Which domains of childhood physical activity predict physical activity in adulthood? A 20-year prospective tracking study

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ABSTRACT

Purpose: It is important to examine how childhood physical activity is related to adult physical activity in order to best tailor physical activity promotion strategies. The time and resource intensive nature of studies spanning childhood into adulthood means our understanding of physical activity trajectories over this time span is limited. This study aimed to determine whether childhood domain-specific physical activities predict domain-specific physical activity 20 years later in adulthood, and whether age and sex play a role in these trajectories.

Methods: In 1985, 6412 9-15 year-old children self-reported frequency and duration of discretionary sport and exercise ('leisure activity'), transport activity, school sport and physical education (PE) in the past week, and number of sports played in the past year. In 2004-6, 2201 of these participants (age 26-36) completed the long International Physical Activity Questionnaire and/or wore a Yamax pedometer. Analyses included partial correlation coefficients and log binomial regression.

Results: Child and adult activity were weakly correlated (r=-0.08 - 0.14). Total weekly physical activity in childhood did not predict adult activity. School PE predicted adult total weekly physical activity and daily steps (older females), while school sport demonstrated inconsistent associations. Leisure and transport activity in childhood predicted adult leisure activity among younger males and older females, respectively. Childhood past year sport participation positively predicted adult physical activity (younger males and older females).

Conclusions: Despite modest associations between childhood and adult physical activity that varied by domain, age and sex, promoting a range of physical activities to children of all ages is warranted.

INTRODUCTION

Despite the well-known benefits of physical activity,[1] a large proportion of adults in developed countries are insufficiently active at levels recommended for good health.[2, 3] In an attempt to overcome this important public health problem, many physical activity promotion strategies target children and adolescents with the aim of promoting life-long participation in physical activity. These interventions are generally based on an underlying assumption that physically active children will become physically active adults – that is, that physical activity 'tracks' across the lifespan. While evidence from short-term tracking studies suggests that physical activity can remain relatively stable over short periods (e.g. 2-3 years),[4, 5] findings from the limited number of longer term studies suggest that physical activity during childhood and adolescence at best weakly predicts adult physical activity.[4, 6]

Because of the resource- and time-intensive nature of prospective studies spanning the period from childhood into adulthood, there are relatively few studies of this kind. There are also few studies that have examined different 'domains' of childhood physical activity (e.g. transport activity, school-based activities, leisure activity, sport) to determine whether specific types of activity better predict adult physical activity. Many of these studies have been relatively small (n<250) with limited ability to examine potential age and sex differences,[6-11] and larger studies have mostly included childhood measures focused on organised sport, sports club membership, or sport training and competitions.[12-16] While the examination of sport is not problematic *per se*, current public health messages encourage incorporating activity into everyday activities, such as using active means of transport for commuting to school or work.[17] Examining relationships between domains of physical activity in childhood and adulthood may provide insights into the types of activities in childhood that may warrant stronger

targeting in interventions. The Northern Ireland Young Hearts study examined physical activity in childhood more broadly than previous studies by including measures of active transport to and from school and activity during school breaks,[18] but was limited to participants aged 15 years at baseline, so provided little information about younger children. Furthermore, none of these studies have included an objective measure of physical activity at any time point, which is important in terms of overcoming some of the limitations associated with self-report measures.[19, 20]

Given the limited understanding of physical activity trajectories over extended periods of time and how this may differ across age and sex groups, this study aimed to determine whether domain-specific childhood physical activities predict domain-specific types of adult physical activity. We addressed this research question with data from a population-based sample of Australians who were aged 9-15 years at baseline and followed up at age 26-36 years, stratified by sex and age group.

METHODS

Ethics

At baseline, approval was granted from the Directors of Education in each state and consent was obtained from parents and children. At follow-up, ethical clearance was obtained from the Southern Tasmanian Medical Research Ethics Committee (H0008152) and participants provided written informed consent.

Sample

1n 1985, 8,498 7-15 year-olds participated in the Australian Schools Health and Fitness Survey, a nationally representative survey of the health and fitness of Australian children and adolescents.[21, 22] A two-stage probability sampling process involved selecting schools with a probability proportional to size (n=109, 90.1% response rate), then using simple random sampling to select 10 boys and girls from each age strata within schools (n=8,498, 67.5% response rate). At follow-up, 6,840 original participants (81%) were traced from current and historical electoral rolls, electronic telephone directories, and contact with classmates as part of the Childhood Determinants of Adult Health study.[23, 24] Of these, 5,170 agreed to participate in follow-up (61% of the baseline sample) and in 2004-6 physical activity data were collected from 2,879 (34% of the baseline sample) individuals.

Measures

Baseline physical activity: Questionnaires were administered to students in small groups of four under the supervision of data collectors who were mostly graduate or undergraduate Physical Educators and who had undertaken two days of project training. Data collectors read instructions to all groups and the first page of questions was worked through with the data collector reading and explaining each line. In

primary schools, the entire questionnaire was read to all students. In secondary schools, where all students were clearly able to read, line by line progress was relaxed and students proceeded at their own pace; where any doubt existed about reading skill level of any group member, the data collector continued to read the entire questionnaire. Participants aged 9-15 years (n=6,559; those aged <9 were not considered to have the cognitive ability to complete the questionnaire) self-reported past week duration and frequency of discretionary sport or exercise ('leisure activity'), walking and cycling to and from school (transport activity), school physical education (PE) and school sport. For each activity, frequency was multiplied by duration to estimate minutes per week, and activities were summed to estimate total weekly physical activity (minutes/week).[25] Participants also reported the number (up to six) of sports that they had played for an organised team, group, club or school in the past year (past year sport participation). Total weekly physical activity and past year sport participation demonstrated similar associations with objectively measured cardiorespiratory fitness in this sample (Spearman's *rho*=0.18 and 0.15, p<0.001) as observed for other self-report measures among children.[26]

Follow-up physical activity: Participants (n=2,679) completed the long version of the International Physical Activity Questionnaire (IPAQ-L) which assesses physical activity for leisure, transport, work, and domestic purposes in the past week.[27] Because leisure and transport activity are under volitional control and are more discretionary than occupational or domestic physical activity (and therefore more amenable to intervention), these domains were the focus of this study. Further, it seems conceptually unlikely that childhood physical activity would predict adult participation in non-discretionary activities such as occupational and domestic physical activity. Three variables were calculated to represent minutes per week of physical activity (a) for leisure, (b) for transport, and (c) total weekly physical activity. In this sample, leisure and transport activity were significantly correlated with a physical working capacity at a heart rate of 170 (PWC_{170})objective cardiorespiratory fitness test (Spearman's

rho=0.3, p<0.001). The PWC_{170} test followed standardized procedures [28] and was conducted on a Monark cycle ergometer (model 828E; Monark Exercise AB, Vansbro, Sweden) as a continuous test. PWC_{170} was divided by lean body mass (Watts/kilogram of lean body mass) estimated from the sum of four skinfolds by using standard equations [29-31]. Participants also wore a Yamax Digiwalker pedometer (SW-200) and recorded total steps at the end of each day, daily start time and daily end time for seven days. Daily records were excluded if the pedometer was worn for less than 8 hours or >60,000 steps were reported (n=11). Average daily steps was calculated for participants with a minimum of four days readings (n=2,269), consistent with other studies.[32, 33] In this sample, daily steps were significantly correlated with the PWC_{170} cardiorespiratory fitness test (Spearman's *r*=0.2, p<0.001), with self-reported total physical activity (males: *r*=0.38, females: *r*=0.28), and with leisure activity (*r*=0.21) and active commuting (*r*=0.18) among females, but not males (*r*=0.00 and *r*=0.08, respectively) [34].

Analyses

Baseline questionnaires from 147 participants were deemed invalid due to large amounts of missing physical activity data (≥30 missing values from the physical activity questionnaire), resulting in valid data for 6,412 children. Participants who were pregnant at follow-up were excluded (n=68). Those who completed the baseline physical activity survey as well as either the follow-up physical activity survey (n=2,047) or wore a pedometer at follow-up (n=1,756) were included in analyses (total n=2,201 participants eligible for analyses). Differences in the baseline characteristics of those who participated in follow-up and those who did not were assessed using one-way analysis-of-variance (ANOVA) for continuous variables (with equal variances) or the Kruskal-Wallis equality-of-populations rank test for continuous variables (with unequal variances), and chi-squared tests for categorical variables. Age was stratified for all analyses into younger (9-12 years at baseline) or older (13-15 years at baseline) age groups. Due to skewed self-reported physical activity data, age-adjusted partial correlation coefficients

were calculated using ranked data. Log binomial regression was used to predict the relative risk (RR) of being in the top third of physical activity in adulthood according to third of activity in childhood, adjusted for age, and stratified by sex and age group. Stata version 10.2 (Statacorp, College Station, Texas, USA) was used for all analyses.

RESULTS

There was no significant difference in median total weekly physical activity (320 vs. 320 minutes/week), leisure activity (120 vs. 120 minutes/week), transport activity (20 vs. 20 minutes/week), school sport (45 vs. 45 minutes/week), school PE (60 vs. 60 minutes/week), or past year sport participation (2 vs. 2 sports) reported at baseline between those who participated in follow-up and those who did not. Those who participated in follow-up were marginally older at baseline (12.0 vs. 11.9 years, $p=0.01$) and a greater proportion were female (53% vs. 47%, $p<0.001$).

Mean age was 12 years at baseline and 31 years at follow-up, with an average follow-up duration of 19.6 (SD: 0.6) years. At baseline, older males reported significantly more time in total weekly physical activity and leisure activity, and a greater number of past year sports than older females (**Table 1**). At follow-up, younger females reported significantly more time spent in transport activity than younger males.

[TABLE 1 ABOUT HERE]

Some statistically significant, albeit weak, correlations were observed between child and adult physical activity, most commonly among younger males and older females (**Table 2**).Total weekly physical activity in childhood was positively correlated with adult leisure activity among younger males and older females, and with transport activity among younger males. School PE was correlated with adult total weekly physical activity among younger males and older females, and with daily steps among younger females. Past year sports participation was positively correlated with adult total weekly physical activity, leisure and transport activity among younger males, and with leisure and transport activity among older females. Childhood leisure activity was significantly correlated with adult leisure activity among younger

males, but an inverse correlation was observed with total weekly physical activity among younger females; an inverse correlation was also detected between school sport and adult total weekly physical activity among the younger females. No correlation was observed between childhood transport activity and adult physical activity.

[TABLE 2 ABOUT HERE]

In general, childhood physical activity was a poor predictor of adult total physical activity (**Table 3**). Childhood total weekly physical activity, leisure and transport activity were not predictive of adult total weekly physical activity. Higher levels of school sport among older males were associated with a 40% increase in the likelihood of being in the top third of total weekly activity in adulthood, but with a 40% lower likelihood among younger males. Higher levels of school PE were associated with a 50% increase in the likelihood of being in the top third of adult total weekly physical activity among younger females. Higher past year sport participation in childhood was associated with a 60% greater likelihood of being in the top third of adult weekly physical activity among younger males, but with a 40% lower likelihood in older females.

[TABLE 3 ABOUT HERE]

Few associations were observed between childhood physical activity and adult daily steps (data not shown), with childhood leisure activity, transport activity, school sport and past year sport participation not predictive of adult daily steps. Higher levels of school PE were associated with an increased likelihood of being in the top third of adult daily steps among younger females (RR 1.4, 95% CI 1.04,

1.94). Medium levels of total weekly physical activity in childhood were associated with a decreased likelihood of being in the top third of adult daily steps for older females (RR 0.6, 95% CI 0.41, 0.90).

No associations were observed between childhood total weekly physical activity, school sport, school PE or past year sport participation and adult leisure activity (**Table 4**). However, high levels of childhood leisure activity were associated with a 40% increase in the likelihood of being in the top third of adult leisure activity for younger males, and medium levels of childhood transport activity were associated with a 40% greater likelihood of being in the top third of adult leisure activity among older females.

[TABLE 4 ABOUT HERE]

No association was evident between childhood total weekly physical activity, leisure activity, transport activity, school sport or PE and adult transport activity (**Table 5**). However, past year sport participation was associated with a 60% greater likelihood among younger males and a 40% greater likelihood among older females of being in the top third of adult transport activity.

[TABLE 5 ABOUT HERE]

DISCUSSION

This study aimed to determine whether domains of childhood physical activity predicted domain-specific physical activities in adulthood. In a population-based sample of Australians followed prospectively over 20 years from childhood into adulthood, we found that some domains of childhood physical activity were predictive of adult physical activity. However, few associations were evident, most were relatively weak in magnitude and, for some activities, inconsistent in direction. Weekly school PE, weekly school sport, and past year sport participation predicted adult physical activity more commonly than did childhood total weekly physical activity, transport activity or leisure activity, and associations were more common among younger males and older females.

This study is one of the first to examine the influence of a diverse range of childhood physical activities on adult physical activity, and to do so for males and females separately across a range of ages. The findings are consistent with other studies that suggest limited tracking of physical activity from childhood into adulthood,[4, 6] although provide some insights for physical activity domains that may warrant further targeting in interventions to promote activity across the lifespan, and amongst which sex and age groups this targeting may be most appropriate.

Childhood participation in past year sport predicted adult total weekly physical activity among younger males, and transport activity among younger males and older females. It is plausible that childhood sport participation over the year is related to adult activity because it is not dependent on the structure of school and school routines. For instance, declines in participation in school-dependent activities, such as school sport or PE, at the completion of schooling may be because the support and organisational structures that schools provide for physical activity are no longer available. Those who already allocate a

proportion of their leisure time to regular participation in physical activity may be more likely to continue to allocate this time to physical activity upon leaving school. In contrast, children who engage in less physical activity in their leisure time outside of school may not perceive physical activity as a priority, may not enjoy physical activity, may not be supported or encouraged to participate, or may not be in the habit of spending their discretionary time being active; these habits that may then continue through to adulthood.

School PE predicted adult total weekly physical activity and daily steps among younger females. This is consistent with findings from the Cardiovascular Risk in Young Finns study, where PE grade positively predicted overall physical activity 9 years later among 9-year-old females.[16] Reasons for why these associations are observed between school PE and adult physical activity among younger but not older girls are unclear. It may be that the decreases in physical activity typically observed among adolescent girls [35] obscure any potential relationship with adult activity, and that PE participation of younger girls is more predictive of future behaviour. For instance, it could be that while most girls decrease their physical activity as they move into adolescence, those who were most active in their younger years may be more likely to reinitiate participation in early adulthood. Alternately, a higher proportion of the older females had children at follow-up (72% vs. 51% of younger females), and women with children are less likely to participate in physical activity,[36] which may explain this finding. A further explanation is that younger females may have greater perceived physical activity competence than older females, which has been found in this sample to be predictive of persistent physical activity throughout adolescence and into early adulthood among females.[37]

School sport was positively predictive of total weekly activity among older males, but inversely associated with total activity among younger males. Reasons for these contrasting findings in younger

males are unclear. It is possible that as school sport becomes non-compulsory in higher year levels , males who continue participation later in the school years may also be those with better motor skills or higher physical activity self-efficacy, which are positively associated with physical activity behaviour,[38, 39] or with greater perceived competence, which is associated with physical activity among adolescents (13-18 years) but not children (3-12 years).[40]

The limitations of self-reported measures of physical activity in both children and adults have been well-documented,[19, 20] and may explain the lack of significant findings observed. However, the childhood physical activity survey produced results similar to those observed in other population-based surveys, with similar differences observed between boys and girls (boys reported more activity than girls) and similar patterns across age groups (physical activity declined from age 13 among girls while boys' activity increased).[35, 41, 42] Where possible, reliable and valid questionnaires were used, and in adulthood an objective measure of physical activity (pedometers) was employed in an attempt to reduce the potential for reporting biases. However, pedometers and self-report measures may not be expected to correlate well because they capture different elements of physical activity; pedometers capture incidental activity while self-report measures generally do not.

Approximately one quarter of the sample participated in follow-up which may have resulted in a selection bias, but the baseline physical activity characteristics of those who did and did not participate were similar. Plausibly those who were not involved in follow-up were less active as adults than those who did participate, which would result in an underestimation of associations between child and adult activity due to reduced heterogeneity. No adult information is available on non-participants due to privacy legislation, so this cannot be confirmed. However, there was large variation in the physical activity behaviours of the adult sample. Because data were collected at two time points only, physical

activity patterns between these time points are unknown. Plausibly, participants changed their physical activity participation patterns many times, or physical activity at the time of data collection may not be representative of usual participation.

Despite the limitations, this study had a number of important strengths. Most previous research has examined the influence of total childhood activity on total adult activity, which provides limited insights into the specific physical activity behaviours that best predict physical activity in adulthood. The follow-up sample was large which enabled stratification by sex and age group, providing insights into the population segments that may be more amenable to physical activity promotion strategies. This was the first study spanning these important life stages that has employed an objective measure of physical activity (pedometers) at follow up.

In conclusion, this study found that different domains of childhood physical activity were modestly predictive of physical activity in adulthood, with physical activity domain, age and sex variations evident. Despite the modest associations observed, promoting a range of physical activities to children, adolescents and adults of all ages is warranted given the large proportion of the population who are currently active at levels insufficient for health benefits.

WHAT THIS STUDY ADDS

- This is one of few studies to examine in detail whether specific types of physical activity in childhood are predictive of physical activity in adulthood
- Weak but significant associations were observed between a small number of childhood and adulthood domain-specific physical activities
- Promoting a range of physical activities across the lifecourse is warranted in order to maximise continued, lifelong participation in regular physical activity

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COMPETING INTERESTS

The authors have no competing interests to declare.

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CONTRIBUTORSHIP STATEMENT

VC conducted the analyses and drafted the manuscript. TD and AV were involved in the conceptualisation and design of the study, provided input into interpretation of data, and provided important intellectual content through critical revisions. All authors approved a final version of the manuscript.

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Table 1: Characteristics of participants in childhood (1985) and adulthood (2004-6), by sex and baseline age group.

	Baseline	**Males**		**Females**		**p***
	Age (yrs)	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Baseline (childhood)						
Age (years)	9-12	11 (1)	11 (10, 12)	10 (1)	11 (10, 11)	0.66
	13-15	14 (1)	14 (13, 15)	14 (1)	14 (13, 15)	0.75
Total weekly PA	9-12	384 (325)	295 (170, 510)	366 (340)	273 (160, 472)	0.15
(mins/wk)						
	13-15	570 (504)	445 (240, 720)	462 (443)	345 (210, 580)	**<0.001**
Leisure PA (mins/wk)	9-12	216 (301)	120 (0, 300)	185 (282)	91 (15, 240)	0.14
	13-15	332 (441)	200 (60, 450)	250 (403)	120 (30, 300)	**<0.001**
Transport PA (mins/wk)	9-12	49 (90)	20 (0, 70)	49 (108)	15 (0, 58)	0.14
	13-15	56 (89)	25 (0, 80)	54 (72)	20 (0, 100)	0.59
School sport (mins/wk)	9-12	63 (78)	50(0, 90)	76 (125)	60 (0, 90)	0.30
	13-15	85 (152)	40 (0, 120)	68 (119)	20 (0, 90)	0.10
School PE (mins/wk)	9-12	56 (69)	40 (0, 70)	56 (79)	38 (0, 78)	0.83
	13-15	98 (114)	80 (0, 150)	91 (103)	80 (40, 120)	0.99

Past year sport (n)	9-12	3 (1)	2 (1, 3)	2 (1)	2 (1, 3)	0.13
	13-15	3 (2)	3 (2, 4)	3 (2)	2 (1, 3)	**0.04**
Follow-Up (adulthood)						
Age (years)	9-12	30 (2)	30 (29, 31)	30 (2)	30 (29, 31)	**<0.01**
	13-15	34 (1)	34 (33, 35)	33 (2)	33 (32, 34)	0.09
Total weekly PA	9-12	772 (521)	678 (377, 1064)	750 (485)	660 (360, 1050)	0.70
(mins/wk)						
	13-15	811 (573)	659 (170, 1194)	795 (509)	712 (390, 1125)	0.72
Daily steps	9-12	8995 (3352)	8533 (6609, 10869)	8981 (3100)	8543 (6802, 11068)	0.82
	13-15	9615 (3800)	9130 (6941, 11831)	9031 (3183)	8827 (6882, 10723)	0.07
Leisure PA (mins/wk)	9-12	168 (216)	93 (0, 240)	157 (186)	110 (20, 240)	0.74
	13-15	168 (220)	100 (0, 240)	148 (186)	90 (0, 219)	0.42
Transport PA (mins/wk)	9-12	103 (164)	40 (0, 140)	108 (160)	60 (0, 140)	**0.04**
	13-15	109 (179)	37 (0, 140)	94 (143)	44 (0, 145)	0.64

*p-values from Kruskal-Wallis equality-of-populations rank test; bold indicates statistically significant difference ($p<0.05$)

PA: physical activity; PE: physical education; SD: standard deviation; IQR: inter-quartile range

Table 2: Age-adjusted correlation coefficients for the association between physical activity in childhood and adulthood, by sex and baseline age group.

Childhood Physical Activity	Adult Physical Activity							
	Total weekly PA (mins/wk)		Daily steps		Leisure PA (mins/wk)		Transport PA (mins/wk)	
	M	F	M	F	M	F	M	F
Total weekly PA (mins)								
9-12 yrs	.08	-.07	-.01	.02	**.12‡**	.01	**.10†**	.03
13-15 yrs	.05	.09	-.04	.00	.02	**.11†**	.02	.01
Leisure PA (mins)								
9-12 yrs	.03	**-.08†**	-.02	.03	**.12†**	.03	.08	.02
13-15 yrs	.01	.08	-.02	.04	.00	.07	.02	.05
Transport PA (mins)								
9-12 yrs	.03	-.02	.06	.03	-.03	.05	-.01	-.03
13-15 yrs	.00	.06	-.04	-.03	.00	.07	-.00	.07
School sport (mins)								
9-12 yrs	-.03	**-.08†**	-.03	-.06	.06	-.01	.04	.02
13-15 yrs	.09	.02	.02	-.07	-.02	.05	.02	-.04
School PE (mins)								
9-12 yrs	**.09†**	.07	-.03	**.12†**	.03	-.07	.03	.01
13-15 yrs	.03	**.09†**	-.08	-.02	.02	.09	.03	-.04
Past year sport (n)								
9-12 yrs	**.09†**	-.04	.05	.04	**.09†**	.00	**.14†**	-.01

13-15 yrs	-.02	.08	.01	.03	.09	**.10†**	.02	**.13†**

‡ p<0.001, †p<0.05

PE: physical education; M: males; F: females

Table 3: Relative risk (95% confidence interval) of being in the top third of total physical activity in adulthood according to third of physical activity in childhood, by sex and baseline age group.

Childhood Physical Activity		Total Weekly PA in Adulthood			
		9-12 years at Baseline		13-15 years at Baseline	
		Males (n=528)	Females (n=646)	Males (n=410)	Females (n=463)
Total weekly PA					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		1.1 (0.8, 1.5)	1.0 (0.8, 1.3)	1.2 (0.8, 1.6)	0.8 (0.6, 1.1)
Top third		1.1 (0.8, 1.4)	0.9 (0.7, 1.2)	1.3 (1.0, 1.9)	1.0 (0.8, 1.4)
	p_{trend}	0.72	0.39	0.08	0.72
Leisure PA					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		1.3 (0.9, 1.7)	1.0 (0.8, 1.3)	1.0 (0.8, 1.5)	1.2 (0.9, 1.6)
Top third		1.1 (0.8, 1.5)	0.8 (0.6, 1.1)	1.0 (0.7, 1.4)	1.1 (0.8, 1.5)
	p_{trend}	0.59	0.12	0.87	0.47
Transport PA					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		1.1 (0.8, 1.5)	1.1 (0.9, 1.5)	1.1 (0.8, 1.6)	1.2 (0.9, 1.6)
Top third		1.0 (0.8, 1.3)	0.9 (0.7, 1.2)	0.9 (0.7, 1.3)	1.0 (0.8, 1.4)
	p_{trend}	0.94	0.46	0.74	0.80
School sport					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		**0.6 (0.4, 0.9)†**	0.8 (0.6, 1.1)	1.0 (0.7, 1.6)	0.8 (0.5, 1.1)
Top third		0.9 (0.7, 1.2)	0.9 (0.7, 1.2)	**1.4 (1.1, 1.9)†**	1.0 (0.7, 1.3)
	p_{trend}	0.31	0.43	**0.01**	0.76

School PE					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		1.1 (0.8, 1.5)	1.3 (0.9, 1.7)	1.0 (0.7, 1.5)	1.1 (0.8, 1.5)
Top third		1.9 (0.8, 1.5)	**1.5 (1.1, 1.9)‡**	1.2 (0.9, 1.6)	1.3 (0.9, 1.7)
	p_{trend}	0.60	**0.004**	0.34	0.12
Past year sport					
≤One		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Two		1.2 (0.8, 1.7)	0.8 (0.6, 1.0)	0.8 (0.6, 1.2)	**0.6 (0.4, 0.9)‡**
≥Three		**1.6 (1.1, 2.3)‡**	0.9 (0.7, 1.1)	0.8 (0.6, 1.1)	0.9 (0.7, 1.2)
	p_{trend}	**0.003**	0.26	0.21	0.93

‡ p<0.01, †p<0.05 (bold indicates statistically significant association)

PA: physical activity; PE: physical education

Table 4: Relative risk of being in the top third of leisure physical activity in adulthood according to third of physical activity in childhood, by sex and baseline age group.

Childhood PA		Leisure PA in Adulthood			
		9-12 years at Baseline		13-15 years at Baseline	
		Males (n=528)	Females (n=646)	Males (n=410)	Females
Total PA					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		1.0 (0.8, 1.4)	1.0 (0.8, 1.3)	0.8 (0.6, 1.1)	1.0 (0.7, 1.4)
Top third		1.3 (1.0, 1.7)	1.0 (0.8, 1.3)	1.1 (0.8, 1.5)	1.3 (0.9, 1.7)
	p_{trend}	0.06	0.79	0.62	0.09
Leisure PA					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		1.3 (0.9, 1.7)	1.0 (0.8, 1.3)	0.8 (0.6, 1.1)	1.2 (0.8, 1.6)
Top third		**1.4 (1.0, 1.9)†**	1.0 (0.8, 1.3)	1.0 (0.7, 1.4)	1.3 (0.9, 1.8)
	p_{trend}	**0.03**	0.84	0.97	0.14
Transport PA					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		1.1 (0.8, 1.4)	1.0 (0.8, 1.4)	0.8 (0.5, 1.2)	**1.4 (1.0, 2.0)†**
Top third		0.8 (0.7, 1.1)	1.1 (0.8, 1.3)	1.0 (0.7, 1.3)	1.2 (0.9, 1.5)
	p_{trend}	0.23	0.62	0.78	0.32
School sport					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		1.0 (0.7, 1.4)	1.1 (0.8, 1.4)	0.9 (0.6, 1.4)	1.0 (0.7, 1.4)
Top third		1.2 (1.0, 1.6)	0.8 (0.6, 1.1)	0.9 (0.6, 1.2)	1.1 (0.8, 1.4)

p_{trend}	0.10	0.12	0.39	0.62
School PE				
Bottom third	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third	1.1 (0.8, 1.5)	0.9 (0.7, 1.2)	0.9 (0.7, 1.3)	1.1 (0.8, 1.5)
Top third	1.3 (1.0, 1.7)	0.9 (0.7, 1.1)	1.1 (0.8, 1.6)	1.2 (0.8, 1.6)
p_{trend}	0.06	0.29	0.40	0.38
Non-school sport (n)				
≤One	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Two	1.3 (0.9, 1.8)	1.0 (0.8, 1.3)	1.0 (0.6, 1.5)	1.1 (0.7, 1.5)
≥Three	1.3 (1.0, 1.8)	0.9 (0.7, 1.2)	1.3 (0.9, 1.8)	1.2 (0.9, 1.6)
p_{trend}	0.10	0.57	0.09	0.30

‡ p<0.001, †p<0.05

PA: physical activity; PE: physical education

Table 5: Relative risk of being in the top third of transport physical activity in adulthood according to third of physical activity in childhood, by sex and baseline age group.

Childhood PA		Transport PA in Adulthood			
		9-12 years at Baseline		13-15 years at Baseline	
		Males	Females	Males	Females
Total PA					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		0.8 (0.6, 1.1)	0.9 (0.7, 1.1)	0.8 (0.6, 1.1)	0.9 (0.7, 1.2)
Top third		1.1 (0.9, 1.5)	1.0 (0.8, 1.3)	0.9 (0.6, 1.2)	1.0 (0.7, 1.3)
	p_{trend}	0.31	0.92	0.48	0.96
Leisure PA					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		0.9 (0.6, 1.2)	0.9 (0.7, 1.2)	1.0 (0.7, 1.4)	1.1 (0.8, 1.5)
Top third		1.0 (0.8, 1.4)	1.0 (0.8, 1.3)	1.0 (0.7, 1.4)	1.0 (0.7, 1.4)
	p_{trend}	0.79	0.92	0.91	0.87
Transport PA					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		1.1 (0.8, 1.5)	0.9 (0.6, 1.2)	0.8 (0.6, 1.2)	1.1 (0.8, 1.7)
Top third		0.9 (0.7, 1.2)	1.0 (0.8, 1.2)	0.9 (0.6, 1.2)	1.3 (1.0, 1.7)
	p_{trend}	0.70	0.73	0.36	0.08
School sport					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		1.0 (0.7, 1.3)	1.2 (0.9, 1.6)	1.0 (0.6, 1.5)	1.1 (0.8, 1.5)
Top third		1.2 (0.9, 1.6)	1.1 (0.9, 1.4)	1.0 (0.7, 1.4)	0.9 (0.6, 1.2)

	p_{trend}	0.22	0.29	0.92	0.38
School PE					
Bottom third		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Middle third		1.0 (0.8, 1.4)	1.0 (0.8, 1.3)	1.0 (0.7, 1.4)	1.1 (0.8, 1.4)
Top third		1.0 (0.8, 1.4)	0.9 (0.7, 1.2)	1.1 (0.8, 1.5)	0.8 (0.6, 1.2)
	p_{trend}	0.81	0.43	0.64	0.26
Non-school sport (n)					
≤One		1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Two		1.3 (0.9, 1.8)	0.9 (0.7, 1.2)	0.9 (0.6, 1.4)	0.8 (0.5, 1.2)
≥Three		**1.6 (1.1, 2.2)†**	0.9 (0.7, 1.2)	0.9 (0.7, 1.3)	**1.4 (1.0, 1.9)†**
	p_{trend}	**0.003**	0.56	0.76	**0.01**

‡ p<0.001, †p<0.05

PA: physical activity; PE: physical education