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# Variation in Sport Participation, Fitness and Motor Coordination With Socioeconomic Status Among Flemish Children

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Socioeconomic status (SES) is often indicated as a factor that influences physical activity and associated health outcomes. This study examined the relationship between SES and sport participation, morphology, fitness and motor coordination in a sample of 1955 Flemish children 6–11 years of age. Gender, age and SES-specific values for morphologic dimensions, amount and type of sport participation and fitness and motor coordination tests were compared. SES was positively and significantly associated with sport participation and sports club membership in both sexes. Although differences were not consistently significant, morphologic dimensions and tests of fitness and motor coordination showed a trend in favor of children from higher SES. The results suggest that public and local authorities should consider providing equal opportunities for children in all social strata and especially those in the lower SES to experience the beneficial effects of sport participation through which they can enhance levels of physical fitness and motor coordination.

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Reduced levels of physical activity, increased levels of physical inactivity associated with a sedentary lifestyle, higher prevalence of overweight and obesity, and reduced levels of fitness and motor coordination are increasingly common in children from developed countries (11,20,41). According to the World Health Organization (45), almost two-thirds of the children are insufficiently active with serious implications for their fitness and their future health. These trends have implications for the presence of risk factors associated with cardiovascular and metabolic health in adulthood (38). Consequently, it is regularly recommended that programs of regular physical activity be implemented for the purpose of improving health status during childhood which may reduce chronic (metabolic) diseases at adult ages (29,40).

More recently, the interactions of motor competence and physical activity beginning in early childhood have been noted (37). Children who are more proficient in movement skills tend to be more physically active. The results emphasize the potential influence of environmental factors, e.g., living conditions, SES, parental activity, among others, on opportunities for physical activity and practice of movement skills (7,14,32). Emphasis on movement skills per se is relatively recent and highlights the need to better understand the development of motor proficiency among children (37).

SES is a confounding factor in the relationship between physical activity and health outcomes (4), but results are not necessarily consistent across studies and the dimension of physical activity that is considered. Among Taiwanese youth, for example, SES was not related to estimated total daily energy expenditure and energy expenditure in moderate-to-vigorous activities (16). On the other hand, SES was related to the intention to exercise among Canadian youth (13), while lower SES groups in Flanders (Belgium) tended to show a more sedentary lifestyle compared with groups from middle and high SES (34). Studies of parental income and extracurricular use of sport facilities (an indirect measure of sport participation) indicated significantly less participation among children from low income compared with children from high income families (42,46). However, total physical activity was not related to parental income, suggesting that families from low SES may compensate for the lack of organized forms of leisure time activities by being active in nonorganized forms of physical activity. The latter was confirmed among elementary school children in the Bristol (UK) areas (2). Parents of children attending schools in low SES neighborhoods indicated that their encouragement of sport participation of their children was largely restricted to verbal recommendation due to the high cost of organized sport-based activity participation.

Although sport participation is only one component of total physical activity, it has been postulated that sport participants have higher current estimated energy expenditure and that sport participation may enhance health benefits of physical activity (9,28). Moreover, boys and girls involved in organized youth sports tend to expend, on average, more overall energy (total daily energy expended in absolute terms and per unit body mass) and energy in moderate-to-vigorous activities ( $\approx 4.8$  METs) than nonparticipants (18). In a more recent study which included accelerometry with boys (6–12y), participation in youth sport accounted for about one-fourth of 110 min of moderate-to-vigorous physical activity in the day (43).

It is suggested that individuals living under conditions of limited economic, social and cultural capital are less likely to participate in sports and are more likely to be excluded from this active form of physical activity due to their unfavorable

situation (5). Children from low SES groups are also under threat of social exclusion as evident in the backgrounds of participants in high-performance youth sport; the majority was from middle class and relatively affluent households (5).

Indicators of SES vary among studies (e.g., income, parental education and occupation, and neighborhood of residence) as do measures of physical fitness and contexts of physical activity. Several studies have considered the relationship between SES and physical fitness and performance, but results vary among studies. Results for American children are inconclusive and confounded in part by variation associated with ethnicity (23). Among Polish youth, parental education and family living conditions (proxies for SES) had only a weak influence on a variety of motor performance tests (44). Among Portuguese youth resident on Madeira Island, SES significantly influenced body size and fatness (higher in higher SES youth), but showed no clear pattern of association with tests of fitness (12). Results focusing on SES and motor coordination assessed with the Körper-Koordinationstest für Kinder (KTK) in German children were equivocal. One study noted no significant association between motor coordination and SES (1), while another noted lower levels of motor coordination among children from low SES families (30).

This study considers variation in body size, fitness, motor coordination and sport participation by level of SES in a representative sample of Flemish elementary school children 6–11 years of age. It was hypothesized that children from low SES would show lower values for sport participation compared with peers from middle and high SES, and that children from low SES would perform less well on tests of fitness and motor coordination given their lack of experience in sport participation.

## Methods

### Study Design and Participants

The study design was cross-sectional. Children (6–11 y) were recruited from primary schools randomly selected throughout the Flemish region of Belgium. Twenty-nine schools were randomly selected resulting in a sample of 2183 children. The schools were representative of geographic region and school system (catholic, governmental, provincial and city). The study was approved by the educational authorities and by the Ethics Committee of the Ghent University Hospital. The participants without informed consent of their parents or guardians participated in the test assessment to guarantee their daily physical activity, but were not included in the analysis. From the 2183 participants, 228 (9.6%) were excluded due to missing values resulting in a final sample of 1955 children of whom 52% were boys.

### Measurements

**SES, Physical Activity, Sport Participation.** SES was assessed from current occupational status of both parents/legal guardians. Occupational status was defined using following categories from low to high: unemployed, housekeeping, (un)skilled worker, clerk, education and teaching, self-employed, management, executive position, and profession (i.e., physicians, lawyers, etc.). The variability of occupations establishes a range of SES characteristic of the lifestyle of the parents, especially in Western societies where individual wealth is less decisive when it

comes to personal welfare (36). Two other categories (e.g., retired and deceased) were not represented in sample. Consequently, subjects were categorized into three levels: low, middle and high SES (Figure 1).

The questionnaire used to assess level of physical activity and sport participation included sociodemographic questions, including parental occupation (27). The questionnaire was completed at home with the assistance of parents. Sport participation was measured by asking respondents to select their three most practiced and actual sports during the last 12 months. Frequencies and durations were noted for each of the sports. A sport participation index was computed by summing hours per week spent in the three sports. Participants also noted whether they were a member of an official sports club (sports club membership).

**Morphology.** Height and sitting height were measured with a Harpenden stadiometer (Holtain Ltd, UK) according the guidelines of Lohman et al. (21) by the same test leader. Body weight and estimated percentage fat were measured with a Tanita bioelectrical impedance (weight) scale (type BC-420 SMA, Japan). According to the manufacturers’ guidelines, the scale was approved for medical research in subjects from 5 to 99 years of age.

**Fitness.** Fitness was assessed with several items of the Eurofit test battery (6): hand grip (HGR; static strength), sit and reach (SAR; flexibility), standing broad jump (SBJ; explosive strength), 10 × 5m shuttle-run (SHR; speed and agility) and 20m endurance shuttle-run (ESR; cardiorespiratory endurance). Knee push-ups (KPU; upper body functional strength) and sit-ups (SUP; trunk strength) from the BOT-SF2 (3), the counter movement jump with hands fixed on hips (CMJ; explosive strength) using OptoJump (Microgate, Italy), and shoulder flexibility (SFL, with a flexible steel tape after Johnson and Nelson (17)) were also included. The selection of tests was based on practical considerations regarding age-appropriateness, user-friendliness and discriminating power among children 6–11 years.

Parent 1 \ Parent 2	Unemployed	House-keeping	(Un)skilled worker	Clerk	Education and teaching	Self-employed	Management	Executive position	Liberal profession				
Unemployed	<b>LOW</b>					<b>MIDDLE</b>							
Housekeeping													
(Un)skilled worker	<b>MIDDLE</b>					<b>HIGH</b>							
Clerk													
Education and teaching													
Self-employed													
Management	<b>MIDDLE</b>									<b>HIGH</b>			
Executive position													
Liberal profession													

**Figure 1** — Classification of SES based on the occupation of both parents or legal guardians.

**Motor Coordination.** Motor coordination was assessed with the Körper-Koordinationstest für Kinder (KTK; 19). The test is reliable and valid with children 5–15 years and was recently tested for suitability in Flanders (41). The battery included four test items: jumping sideways across a wooden slat (JS), moving sideways on boxes (MS), hopping for height on one leg (HH) and walking backward on balance beams (WB). The raw performance scores of each subtest were transformed into age- and gender-specific motor quotients, together resulting in a general Motor Quotient (MQKTK).

## Test Procedures

The fitness and motor coordination tests were performed in the gymnasium during physical education classes at the respective schools. Test sessions lasted approximately 85 min. Subjects wore suitable sports clothes and performed the tests barefoot, except for the ESR. Qualified examiners provided standardized instructions and demonstrations according to the test guidelines. Children were encouraged to perform at their best.

## Statistical Analyses

All analyses were gender-specific. Two-way ANOVAs were used to evaluate sport participation by age group and SES. The other dependent variables were grouped into three clusters for analysis: morphology, fitness and motor coordination. Second, multivariate analyses of covariance (MANCOVAs) with hours of sport participation as a covariate were used to examine the effect of SES. Three age groups were considered (6–7 years, 8–9 years and 10–11 years). Bonferroni adjustments for multiple comparisons were used throughout. Main effects of SES and age and the SES x age interaction effect were reported, and effect sizes (by means of  $h^2$ ) for these main effects were added. A significance level of  $p < .05$  was accepted. SPSS 16.0 for Windows was used.

# Results

## SES Variation in Sport Participation and Sports Club Membership

Descriptive statistics for hours of sport participation and sports club membership by gender, age and SES are presented in Table 1. Percentage of sports club membership represents children actually participating in a sport or several sports who are enrolled in at least one official sports club. The effects of SES, age and SES x age interaction effect are significant in girls. High SES girls had significantly greater sport participation than low and middle SES peers. Percentage of sports club membership increases with higher SES. Among boys, the effect of SES and age for hours of sport participation are significant. High SES boys indicate greater sport participation than lower SES boys. Descriptive statistics for sports club membership follows the same pattern as in girls. Low SES boys have lower percentages compared with middle and high SES boys who do not differ from each other.

**Table 1 Two-Way ANOVA for Sport Participation (h/week) [Means (SD)], and Percentage of Sports Club Membership by Age and SES Group for Girls and Boys**

GIRLS	6-7 year			8-9 year			10-11 year			F-value ( $\eta^2$ )	Post hoc (SES)		
	Low	Middle	High	Low	Middle	High	Low	Middle	High				
n	36	129	103	54	207	151	52	123	88				
Age (years)	7.3 (0.5)	7.0 (0.5)	7.1 (0.5)	9.0 (0.6)	9.0 (0.6)	9.0 (0.6)	11.0 (0.6)	11.0 (0.5)	11.0 (0.5)				
Sport participation (h/week)	0.97 (1.45)	1.43 (1.56)	2.25 (2.20)	1.33 (1.80)	2.29 (2.57)	2.43 (2.17)	2.33 (3.32)	2.08 (2.44)	2.33 (1.95)	6.526*** (0.014)	5.291** (0.011)	2.452* (0.010)	L <sub>1</sub> M >H
Membership sports club (%)	25.0	57.4	73.8	46.3	62.8	73.5	42.3	63.4	71.6				
BOYS	6-7 year			8-9 year			10-11 year			F-value ( $\eta^2$ )	Post hoc (SES)		
	Low	Middle	High	Low	Middle	High	Low	Middle	High				
n	39	141	92	47	239	141	52	147	114				
Age (years)	7.1 (0.5)	7.1 (0.6)	7.2 (0.6)	9.2 (0.5)	9.1 (0.6)	9.0 (0.6)	10.9 (0.6)	10.9 (0.5)	11.0 (0.6)				
Sport participation (h/week)	1.72 (1.93)	2.08 (1.81)	2.56 (2.04)	2.11 (2.42)	2.79 (2.45)	2.80 (2.36)	3.18 (2.65)	2.99 (2.67)	3.54 (2.79)	3.903* (0.008)	12.890*** (0.025)	1.001 (0.004)	L <sub>1</sub> M >H
Membership sports club (%)	30.8	67.4	82.6	46.8	71.1	73.8	59.6	71.4	75.4				

L= low, M= middle and H= high SES group (\*p<.05; \*\*p<.01)

## SES Variation in Morphology, Fitness and Motor Coordination in Girls

Descriptive statistics and results of the MANCOVAs for morphology, fitness and motor coordination among girls are presented in Table 2. Height does not differ by SES whereas body weight, BMI and percentage fat differ significantly. High SES children have, on average, lower weight, BMI and percentage fat than low and middle SES children who do not significantly differ from each other. As expected, height, weight and BMI show a significant age effect while percentage fat varies significantly with age. The SES x age interaction is not significant for morphologic dimensions and estimated fatness.

Except for HGR, hours of sport participation is a significant covariate for all fitness variables. Four fitness items differ significantly by SES. SFL, SHR, SUP and ESR are better in high compared with low SES children, but differences with middle SES children are not consistent for the four fitness tests. As expected, fitness tests show a significant age effect. The interaction SES x age is not significant for all tests.

Hours of sport participation is also a significant covariate for the motor coordination tests. The three tests of motor coordination (JS, WB, and HH) and MQ KTK differ significantly by SES among girls. Scores are better for high SES compared with low and middle SES girls, while the latter do not differ. The motor coordination variables vary significantly with age, except for MQ KTK, which is already adjusted for chronological age.

## SES Variation in Morphology, Fitness and Motor Coordination in Boys

Descriptive statistics and results of the MANCOVAs for morphology, fitness and motor coordination among boys are presented in Table 3. Except for height and weight, hours of sport participation is a significant covariate for all variables. BMI significantly differs among boys by SES group. Low SES boys have higher BMIs than middle and high SES boys who do not differ. Height, weight, BMI and percentage fat are significantly influenced by age, and there are no interactions between SES and age for the four morphological variables.

Hours of sport participation is a significant covariate for all fitness items. Only one fitness test (SUP) differs significantly by SES. High SES boys perform better than low SES boys in SUP. All other comparisons are not significant. Fitness scores, except for flexibility, increase significantly with age, and SES x age interactions are not significant.

Hours of sport participation are a significant covariate for all motor coordination variables. In contrast to girls, the four tests of motor coordination and MQ KTK do not differ significantly by SES among boys. Age significantly influences all motor coordination variables, and there are no significant interactions for SES and age.

## Discussion

The present study considered differences in sport participation, morphology, fitness and motor coordination among children of low, middle and high SES. SES was significantly related to sport participation and sports club membership; both

Table 2 Morphology, Fitness and Motor Coordination [Means (SD)] by Age and SES in Girls

	6-7 year						8-9 year						10-11 year						F-value ( $\eta^2$ )		Post hoc (SES)		
	Low		Middle		High		Low		Middle		High		Low		Middle		High		SES	Age		SES*Age	
	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Low	Middle	High	Covariate (Sport participation)							
n	36	129	103	54	207	151	52	123	88														
							Morphology																
Height (cm)	125.0 (6.3)	123.1 (6.8)	123.0 (5.9)	135.1 (6.5)	134.9 (6.6)	135.5 (5.9)	145.3 (7.2)	146.9 (7.2)	145.7 (7.7)	0.385 (0.000)	0.263 (0.001)	587.048** (0.558)	1.492 (0.006)										
Weight (kg)	26.5 (4.1)	24.7 (5.0)	23.7 (3.8)	32.1 (7.4)	31.0 (6.4)	31.2 (5.9)	38.7 (8.3)	39.2 (8.7)	37.2 (6.9)	0.226 (0.000)	4.008* (0.009)	229.351** (0.330)	1.294 (0.006)	L,M >									
BMI (kg/m <sup>2</sup> )	16.9 (1.8)	16.2 (2.1)	15.6 (1.5)	17.4 (3.2)	17.0 (2.6)	16.9 (2.5)	18.2 (3.1)	18.0 (3.0)	17.4 (2.3)	0.006 (0.000)	6.188** (0.013)	23.650** (0.048)	0.832 (0.004)	L,M >									
Fat% (%)	22.7 (4.7)	20.8 (5.1)	19.1 (4.0)	22.2 (7.3)	20.9 (6.2)	20.8 (6.1)	21.4 (7.0)	21.2 (6.6)	20.1 (5.4)	1.222 (0.001)	5.804** (0.012)	0.550 (0.001)	1.074 (0.005)	L,M >									
							Fitness																
SAR (cm)	22.0 (4.8)	22.6 (4.3)	23.1 (4.8)	22.0 (6.0)	21.6 (6.0)	21.7 (6.1)	20.0 (7.5)	20.9 (6.8)	20.8 (6.4)	22.579** (0.025)	0.048 (0.000)	7.757** (0.018)	0.529 (0.002)										
SFL (cm)	82.4 (15.6)	78.4 (14.4)	75.5 (14.6)	86.9 (16.3)	82.4 (15.0)	81.2 (16.1)	93.3 (17.1)	91.2 (15.0)	89.1 (14.9)	4.453* (0.005)	5.192** (0.012)	36.413** (0.077)	0.129 (0.001)	L >									
SHR (s)	25.3 (2.4)	25.2 (2.2)	24.3 (1.8)	23.8 (2.3)	23.2 (1.8)	22.9 (1.6)	22.2 (1.9)	22.3 (1.7)	22.1 (1.3)	22.671** (0.025)	6.074** (0.014)	108.626** (0.200)	1.434 (0.007)	L,M >									
CMJ (cm)	14.7 (2.7)	14.6 (3.4)	15.8 (3.6)	17.1 (4.3)	17.8 (4.0)	17.6 (3.4)	19.0 (4.7)	19.9 (4.1)	19.7 (3.1)	15.852** (0.018)	0.982 (0.002)	67.169** (0.134)	1.098 (0.005)										
SBJ (cm)	106.8 (16.1)	106.8 (18.9)	111.9 (19.8)	121.2 (17.0)	124.6 (19.1)	127.9 (17.7)	136.4 (20.9)	137.6 (19.6)	137.1 (17.9)	27.118** (0.030)	1.478 (0.003)	110.617** (0.203)	0.598 (0.003)										

(continued)



**Table 2 (continued)**

	6-7 year				8-9 year				10-11 year				F-value ( $\eta^2$ )				Post hoc (SES)
	Low	Middle	High		Low	Middle	High		Low	Middle	High		Sport participation	SES	Age	SES*Age	
HGR (kg)	13.2 (3.6)	12.7 (3.6)	12.9 (3.4)		16.4 (2.8)	17.0 (3.2)	17.7 (3.3)		21.7 (4.3)	22.0 (4.4)	21.7 (3.9)		3.756 (0.004)	0.241 (0.001)	304.710** (0.412)	1.198 (0.005)	L > <
KPU (n/30s)	18.8 (5.3)	17.8 (6.3)	18.5 (4.5)		22.0 (6.3)	21.9 (5.6)	22.1 (5.0)		22.5 (7.8)	24.0 (6.0)	25.5 (6.3)		42.995** (0.047)	0.882 (0.002)	43.604** (0.091)	2.251 (0.010)	L > <
SUP (n/30s)	14.2 (7.2)	14.1 (7.9)	14.9 (6.8)		18.6 (6.2)	21.1 (6.7)	21.6 (6.9)		21.7 (7.7)	23.2 (6.7)	25.2 (5.9)		17.772** (0.020)	4.086* (0.009)	81.694** (0.158)	1.052 (0.005)	H
ESR (min)	2.5 (1.4)	2.5 (1.3)	3.1 (1.5)		3.4 (2.0)	3.7 (1.7)	4.2 (2.2)		4.9 (1.9)	4.8 (2.1)	5.6 (1.8)		10.512** (0.012)	10.325** (0.024)	82.988** (0.164)	0.218 (0.001)	L, M > < H
Motor coordination																	
JS (n/2x 15s)	36.2 (9.7)	37.6 (10.4)	41.6 (11.1)		53.2 (12.3)	53.0 (11.7)	56.3 (11.0)		64.2 (11.2)	64.5 (10.6)	65.6 (10.7)		35.290** (0.039)	4.699** (0.011)	271.549** (0.383)	0.610 (0.003)	L, M > < H
MS (n/2x 20s)	30.8 (6.3)	30.5 (5.4)	32.1 (5.7)		38.0 (6.0)	38.6 (6.6)	39.4 (6.0)		44.9 (6.9)	43.1 (6.5)	44.4 (6.3)		27.369** (0.030)	2.570 (0.006)	210.798** (0.325)	0.428 (0.002)	L, M > < H
WB (n)	28.5 (11.4)	29.4 (12.7)	34.1 (11.0)		37.7 (14.6)	41.8 (14.7)	43.8 (12.5)		47.8 (13.3)	48.2 (12.7)	51.4 (13.9)		32.771** (0.036)	6.341** (0.014)	90.577** (0.171)	0.262 (0.001)	L, M > < H
HH (pts)	31.3 (11.6)	33.0 (11.9)	37.5 (13.4)		45.3 (15.2)	49.8 (13.9)	51.5 (11.6)		61.1 (12.2)	60.6 (12.0)	61.2 (11.4)		20.664** (0.023)	4.018* (0.009)	215.274** (0.330)	1.122 (0.005)	L, M > < H
MQ	88.3 (13.2)	91.8 (14.7)	96.9 (14.4)		91.0 (16.3)	93.9 (16.2)	96.7 (15.3)		94.2 (16.1)	93.1 (14.5)	95.7 (13.9)		38.423** (0.042)	4.952** (0.011)	0.247 (0.001)	0.429 (0.002)	L, M > < H

L= low, M= middle and H= high SES group (\*p<.05; \*\*p<.01)

**Table 3 Morphology, Fitness and Motor Coordination [Means (SD)] by Age and SES in Boys**

	6-7 year			8-9 year			10-11 year			F-value ( $\eta^2$ )			
	Low	Middle	High	Low	Middle	High	Low	Middle	High	SES	Age	SES*Age	Post hoc (SES)
n	39	141	92	47	239	141	52	147	114				
							Morphology						
Height (cm)	124.0 (5.0)	124.7 (6.1)	125.6 (6.9)	136.0 (6.9)	135.3 (6.6)	135.9 (6.4)	144.9 (7.9)	144.8 (7.3)	146.1 (7.4)	1.309 (0.001)	1.732 (0.003)	508.829** (0.504)	0.329 (0.001)
Weight (kg)	25.3 (3.8)	25.0 (4.7)	25.4 (4.8)	32.1 (7.2)	30.5 (6.2)	31.2 (5.5)	39.3 (9.8)	37.4 (8.4)	37.2 (7.1)	2.052 (0.002)	2.016 (0.004)	221.663** (0.307)	0.568 (0.002)
BMI (kg/m <sup>2</sup> )	16.4 (1.8)	16.0 (2.1)	16.0 (2.0)	17.2 (3.0)	16.5 (2.2)	16.8 (2.1)	18.5 (3.5)	17.7 (2.9)	17.3 (2.5)	6.745* (0.007)	4.104* (0.008)	32.732** (0.061)	0.861 (0.003)
Fat% (%)	19.1 (4.1)	18.4 (4.6)	18.1 (3.8)	17.7 (6.6)	16.7 (4.9)	16.9 (4.5)	18.4 (7.4)	16.6 (6.1)	15.8 (5.8)	17.719** (0.017)	3.004 (0.006)	4.449* (0.009)	0.816 (0.003)
							Fitness						L > < M,H
SAR (cm)	20.4 (5.8)	20.2 (4.5)	19.0 (5.5)	18.8 (5.4)	17.9 (5.8)	18.1 (5.5)	17.2 (6.4)	16.3 (6.3)	16.6 (6.4)	10.775** (0.011)	1.312 (0.003)	19.009** (0.039)	0.641 (0.003)
SFL (cm)	85.3 (15.1)	86.5 (14.8)	85.8 (14.4)	90.4 (16.0)	89.4 (14.9)	87.8 (16.7)	99.3 (15.7)	96.3 (17.6)	96.1 (17.2)	9.522** (0.010)	0.412 (0.001)	33.558** (0.066)	0.429 (0.002)
SHR (s)	23.9 (1.6)	24.3 (2.1)	24.1 (1.9)	23.1 (2.1)	22.5 (1.8)	22.4 (1.8)	21.9 (2.0)	21.7 (1.7)	21.3 (1.5)	51.622** (0.052)	1.681 (0.004)	85.616** (0.153)	1.164 (0.005)
CMJ (cm)	16.4 (3.2)	15.8 (3.6)	16.2 (3.8)	19.6 (3.8)	18.6 (4.0)	18.9 (3.9)	20.5 (4.4)	21.5 (4.3)	22.0 (4.7)	19.465** (0.020)	0.483 (0.001)	79.944** (0.144)	1.762 (0.007)

(continued)

**Table 3 (continued)**

	6-7 year			8-9 year			10-11 year			F-value ( $\eta^2$ )			Post hoc (SES)	
	Low	Middle	High	Low	Middle	High	Low	Middle	High	Sport participation	SES	Age		SES*Age
SBJ (cm)	116.4 (16.3)	116.4 (19.3)	119.5 (18.8)	129.3 (18.7)	133.0 (18.3)	134.0 (18.3)	142.8 (21.8)	145.1 (21.8)	147.9 (20.2)	47.775** (0.048)	1.713 (0.004)	97.430** (0.170)	0.135 (0.001)	
HGR (kg)	13.6 (3.0)	13.9 (3.6)	14.6 (3.5)	18.5 (2.9)	18.7 (3.8)	19.0 (3.5)	22.9 (4.5)	23.0 (4.2)	23.9 (4.3)	12.522** (0.013)	2.936 (0.006)	296.423** (0.385)	0.180 (0.001)	
KPU (n/30s)	20.9 (5.8)	19.7 (5.6)	20.0 (5.6)	24.0 (6.4)	24.3 (6.1)	24.4 (5.5)	27.1 (7.3)	28.5 (7.1)	28.9 (6.5)	66.779** (0.066)	0.038 (0.000)	76.723** (0.139)	1.016 (0.004)	
SUP (n/30s)	13.2 (6.9)	14.0 (8.0)	15.4 (8.7)	19.1 (7.0)	20.6 (6.6)	20.7 (7.5)	22.4 (7.1)	23.9 (7.1)	25.1 (6.2)	19.515** (0.020)	3.419* (0.007)	85.648** (0.153)	0.331 (0.001)	L > < H
ESR (min)	3.5 (2.4)	3.7 (1.9)	4.2 (2.0)	5.0 (2.4)	5.2 (2.1)	5.2 (2.3)	6.0 (2.7)	6.1 (2.6)	6.6 (2.4)	135.033** (0.129)	1.915 (0.004)	44.125** (0.088)	0.533 (0.002)	
Motor coordination														
JS 15s (n/2x)	41.8 (9.9)	40.1 (10.9)	42.4 (10.9)	50.8 (12.5)	54.4 (12.3)	54.8 (11.9)	64.0 (12.9)	64.6 (11.7)	65.5 (11.0)	106.519** (0.102)	0.519 (0.001)	211.563** (0.310)	0.953 (0.004)	
MS 20s (n/2x)	32.0 (5.2)	31.6 (5.9)	32.6 (6.4)	36.6 (6.2)	38.5 (6.9)	38.9 (6.3)	43.6 (6.3)	42.9 (6.6)	43.8 (6.3)	39.749** (0.040)	0.880 (0.002)	157.640** (0.251)	0.723 (0.003)	
WB (n)	26.3 (14.0)	27.0 (12.8)	30.8 (12.5)	37.2 (13.9)	38.4 (13.2)	39.4 (13.8)	45.6 (12.1)	45.8 (14.4)	45.4 (14.5)	22.806** (0.024)	0.925 (0.002)	82.317** (0.149)	0.799 (0.003)	
HH (pts)	37.8 (10.1)	38.1 (12.7)	39.0 (13.0)	51.3 (14.6)	54.1 (12.1)	54.2 (13.5)	62.2 (15.7)	64.3 (13.2)	65.4 (11.9)	85.347** (0.083)	0.672 (0.001)	202.246** (0.300)	0.270 (0.001)	
MQ KTK	99.6 (12.5)	97.8 (13.7)	102.3 (13.4)	92.1 (14.7)	97.1 (14.0)	98.4 (14.0)	95.8 (17.2)	96.7 (15.9)	97.5 (15.4)	91.672** (0.089)	1.707 (0.004)	9.153** (0.019)	1.277 (0.005)	

L= low, M= middle and H= high SES group (\*p<.05; \*\*p<.01)

had higher frequencies in children from higher SES conditions. Controlling for sport participation, however, reduced or eliminated differences in morphologic dimensions, fitness and motor coordination tests among SES groups in boys, but not in girls.

As a significant main effect in both boys and girls, high SES children participated about one hour per week more in sports compared with low SES children. The influence of the SES x age interaction in girls suggested that the differences in hours of sport participation were more pronounced at younger ages (6–9 year). The observations were generally consistent with previous studies which suggested that lower SES children participated less in organized forms of extracurricular activities compared with higher SES peers (42,46). It should also be noted that many low and middle SES neighborhoods had fewer physical activity resources available compared with high SES neighborhoods (10,22). Limited physical activity resources in a community may influence active transport and unstructured physical activities. An additional confounder in evaluating SES variation in sport participation, fitness and motor coordination is nutrition, perhaps energy availability or an unhealthy diet. Unfortunately, nutritional information was not included in the current study. Other factors may be related to child and/or parental readiness and lack of basic movement skills for participation in organized sport.

Consistent with the preceding, low SES children reported lower club membership compared with high SES children in all age groups, while middle SES children reported club membership intermediate between low and high SES groups. It has been suggested that high costs of youth sports program or sport clubs were an impediment for parents from low SES households (33). In addition to registration fees, costs associated with equipment and transport, and constraints on parental time are additional factors for low SES households. Based on a survey in the mid-1990s, the average Flemish family spent \$1,809 on sport which is a substantial amount especially for people with low incomes (39). The authors concluded with a call for government funding to finance the construction and maintenance of a variety of sport facilities and to lower the price thresholds for low income families.

Observations in the current study also suggested that low and middle SES children lag behind high SES children (girls more so than boys) on several morphological indicators (as measures of health-related fitness, i.e., BMI and fat percentage). Also in girls, many fitness and motor coordination variables differed between children by SES, although results were not consistent. Among Portuguese children on the island of Madeira, high SES children had better performances in abdominal muscle strength (SUP) and speed and agility (SHR), lower SES Madeira children outperformed their higher SES peers in several tests (e.g., SBJ and HGR; 12). The contrasting observations were not apparent in the current study and might reflect differences in criteria for SES and perhaps differences in urbanization, economic prosperity and access to public transport.

Few previous studies have considered motor coordination relative to SES. Results for Flemish children were consistent with observations on German children (30). The MQ KTK varied with SES in both girls and boys and suggested that children from low SES had a higher probability of impaired motor coordination.

The potential role of sports club membership in motor coordination needs further study. It appears reasonable to assume that children who are enrolled in a

sports club are physically active on a regular basis and receive regular instruction and practice under the supervision of qualified and experienced coaches. Participants in a sports club are also more likely to be surrounded by equally interested and perhaps talented peers who likely contribute to enhanced motivation. The influence of peers in providing social support is evident in social (participation in the activity), emotional (encouragement) and instrumental (sharing equipment or means of transportation) aspects of sport participation (8). Structured sport participation is also associated with higher levels of physical activity and motor competence during childhood and adolescence and with higher probability of participation in physical activity in adulthood (24).

However, as lower SES children typically tend to engage more in street play, this group must have more access to unstructured physical activity which perhaps has a more permanent influence on motor competence. Physical activity also has weak to strong positive influences on anxiety and depression symptoms (15,25), aerobic fitness (31) and even on academic competence (35). The latter is of great interest since children from low SES generally have an unfavorable position concerning academic competence compared with peers from higher SES groups (26).

The present study considered morphologic, fitness and motor coordination variables in relation to SES, statistically controlling for sport participation in a representative sample of Flemish primary school children. Nevertheless, the study has some limitations. Its cross-sectional design precludes causal statements of potential effects of SES on growth, fitness and coordination. Information on physically active transport, unstructured physical activities and energy intake was not obtained. Although several studies have shown a significant influence of parental sport participation on the sport participation of offspring, the current study did not include an assessment of parental sport participation.

In summary, low SES was associated with reduced sport participation and sports club membership. Low and middle SES was also associated with elevated body mass, BMI and percentage fat and with generally poorer motor coordination compared with high SES in girls. Corresponding comparisons among boys were not consistent. SES differences were inconsistent among physical fitness tests, although several of the comparisons were significant. The results suggested a greater vulnerability of girls compared with boys under conditions associated with low SES. Given the potential importance of involvement in sport, the results also suggested a potentially important role for improving sport opportunities for lower SES children and girls in particular.

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