figs. 1–3. On average, SPORT boys compared to non-SPORT boys had higher TPAI (103.6(0.82) vs. 93.6(2.08), $p < 0.001$), engaged in more sqrtMVPA (6.4(0.10) vs. 5.4(0.25), $p < 0.001$) and less time in sqrtSED activity (19.8(0.12) vs. 20.8(0.31), $p < 0.0001$).

SPORT girls were more active in terms of TPAI (95.5(0.90) vs. 92.3(1.58), $p < 0.001$), engaged in more sqrtMVPA per day (5.66(0.112) vs. 4.91(0.200), $p < 0.001$) and spent less time in daily sqrtSED activity (20.06(0.13) vs. 20.94(0.22), $p < 0.001$) compared to non-SPORT girls.

For both boys and girls, significant Age.Sport effects indicated that differences in TPAI between SPORT and non-SPORT participants changed over time. Fig. 1a and b indicate that the effect of SPORT in PA was smallest at age 16 years. For girls, a similar pattern of change over time was found; SPORT participants had higher sqrtMVPA and lower sqrtSED at age 11 and 12 years, and these differences were reduced at age 16 years.

Table 1 shows the percentages of youth meeting PA recommendations of 60 min MVPA per day[21] and 11,000 steps per day for girls and 13,000 steps per day for boys.[22] Although a greater proportion of SPORT participants met recommendations, the majority were still classified as not achieving guidelines. On average across all measurement years, the recommended level of MVPA of 60 min per day was achieved by 18% of SPORT girls and 7% of non-SPORT girls. For boys these figures were 22% for SPORT and 7% for non-SPORT participants.

As shown in Fig. 4a and b, SPORT boys had higher (2.51(0.026) vs. 2.146 (0.067), $p < 0.001$) and SPORT girls had higher (2.24(0.028) vs. 2.00(0.05), $p < 0.001$) sqrtCRF scores than non-SPORT participants. In practical terms, on average a 12-year-old SPORT boy could run for an extra 2 min 06 s on the shuttle run test than a non-SPORT boy. At the same age a SPORT girl would run for an extra 1 min 15 s. Differences in CRF between SPORT and non-SPORT girls changed with age ($p = 0.003$), and as shown in Fig. 4b, the difference was smallest at age 16 years. For example, at age 12 years SPORT girls achieved 31% higher CRF scores and at age 16 years this difference was 22%.

SPORT girls were found to have lower %BF than non-SPORT girls (27.8 (0.60) vs. 30.3(0.62), $p = 0.045$) over the course of the study. For example, a 12-year-old SPORT girl of median weight 45 kg would have 1.3 kg less body fat than a non-SPORT girl. While

Table 2
Relationships between physical activity, sedentary time, cardio-respiratory fitness, percent body fat and each of Age, SPORT, and SES. The effect for SPORT, Wald statistic and significance level *p* are shown.

Model		Boys			Girls		
Response	Fixed effect	Wald	Effect (standard error)[e]	*p*-Value	Wald	Effect (standard error)	*p*-Value
Total physical activity index	Age[a]	244.87		<0.001	141.34		<0.001
	Sport Status[b]	20.26	10.97 (2.20)	<0.001	6.79	4.64 (1.76)	0.01
	Age.Sport Status[c]	20.07		0.001	15.18		0.01
	Socio-economic index[d]	0.28		0.598	6.04		0.015
Moderate and vigorous activity (SQRT min/day)	Age	79.98		<0.001	74.43		<0.001
	Sport Status	13.87	1.10 (0.27)	<0.001	14.57	0.87 (0.23)	<0.001
	Age.Sport Status	1.94		0.38	5.95		0.053
	Socio-economic index	3.08		0.082	4.28		0.041
Sedentary activity (SQRT min/day)	Age	61.56		<0.001	157.02		<0.001
	Sport Status	7.4	−0.77 (0.61)	0.007	8.99	−0.75 (0.25)	0.003
	Age.Sport Status	0.01		0.928	0.01		0.963
	Socio-economic index	0.1		0.754	3.32		0.071
Cardio respiratory fitness (SQRT shuttle run score)	Age	831.32		<0.001	621.19		<0.001
	Sport Status	25.89	0.38 (0.07)	<0.001	17.18	0.24 (0.06)	<0.001
	Age.Sport Status	8.16		0.149	18.1		0.003
	Socio-economic index	0.01		0.955	4.68		0.032
Percent body fat (%)	Age	275.54		<0.001	100		<0.001
	Sport Status	0.89	−0.96 (0.33)	0.347	4.73	−2.39 (1.12)	0.031
	Age.Sport Status	5.06		0.17	4.15		0.247
	Socio-economic index	1.44		0.232	0.06		0.811

[a] Age effects indicate a difference in the response term over time (with age).
[b] Sport Status effects indicate a difference in the response term between sports club participants and non-participants.
[c] Age.Sport Status interaction effects indicate differences in the response term over time (with age) between sports club participants and non-participants.
[d] Socio-economic index – Australian Government Bureau of Statistics index of relative socio-economic advantage and disadvantage.
[e] Effects for the Age and Age.Status terms are not shown due to the multiple degrees of freedom associated with these terms.

Fig. 5a shows a tendency for SPORT boys to have lower %BF at age 12 and 16 years there was no overall difference ($p = 0.33$). Furthermore, there was no evidence that the magnitude of differences in %BF between SPORT and non-SPORT participants changed with age (boys $p = 0.13$, girls $p = 0.24$).

4. Discussion

This study, strengthened by the longitudinal nature of yearly observations within the one cohort of boys and girls, provides support for the hypotheses that: SPORT participants are more active on a daily basis; spend more time engaged in MVPA; less time engaged in sedentary activity and; have better CRF than non-SPORT participants. In addition girls belonging to sports clubs were found to have lower %BF. While higher CRF levels were maintained with increasing age among SPORT participants, of concern is that the beneficial effects of SPORT on PA levels diminished during adolescence, especially in girls. Furthermore, the majority of participants in this study, including SPORT participants, did not meet daily recommended levels of PA.

Low percentages of SPORT participants meeting PA guidelines not only indicate that PA levels in this study were low as previously reported,[15] but also that sports participation, at current levels is not sufficient in itself to meet PA recommendations. Parents, teachers, and coaches should be aware that a child's participation in sport does not necessarily equate to having a sufficiently active child. Of additional concern was the diminished association between SPORT and PA during adolescence, especially when MVPA was in decline. Given that sports participation has been suggested to be an increasingly significant source of PA during adolescence,[13] an investigation of sustainable ways to increase PA through sport at this stage of life is warranted.

In the current study, SPORT was associated with higher levels of CRF. This is consistent with a longitudinal study of Portuguese youth aged 11–17 years which found positive associations between CRF and sport participation,[23] and with findings from

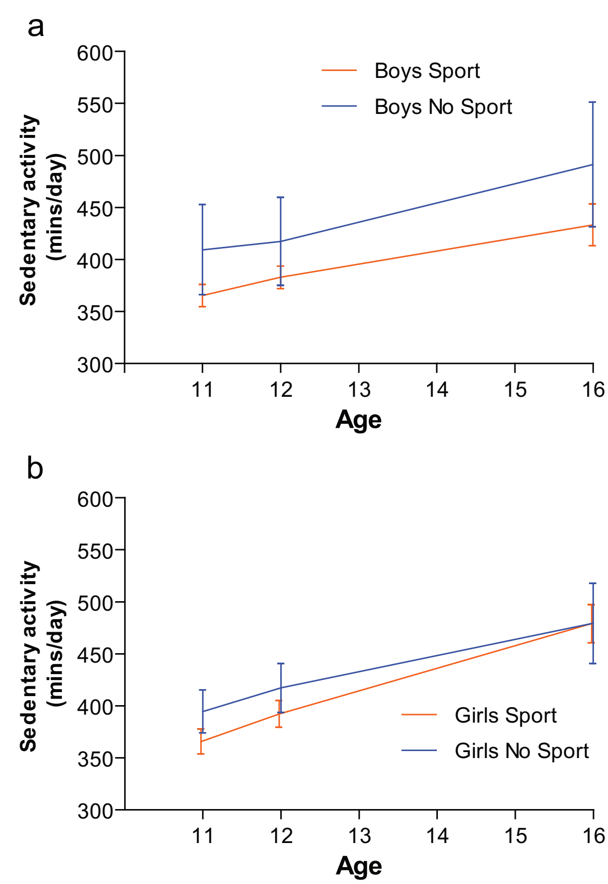

Fig. 3. (a) Adjusted means for boys' sedentary activity, classified by sport and non-sport participation with 95% confidence intervals. Overall, sports participants were less sedentary ($p = 0.007$). (b) Adjusted means for girls' sedentary activity, classified by sport and non-sport participation with 95% confidence intervals. Overall, sports participants were less sedentary ($p = 0.003$).

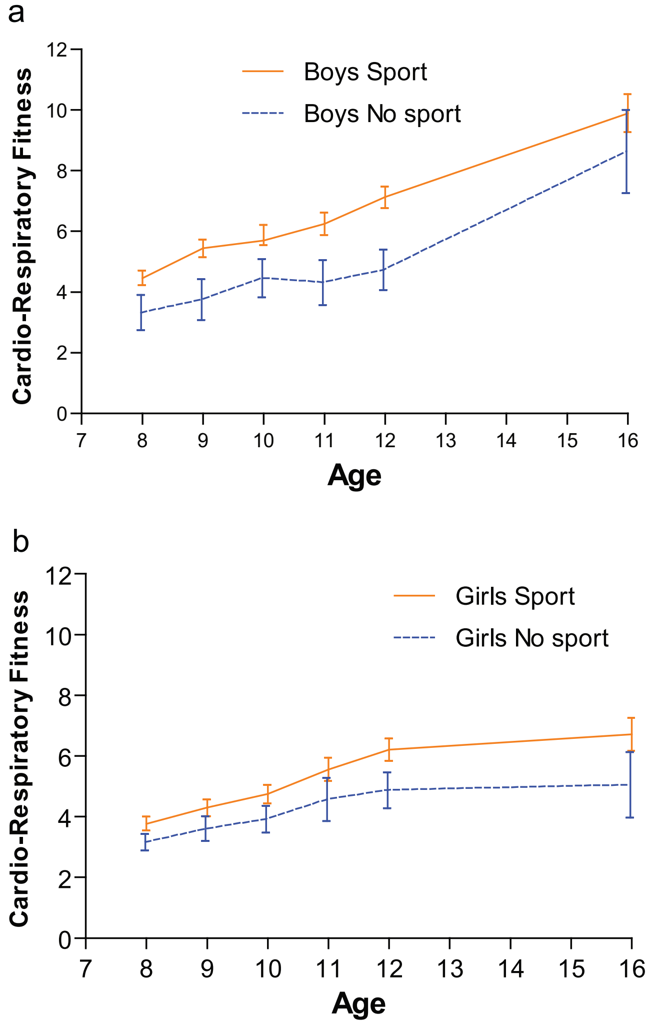

Fig. 4. (a) Adjusted means for boys' cardio-respiratory fitness, classified by sport and non-sport participation with 95% confidence intervals. Overall, sports participants were fitter ($p < 0.001$). (b) Adjusted means for girls' cardio-respiratory fitness, classified by sport and non-sport participation with 95% confidence intervals. Overall, sports participants were fitter ($p < 0.001$). The magnitude of differences in cardio-respiratory fitness between sport and non-sport participants varied with age ($p = 0.003$).

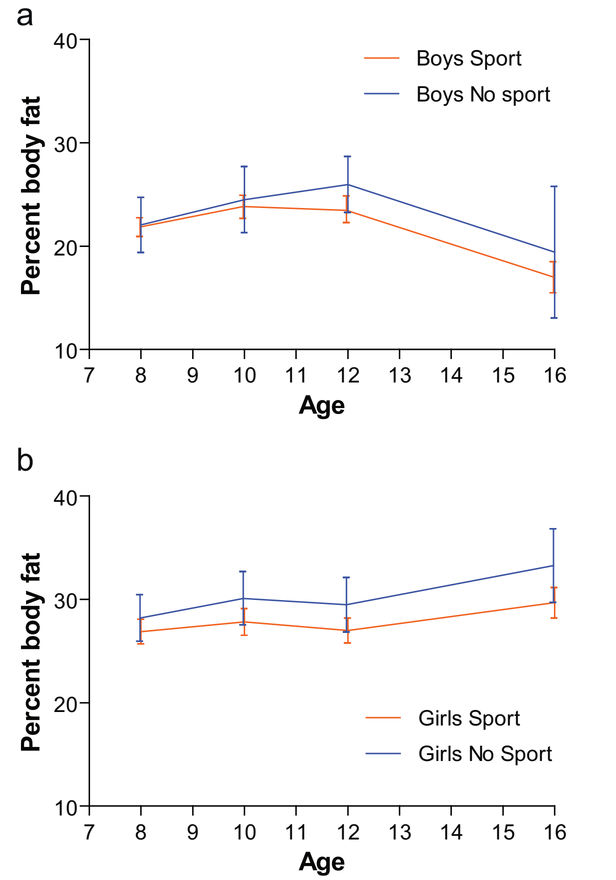

Fig. 5. (a) Adjusted means for boys' percent body fat, classified by sport and non-sport participation with 95% confidence intervals. Overall, there were no differences in percent body fat between sport and non-sport participants ($p = 0.347$). The magnitude of differences in %BF between sport and non-sport participants did not vary with age ($p = 0.17$). (b) Adjusted means for girls' percent body fat, classified by sport and non-sport participation with 95% confidence intervals. Overall, sport participant girls had lower percent body fat ($p = 0.031$). The magnitude of differences in %BF between sport and non-sport participants did not vary with age ($p = 0.247$).

cross-sectional studies in both children[9] and adolescents.[7] Somewhat paradoxically, in the girls, despite the maintained superior CRF among SPORT participants throughout the study, the advantage they possessed in MVPA was lost during adolescence. This suggests that either sport during mid-adolescence in girls consisted of less MVPA than in the pre-adolescent years, or that during adolescence, any increased MVPA associated with SPORT was accompanied by reduced MVPA during the remainder of the week. Nevertheless, higher CRF among SPORT participants at each measurement period indicate the continuing role of SPORT in maintaining higher fitness levels.

Of interest is the potential role that sport can play in reducing obesity. Using DEXA to measure body composition, our findings indicate that SPORT girls had lower %BF. While a recent review concluded that the association between sports participation and obesity is unclear,[10] the majority of studies in the review used BMI, which the authors noted to be a problematic measure of adiposity among sports participants because they tend to be more muscular. Our findings are supported by a longitudinal study of British youth which found body fat measured by bio-impedance was inversely associated with sports club participation at 12 years (although these associations were not evident at age 9 years).[13] There was a tendency for SPORT boys in our study to have lower %BF, however, these differences were not statistically significant. Gender differences in the associations of physical characteristics are perhaps not surprising given the different developmental changes in adiposity. As shown in Fig. 5a and b, between the ages of 12 and 16 years, %BF increased in girls and decreased in boys. These differences suggest that gender and age need to be taken into account when setting up sport-related strategies to improve body composition.

There were indications in the current study that SES was an influencing factor in the associations between SPORT and PA and fitness for girls. Girls, but not boys of lower SES were less active, more sedentary, not as fit and less likely to participate in SPORT than their counterparts of higher SES. This is consistent with a study of Australian adolescent girls, which found lower SES to be associated with lower sports club membership.[24] Taken together, these findings suggest that girls with lower SES warrant particular attention when designing sport related strategies.

High participation rates in our cohort indicate that sport is a promising way to reach a large proportion of children. An overall participation rate of 72% in our cohort is in-line with findings from an Australian government survey, which reported that 73% of children aged 7–14 years from the same region as the current study participate in sports.[11] The participation rate in our study dropped from age 12 to 16 years and highlights the need to invest in strategies that maintain engagement, particularly during the transition from childhood to adolescence. These strategies need to take a multidimensional approach,[25] as simply increasing the proportion of children taking part in sport may not necessarily result in increases in the percentage of youth meeting recommended levels of PA.[26,27]

Strengths of this study include the longitudinal design, the use of objectively measured PA, and DEXA as a direct measure of body fat. This study was observational and while the longitudinal design builds confidence around the associations between sport participation with each physical characteristic measured, we cannot infer causation. Given that differences in baseline CRF and PA were observed between sport and non-sport participants we cannot rule out the possibility that more active and fit children choose to join a sports club in the first place. A further limitation of this study is our generalist definition of sport club participation which was based on reported club membership and did not take into account differences in duration, frequency, and the type of sport performed. Finally, we used an accelerometer epoch length of 60 s and it has been suggested that larger epoch lengths may under-report MVPA.[28]

5. Conclusion

Australian youth taking part in club sports are more active, fitter and have less body fat than non-participants. While high participation rates indicate the potential of the sports club as a health promoting setting, the majority of sports participants did not meet recommended levels of PA. Of concern was the diminished effect of sports participation on PA levels during adolescence, especially in girls. Strategies aiming to maximise the benefits associated with sport participation are required and should be adapted to the specific gender, age-group and stage of development of the youth. Our findings indicate strategies targeting girls, particularly those from lower SES backgrounds, and the period of adolescence are especially warranted.

Practical implications

- Participation in sport conveys lasting benefits that are considered attributes of a healthy lifestyle.
- Girls participating in sports were less likely to participate as actively as boys. Coaches, parents and teachers should direct more attention to sports training and game strategies that promote greater involvement for girls.
- Greater support for sport inside and outside of school hours could enable more children to meet recommended daily amounts of physical activity.

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