Physical activity and obesity among Year 7 children in Kent, U.K: Gender, social background, and implications for school health promotion

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Physical activity and obesity among Year 7 children in Kent, U.K: Gender, social background, reasons for being active and implications for school health promotion

【Aims】This study explored to what extent level of physical activity (PA) and obesity are associated with gender and socio-economic status (SES) among Year 7 children. Furthermore, we wanted to gain insight into the most common reasons for being physically active in these children.【Methods】678 children were recruited from five secondary schools in Kent, U.K (Boys=397, Girls=281). The mean age was 11.34. To gather information on pattern and psychosocial variables of PA, children were asked to fill in the questionnaire which was adapted from the Health Behaviour in School-Aged Children (HBSC) survey. Anthropometric measures of children's weight, height and skinfold thickness were obtained. Considering PA pattern, adiposity level and psychosocial variables, differences and correlations were explored in Gender and SES groups.【Results】This study confirmed the difference in both levels and types of PA between boys and girls. There were no significant differences in PA patterns among SES groups, apart from the membership of sports club. Significant correlation was found between PA and encouragement from both parents and friends. The difference in gender groups in importance for the following was found; building up strength, taking part in competitions and win, improving my physical skills and pleasing their family, while in SES groups; taking part in competition and win and pleasing my family. Correlations between PA and the following were found to be significant; becoming healthy, building up strength, enjoying myself and have fun, being part of a team, making new friends 【Conclusions】Gender has strong associations with PA patterns; levels and types of PA, as well as importance of reasons for PA. This gender difference should be considered in the school settings. Encouragement from parents and friends is also a good facilitator. Especially, friends are important. Becoming healthy, enjoying themselves and having fun and improving physical skills were found to be important for children. These aspects should be generated when it comes to promotion of PA among school children.

Keywords: physical activity, obesity, children, gender, socioeconomic status (SES)

1: Background (Word counts 3962)

Obesity among children is an increasing cause for public concern all over the world. Importantly in the UK, according to the National Child Measurement Programme (2016), over a third of children in Year 6 were overweight or obese. In addition, obesity prevalence for children living in the most deprived areas in reception and Year 6 was more than double that of those living in the least deprived areas. Physical activity (PA) has been identified as an important determinant of weight control and obesity in childhood (Prentice-Dunn and Prentice-Dunn, 2012; Ciesla, 2014). PA promotion is a public health priority (World Health Organization Regional Office for Europe, 2013). In addition to childhood obesity, physical inactivity has been linked to low socioeconomic status (SES). Several research articles and surveys have reported that socio-economic inequality could be associated with physical inactivity in childhood and that significant differences between boys and girls are apparent (Geckova, van Dijk, Groothoff et al, 2002). Therefore, these issues deserve to be considered in relation to health promotion. Specifically, the whole school approach to this issue would be a vital part of good promotion to encourage children to be physically active but the approach would need to be targeted in culturally relevant ways at specific populations. From the aspect of health promotion, it is fundamental to clarify what children's motivations are, for participating in PA. Importantly, around the age of 10-11 years, the problem of obesity is known to increase (World Health Organization, 2008; Department of Education: Evidence on Physical Education and Sport in Schools, 2013). Therefore, this study aimed to explore the association between socio-cultural factors, PA and adiposity levels as well as identifying effective ways to promote PA through schools, in relation to gender and SES.

2: Methods

A cross-sectional study was carried out, in which comparisons were made between boys and girls in Year 7, who were attending 5 secondary schools in East Kent, U.K., by drawing children from schools in socially contrasting areas. Two principal research methods were used to provide quantitative data:

(1) Questionnaires, which were completed by children, to gather information on patterns of PA and psychosocial variables (reasons for participating in PA outside of school).

(2) Anthropometric measures of childrens' weight, height and skinfold thicknesses.

Relationships were explored between levels of both PA and adiposity and the following factors; PA patterns, SES ('advantaged' or 'disadvantaged') and psychosocial variables (encouragement from parents and friends, and importance of the reasons for participating in PA).

(i) Sample.

A total of 678 children were recruited (Boys=397, Girls =281). The mean age of the sample was 11.3. The averages of height are 150.1 cm for boys, 150 cm for girls and 150 for entire group. Also, the averages of weight are 42.1 kg among boys, 42.1 kg among girls and 42.2 kg in total group. BMI of the majority of children was from 15 to 19, as can be seen in Table 1 (18.7±.16). Children from what might be called 'working class' amounted to 429, while the number of children from what might be called 'middle class' families was 249 (Table 2).

(ii) Physical activity pattern information.

Children were asked to fill in the questionnaire to report their PA patterns;

(Q1) How often children usually engage in vigorous PA outside of school?: Scores were given to each answer as below: Every day-(7), 4 to 6 times a week-(6), 2 to 3 times a week-(5), Once a week-(4), Once a month-(3), Less than once a month-(2) and Never-(1).

(Q2) Sedentary behaviour; watching TV; (Q3) Sedentary behaviour: playing computer game: Scores were given to each answer as below: None-(1), less than half an hour a Day-(2), half an hour to 1 hour-(3), 3 hours-(4), 4 hours-(5) and more than 4 hours-(6).

(Q4) Type of PA children usually take part in: Free descriptive answer.

(Q5) The membership of sport club: Free descriptive answer

The questionnaire was adapted from the Health Behaviour in School-Aged Children (HBSC) survey (Currie, 2000). In fact, in relation to PA patterns, 3 more questions were asked: The level of PA children engaged in, on the previous day; The number of hours each child engaged in PA (which made them 'out of breath and sweat') on the previous day; The number of hours each child usually engaged in PA (which made them 'out of breath and sweat'). As a result, there were significant correlations among all the answers exploring physical activity patterns (All: $p<0.01$) in all of the groups. Therefore, only the question related to hours of vigorous physical activity was selected to investigate further.

(iii) Psychosocial variables for physical activity.

Two questions were used to investigate psychosocial environment; (1) encouragement from parents (Q6), and (2) friends (Q7). In addition, perceived importance of reasons for children to be physically active is included as followed; to become healthy, to build up muscle strength, to lose or maintain weight, to enjoy myself and have fun, to be part

of a team, to make new friends, to take part in competitions and win, to help me feel good about myself, to feel more confident, to improve my physical skills, to help reduce stress, to please my family and to impress other people. Scores were given to each answer as below: none at all-(1), not very much-(2), some-(3), quite a lot-(4) and a great deal-(5).

(iv) Anthropometric Information.

The height, weight and total skin folds of the participants were measured. To measure height, a stadiometer (Leicester Height Measure) was used, and to measure weight, the Seca Model: 761 was used. As a tool to define overweight or obesity, BMI was used. The measurements of biceps, triceps, subscapular and suprailiac in mm were recorded. Total skinfold were calculated as the sum of these measurements.

(v) Socio-economic Information

Social inequalities in health are traditionally measured by examining differences in SES as defined by individuals' (or, in the case of young people, their parents') position in the labour market, education status or income. Gender, ethnicity, age, place of residence and disability are also important dimensions of social difference: these have been under-researched in relation to young peoples' health outcomes (Currie, 2000).

In this study, the category of East Kent Healthy School Scheme in the part of National Healthy School Standard was used. In Kent (U.K.), all of the schools are graded according to indices of social disadvantage and placed into four bands (1-4). The frequency of the provision of free school meals in each school is one of the main indicators of this categorisation. Three schools were from advantaged groups (rated 3 or 4; middle class), the other two schools were from more disadvantaged groups (1, 2; working class). In this study, these groups

were called the 'advantaged group' and the 'disadvantaged group' respectively. To assist the selection of schools, the regional coordinator in East Kent for the National Healthy School Standard was involved in the selection process.

(vi) Analysis.

The following approach to analysis was adopted:

(1) Frequencies and differences in PA patterns, adiposity levels and psychosocial variables in the whole group, boys and girls were analysed. These patterns were further analysed according to SES group. A two-way analysis of variance was employed;

(2) The correlation between PA and psychosocial variables was explored separately according to whole-group, gender and further according to SES group. Pearson correlation was undertaken.

In addition, this study suggested the model of the associations between levels of PA and levels of childhood obesity using variables such as PA pattern, psychosocial variables.

(vii)Ethical issues.

Ethical approval was obtained via the Canterbury Christ Church University Research Ethics Committee. In addition, the survey was carried out according to a research proposal which was approved. Consent forms were obtained from parents. Also, it was emphasized that children could decline to take part in the research, even if parents returned the consent forms to the researcher, giving permission for their children to take part. There were also explanations that all data were coded, in order to maintain confidentiality. While the measurements of stature, body mass and skinfold thickness were being undertaken, each child was separated from the other children who were

waiting for their turn. For feedback to the school, only brief summaries were provided of general trends. No individual data was provided, even though there were strong requests from some schools to provide more specific information.

3: Results

(ⅰ): Gender

In terms of the type and frequency of PA, a gender difference was found to be significant. More boys were physically active than girls ($F=15.9$, $p<0.01$) (Table 3) (Q1). The interaction between gender and SES was not significant. With respect to playing on computers (Q3) (Table 4), there was also a significant difference between boys and girls ($F=142.8$, $p<0.01$), but again, the interaction between gender and SES was not significant. Nearly three quarters of young children stated that they played computer games for up to 3 hours in an average week. 34.4% of girls spent less than 1 hour playing computer games. Specifically, as many as 15.6 % of boys reported that they played computer games for more than 10 hours per week, while only 3.3% of girls did so.

In terms of the type of PA that children preferred (Table 5), there was also a difference between gender groups. Three times the number of boys engaged in football, compared to girls, while nearly twice the number of girls engaged in walking or dancing, compared to boys. Regarding the membership of sports clubs (Table 6), more boys engaged in cricket (Boy=29.7%, Girls=14.3%), golf (Boys=39.4%, Girls=15.2%), football (Boys=59.7% Girls=33.2%) and hockey (Boys=21.5%, girls=11.9%). Football turned out to be the most popular sports club activity among boys, as about 60% of boys reported they played football at a football club, outside of school. On the other hand, a

larger number of girls joined dance lessons (Boys=11.8%, Girls=57.4%) and gymnastics teams (Boys=39.4%, Girls=35.3%) outside of school. When it came to total skinfold thicknesses, a gender difference was found to be significant: F=6.9, p=0.01 (Table 7), with more girls being classed as obese than boys and the interaction between gender and SES were also significant (F=8.9, p=0.01), with girls in the disadvantaged group having the highest levels of obesity.

Regarding psychosocial variables for physical activity, in relation to the question about 'encouragement from friends' (F=6.8, p<0.01), there were more boys who reported that this was an important reason for participating in physical activity outside of school (Table 8). The interaction between gender and SES was not significant. In terms of the reasons for being physically active, more boys reported that; building up muscle strength (F=31.7, p<0.01), taking part in competitions and winning (F=16.5, p<0.01), improving physical skills (F=7.3, p=0.01) and pleasing their family (F=12.9, p<0.01) were important. The interaction between gender and SES was not significant.

(ⅱ): Socio-economic status (SES)

There were significant differences in physical activity patterns according to the SES categorization of the school. More children who attended schools rated as advantaged, played computer games. Also, there was a significant difference in membership of sports clubs, with a much higher proportion of children from the schools categorised as advantaged, engaging in sports club activity. In relation to obesity, children from schools categorized as disadvantaged had higher BMI levels (F=6.4, p=0.01), especially among girls in the disadvantaged group (Table 7). The interaction between gender and SES was significant (F=6.0, p=0.01). When it came to psychosocial variables (Table 8),

regarding reasons for losing or maintaining weight ($F=8.1$, $p<0.01$), taking part in competitions and winning ($F=8.4$, $p<0.01$) and pleasing their family ($F=12.1$, $p<0.01$) were reported more in children from the disadvantaged schools. The interactions between gender and SES were not significant. As for 'being part of a team' ($F=3.7$, $p=0.05$), the interaction between gender and SES was found to be significant, with less boys who attended schools classed as disadvantaged.

(ⅲ): Psychosocial variables (reasons for participating in) and Physical Activity

(ⅰ) Encouragement from parents and friends

In all of the groups, except boys in the disadvantaged group and girls in the advantaged group, there were significant correlations between encouragement from parents and level of physical activity ($r=0.2$-0.3, $p<0.01$) (Table 9). Regarding 'encouragement from friends', it was perceived by 32.8% of children that they received some encouragement from friends. There were significant correlations found in total group reporting of this and level of physical activity ($r=0.2$, $p<0.01$), especially among boys attending schools that were classed as being in the advantaged group ($r=0.2$, $p=0.01$) (Table 9).

(ⅱ)Importance of reasons for children to be physically active

In terms of 'becoming healthy', as a reason for participating in physical activity, there were correlations in the pooled group (boys and girls together: $r=0.1$, $p<0.01$) and for boys only ($r=0.2$, $p<0.01$). This was especially evident among boys attending schools in the disadvantaged group ($r=0.2$, $p=0.01$). As for 'building up muscle strength', as a reason for participating in physical activity, correlations were found to be significant among boys ($r=0.2$, $p<0.05$) and girls ($r=0.2$, $p<0.05$) but only in the schools classed as

being in the disadvantaged group (r=0.1, p<0.01). With respect to 'enjoying myself and having fun', there were correlations in the pooled group (r=0.1, p<0.01) and in the boys only group (r=0.2, p<0.01), especially among boys in the disadvantaged group (r=0.2, p=0.01). Considering 'being part of a team', correlations were found to be significant (r=0.1-0.2, p=<0.01-0.02) in all of the groups, except among girls in the advantaged group. As for 'making new friends', there were significant correlations found in the pooled total group (r=0.1, p<0.05) and boys in the advantaged group (r=0.2, p<0.05) (Table 9).

4: Discussion

（ｉ）: Implications of Findings related to Physical Activity Patterns

This study has shown that both levels and types of PA are significantly different between boys and girls. It can be concluded that further consideration of gender difference is needed when it comes to the promotion of PA among school children. Adolescents are taught sport at school, but many give up the sports activities they pursued in childhood, when they reach puberty (World Health Organization Europe, 1999). Therefore, this study aimed to investigate to what extent levels of PA and adiposity are associated with gender and SES among Year 7 children in a small number of schools in Kent, U.K. It has highlighted how health promotion, in school, might be targeted at specific genders and SES groups in order to encourage children to be physically active. Withdrawal from sports activities was particularly marked in 10-11 year old girls. It was shown that there was a decline in girls' reported participation in PA at this age range and when this is added to previous reports that have shown that girls' participation also declines during secondary school (Gorely, Sandford,

Duncombe, et al. 2011), it perhaps highlights the need for early intervention that can make the most of the reasons why girls participate in physical activity outside school.

It also shows that the decline in participation is influenced by multiple factors that slowly change over time. The factors influencing girls' participation in sport include: social influences such as that of family and friends; environmental factors including the importance of various spaces and places; young people's sense of identity; and the role of competition and fun (Gorely, Sandford, Duncombe, et al. 2011). Gender roles and expectations may have an important influence on participation in sports and exercise. This study confirmed the difference in types of physical activity preferred between boys and girls. It could be said that girls may prefer exercised based activity to sport based activity (Table 5). It is reported by Coakley and White, (1992) that girls in their study were less keen to define themselves as sportswomen, even when they were physically active. It was also reported that girls also viewed sports participation in a restrictive manner as a school activity rather than for their own recreational purposes. Therefore, it is necessary to understand girls' needs and to meet their needs effectively in secondary school practice. Further research is needed to understand this major demographic influence on PA.

In this study, there were no significant differences in PA patterns among SES groups, except the frequency of membership of sports clubs. This could be due to lack of sample size, accurate information on PA patterns and it could also be due to potential limitation of the SES categorisation method adopted by the Kent Healthy School Scheme. The indicator for SES is extremely crucial in self-completed questionnaires, for school children. However, the other commonly-used indicators of parental

education and income would be as difficult and insensitive as occupation, in gaining insight into SES (Currie, Elton, Todd et al, 1997). On the other hand, it has been shown (Sport England, 2003) that pupils living in the top 20% of deprived areas in England are less likely to have taken part in extra-curricular sport (37% compared to 44% of young people who did not live in the top 20 deprived areas). It is also reported (Roberts, 2001) that, in monetary terms, it remains the case that "economic inequalities lead inexorably to inequalities in leisure" and the middle-classes, young and old can afford more money to do the sports and physical activities such as attending health and fitness gyms and joining sports clubs (all of which cost money). This indicated the necessity to investigate SES difference in PA patterns, by use of an alternative indicator of SES in the current study.

This research suggested differences in patterns of membership of sports clubs between children attending schools categorized as disadvantaged and the advantaged, although only frequency was shown. Moreover, children in the advantaged group were spending more time playing on computers, compared with children in the disadvantaged group. Similarly, the PE and Sport Survey (Quick, Simon and Thompton, 2010) found that: schools where a high percentage of pupils took part in three or more hours of PE and out-of-hours school sport were more likely to be categorised as having low numbers of pupils on free school meals (FSM). However, schools in deprived areas were over-represented amongst the lowest performing schools, in terms of their participation in PE and out-of-hours school sport. It could be necessary to consider this difference when PA is promoted among secondary school children. Financial support or alternative solutions such as the development of public gyms may be necessary for children in

deprived areas, so that they too have an opportunity to join sports clubs, regardless of their financial ability.

(ii): Implications of Findings Related to Psychosocial Factors (reasons for participating in physical activity).

This study indicated that parents' and friends' encouragement is an important determinant for participation in PA by 11 year old children. Therefore, encouragement from parents and friends should perhaps be exploited in promoting PA among 11 year old school children. According to Welk (1999), parental encouragement refers to obvious verbal or non-verbal forms of encouragement for a child to be active. In the present study it is important to note that fewer girls received encouragement from friends. This could be due to lack of interest in PA among girls. Therefore, the implication for health promotion among Year 7 girls is that motivating them to participate in physical activity should involve encouragement from their friends.

Correlations between parental encouragement and PA were also investigated. Results showed that there were significant correlations in all the groups (pooled total, boys only and girls only), apart from boys in the disadvantaged group and girls in the advantaged group. Correlations between activity levels and other reasons for being active, the PASS 2003/04 pupil survey (Inchley and Currie, 2004) also found that parental support for being active was significantly associated with moderate and vigorous activity levels. Pupils with high levels of support, especially from their father, were more likely to meet the current recommendations for moderate PA, perform vigorous PA four or more times a week or do two or more hours of vigorous PA a week. The effect of parental support

on children may be affected by parent and child genders, child age, location of parent's PA and whether the family participates in activities together (Taylor and Sallis, 1997).

Inchley and Currie (2004) argued that pupils were more likely to receive encouragement to be active from their parents than their friends, but were most likely to do PA with their friends. It can be concluded that encouragement from both parents and friends is very important so that children can be motivated to be physically active. Regarding the importance of becoming healthy, building up muscle strength and being part of a team (only among boys), correlations with PA patterns were found in the present study. These findings, in relation to potential health benefits of PA, perhaps should form an integral part of health promotion messages, whenever possible. The aspects of building up muscle, in relation to PA, perhaps ought to be introduced, especially for boys. The idea of being part of a team should be taught, or children should be supported to be part of a team, regardless of sex or SES.

(iii): Implications of Findings related to Adiposity Levels

When it came to total skinfold thickness, a gender difference was identified. In addition, a significant difference emerged in line with BMI between SES groups. The data regarding associations between genders and adiposity levels is in contrast with previous studies, which found no significant gender difference in the prevalence of obesity. In particular, it is shown (National Centre for Social Research: Obesity among Children, 2005) that the prevalence of overweight and obesity among boys and girls were extremely similar, with both sexes showing gradual increases in both categories. In fact, in this study, there is a large difference in terms of the number of the sample between boys and girls. Also, this could be due to a biological difference between boys and girls.

However, this study might indicate that there is a need to consider the limitations of the measurement of BMI, as the measurement of total skinfold thickness identified a significant difference in adiposity levels between gender groups in this study.

There seems to be no standard data to show the norms of total skinfold thickness of English children, although the data is available from other countries such as the USA (U.S. Department of Health, Education and Welfare, 1972). This indicates a crucial difficulty in using skinfold thickness to measure adiposity levels from a large number of children. This highlights the need for standard data on skinfold thicknesses of children in the UK. It would be useful to have normative data for UK children. It is indicated that socio-economic status influences obesity in several ways (National Centre for Social Research, 2005). It has been shown that obesity prevalence among children aged 2 to 10 varies according to region and area (U.S. Department of Health, Education and Welfare, 1972). Children living in households with the lowest levels of household income had higher rates of obesity than children from households with the highest levels of income (15.8% compared with 13.3%). In relation to different socio-economic groups (analyzed using the National Statistics Social-Economic Classification - a classification similar to social class), 17.1% of children within semi-routine households were obese compared with 12.4% of those from managerial and professional households. Therefore, there is a need to consider this significant difference in adiposity levels between SES groups. Additionally, this study could not find any significant correlations between adiposity levels and PA levels. Further improvement of the measurement for PA is required in future studies.

(ⅳ): The model of the associations with physical activity and adiposity

The proposed revised models of the associations between PA patterns and adiposity levels are displayed in Figure 1. As can be seen, in this study, the following factors were strongly associated with PA levels: gender, encouragement from parents and friends, perceived importance of reasons to be active; being healthy, building up muscle, being part of a team. The most common reasons were; being healthy, enjoyment and improving physical skills. In terms of adiposity levels, there are no strong correlations between PA levels and adiposity levels. However, when this was measured by total skinfold thickness, it was associated with gender, while when it was measured by BMI, it was associated with SES (as rated by Kent Healthy School Scheme). As discussed earlier, previous studies have also shown an association between PA, adiposity and social factors; gender and SES (Health care and Social care Information centre, 2015)

（ⅴ）: Limitations

Firstly, questionnaires were used to measure children's PA, which relied on childrens' recall. Indeed, measurement error is a particular problem when measuring children (Trost, Ward, Moorehead et al, 1998). This is probably because their attention span is very short and accurate recall is less reliable. Therefore, it is normally recommended that, for children up to 11 years of age, self-report methods are not used, mainly due to children's cognitive limitations (Kohl, Fulton and Caspersen, 2000). Furthermore, no attempt was made to validate the questions by comparison with objective measures of activity and fitness, such as heart rate monitoring, use of motion sensors or physiological analysis. Secondly, it was very difficult to recruit an appropriate number of schools and children, especially schools in a lower socio economic areas. The reasons why it was so difficult might be because the schoolteachers were very busy with

their schoolwork. Also, even though the PE teachers understood the value of this survey, the head of school often thought it meaningless to join this survey. Moreover, there was anecdotal evidence that that this survey might offend the vulnerable pupils such as those who were overweight or obese. In addition, only the school scheme was used to categorise SES. In fact, it was requested by one school that the important question considering parental occupation, indicating their SES, was removed. This was because that particular school had a large number of children with a single parent. This is why this important indicator could not be used for analysis in this study. Even though the postcode was considered as another indicator, this question had to be removed as teachers thought it is too personal. Furthermore, this study only explored physical activity, when it is known that the possible causes of obesity may include diet, environmental and genetic factors and so on..

Note; The article was revised from the study which is submitted to the University of Kent at Canterbury for the Master of Philosophy.

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Table 1: Percentages of BMI in gender groups among total, disadvantaged advantaged group (%)

	Disadvantaged			Advantaged		
BMI	Total	Boys	Girls	Total	Boys	Girls
-15	0.9	0.9	1.0	2.5	2.4	2.7
15-19	63.7	75.2	51.5	74.8	74.1	75.7
20-25	26.4	17.4	35.9	18.9	20.0	17.6
25-	9.0	6.4	11.7	3.8	3.5	4.1
N	212	109	103	159	85	74

N: Number

Table 2: Number of participants in total/gender group

	Rank in NHSS Scheme	Boys	Girls	Missing Data
School A	1	21	23	None
School B	3	107	95	None
School C	4	47	0	None
School D	2	44	25	Total skinfold thickness
School E	2	178	138	None
Total	-	397	281	-

NHSS: National Healthy School Standard

Table 3: The Frequency of answers and results of two way ANOVA: Physical activity (Q1)

		Disadvantaged			Advantaged			Two way ANOVA
		Total	Boy	Girl	Total	Boy	Girl	
Q1 PA	Every day	29.1	34.7	22.9	34.2	43.2	18.2	Gender F-=15.9 p<0.01
	4 to 6 times P/W	19.2	16.5	22.3	23.9	23.2	25	
	2 to 3 times P/W	34.5	35.2	33.8	23	18.1	31.8	
	Once P/W	10.2	6.8	14	11.5	11.6	11.4	
	Once P/M	1.8	2.3	1.3	3.3	1.3	6.8	
	Less than once P/M	1.2	1.7	0.6	3.3	1.9	5.7	
	Never	3.9	2.8	5.1	0.8	0.6	1.1	
	N	333	176	157	243	155	88	

N: Number

Table 4. The Frequency of answers and results of two way ANOVA: Sedentary behaviour; TV (Q2) Computer (Q3) (%)

		Disadvantaged			Advantaged			Two way ANOVA
		Total	Boy	Girl	Total	Boy	Girl	
Q2 TV	None	0	0	0	5.4	6.5	3.4	NS
	Less than half an hour a day	13.3	15.1	11.5	8.3	7.2	10.1	
	Half an hour to 1 hour	5.6	7.2	3.8	46.3	43.1	51.7	
	2 to 3 hours	36.5	31.3	42	34.3	35.3	32.6	
	4 hours	37.2	38	36.3	4.1	5.2	2.2	
	More than 4 hours	7.4	8.4	6.4	1.7	2.6	0	
	N	323	166	157	242	153	89	
Q3 Computer	10 hours or more	10.6	17.5	3.2	9.9	9.9	13.7	Gender
	7-9 hours	4	6.6	1.3	10.3	10.3	15.7	F-142.8
	4-6 hours	9	13.3	4.5	21.9	21.9	28.1	p<0.01
	1-3 hours	33	42.2	23.2	30.2	30.2	29.4	
	Less than 1 hour a week	23.7	12	36.1	18.6	18.6	11.1	SES
	Not at all	19.6	8.4	31.6	9.1	9.1	2	F=9.0 p<0.01
	N	321	166	155	242	100	153	

N: Number

Table 5. The reported frequencies of various type of physical activity: Gender/SES

Boys		Girls		Disadvantaged		Advantaged	
Football	30.2	Running	32.2	Running	28.1	Running	22.9
Running	21	Walking	29.8	Walking	20.8	Walking	22.3
Walking	13.5	Football	9.7	Football	17.8	Football	17.8
Biking	5	Dancing	8	Dancing	7.3	Dancing	4.5
Cricket	3.8	Tennis	3.2	Biking	5.2	Swimming	3.9
Swimming	3.4	Swimming	3	Tennis	2.6	Biking	3.6
Cycling	3.4	Bikng	3	Swimming	2.6	Cricket	3.3
Tennis	2.8	Horse riding	3	Hockey	2.6	Tennis	3.3
Hockey	2.6	Jogging	2.7	Fitness, gym	1.9	Cycling	3
Rugby	2	Basketball	1.8	Cycling	1.9	Rugby	2.1
Basketball	1.8	Cycling	1.2	Jogging	1.9	Jogging	2.1
Jogging	1.4	Boxing	0.6	Horse riding	1.6	Skateboarding	1.8
Boxing	1.2	Ballet	0.6	Basketball	1.6	Horse riding	1.5
Skateboarding	1.2	Skateboarding	0.6	Cricket	1.2	Basketball	1.5
Press-ups	1.2	Cricket	0.3	Boxing	0.9	Badminton	1.2
Fitness, gym	1	Martial arts	0.3	Karate	0.7	Karate	0.9
Karate	1	Karate	0.3	Press-ups	0.5	Boxing	0.9
Badminton	0.8	Table tennis	0	Rugby	0.2	Fitness, gym	0.9
Golf	0.8	Hockey	0	Skateboarding	0.2	Hockey	0.6
Dancing	0.6	Rugby	0	Golf	0.2	Golf	0.6
Horse riding	0.4	Badminton	0	Martial arts	0.2	Press-ups	0.3
Martial arts	0.4	Fitness, gym	0	Badminton	0	Table tennis	0.3
Table tennis	0.2	Press-ups	0	Ballet	0	Martial arts	0.3
Ballet	0	Golf	0	Table tennis	0	Ballet	0.3

Table 6. Percentages of the membership of sports clubs out of school hours: Gender/SES (Q5) (%)

	Total		Boys		Girls		Disadvantaged		Advantaged	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Athletics competition	30.5	67.9	32.7	64.9	27.5	72.1	29.1	69.6	32.8	67.2
Cricket team	23.2	75.4	29.7	68.2	14.3	85.3	24.7	75.3	30.9	69.1
Basketball team	15	83.8	19.2	79	9.4	90.2	15.8	82.4	14	86
Dance lesson	31.2	67.6	11.8	86.4	57.4	42.2	22	49.3	32.4	67.6
Golf	29.1	69.7	39.4	58.8	15.2	84.4	18.1	53.3	34.8	65.2
Gymnastics teams	21.3	77.5	10.9	87.2	35.3	64.3	21.5	76.7	21	79
Fitness classes	12.7	85.7	13.6	83.9	11.5	88.1	12.4	85.5	86.5	13.1
Football team	48.4	50.2	59.7	38.2	33.2	66.4	43.9	53.9	54.5	45.5
Hockey team	17.4	81.2	21.5	76.4	11.9	87.7	18.8	79.1	15.6	84.4
Martial arts classes	24.6	74.2	29.7	68.5	17.6	82	19.4	78.8	32	68
Outdoor activities	70.7	27.9	67	30.9	75.8	23.8	64.2	33.6	79.9	20.1
Swimming competition	41.6	57	38.2	59.7	46.3	53.3	34.5	63.3	51.6	48.4
Tennis matches	26	72.8	32.5	65.7	17.2	82.4	20.6	77.6	33.3	66.7
Other	37.2	61.2	29.3	68.4	49.4	50	32.8	65.2	46.8	53.2

NA: No answer

N: Number

Table 7. Mean of adiposity levels and results of two-way ANOVA, Pearson's correlation with PA (Q1)

		Total			Disadvantaged			Advantaged			Two-way ANOVA	Correlations
		Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls		
TOTALSKI (mm)	Mean	49.8	47.2	53.1	50.8	44.0	57.6	48.9	49.2	48.4	Gender F=6.9, p=0.01 Interaction F=8.9, p=0.01	Boys total r=-0.2, p<0.05; advantaged r=-0.2, p<0.03
	SD	24.5	24.9	24.0	27.8	25.9	28.2	21.8	24.1	17.6		
N		416	235	181	185	92	93	231	143	88		
BMI	Mean	18.7	18.5	19.0	19.1	18.5	19.7	18.3	18.5	18.1	SES F=6.4, P=0.01 Interaction F=6.0, p=0,01	NS
	SD	3.4	3.2	3.6	3.7	3.6	3.9	2.8	2.6	3.0		
N		458	214	244	259	124	135	198	109	89		

NS: Not significant

SD: Standard deviation

Table 8. The Frequencies and Results of Two-way ANOVA: Psychosocial variables for Physical activity (%)

		Disadvantaged			Advantaged			ANOVA
		Total	Boys	Girls	Total	Boys	Girls	
Parental encouragement	A great deal	37.8	38.2	37.4	37.8	42.8	29.2	NS
	Quite a lot	26.3	24.2	28.4	29.5	25	37.1	
	Some	22.2	26.7	17.4	23.2	22.4	24.7	
	Not very much	9.7	7.3	12.3	5.4	5.3	5.6	
	None at all	4.2	3.6	4.5	4.1	4.6	3.4	
	N	320	165	155	241	152	89	
Friend's encouragement	A great deal	20	27.3	12	12.4	14.4	9	Gender F=6.8 p<0.01
	Quite a lot	19.7	19.4	20	22.7	22.2	23.6	
	Some	31.7	27.9	36	33.9	33.3	34.8	
	Not very much	16.8	14.5	19.3	19.8	20.9	18	
	None at all	11.7	10.9	12.7	11.2	9.2	14.6	
	N	315	165	150	242	153	89	
Becoming healthy	Very	78.6	80.5	76.5	83.3	84.8	80.7	NS
	Fairly	19.6	16.6	22.9	15.9	13.9	19.3	
	Not	1.9	3	0.7	0.8	1.3	0	
	N	322	169	153	239	151	88	
Building up muscle strength	Very	54.8	65.7	42.8	49.4	58.9	33.0	Gender F=31.7 p＜0.01
	Fairly	38.3	30.2	47.4	45.2	37.1	59.1	
	Not	6.9	4.1	9.9	5.4	4.0	8.0	
	N	321	169	152	239	151	88	
Losing or maintaining weight	Very	52.8	52.7	52.9	37	38	35.2	SES F=8.1 p<0.01
	Fairly	34.8	35.5	34	50.4	51.3	48.9	
	Not	12.4	11.8	13.1	12.6	10.7	15.9	
	N	322	169	153	238	150	88	

Enjoying myself and having fun	Very	79.1	83.8	73.9	81.9	78.7	87.4	NS
	Fairly	19.1	15	23.5	16.5	20	10.3	
	Not	1.9	1.2	2.6	1.7	1.3	2.3	
	N	320	167	153	237	150	87	
Being part of a team	Very	10.6	7.1	14.5	44.1	44.4	43.7	SES F=3.7 p=0.05
	Fairly	35.9	32.1	40.1	42.4	41.7	43.7	
	Not	53.4	60.7	45.4	13.4	13.9	12.6	
	N	320	168	152	238	151	87	
Making new friends	Very	57.7	60.1	55	58.6	57	61.4	NS
	Fairly	35.4	35.7	35.1	32.6	33.8	30.7	
	Not	6.9	4.2	9.9	8.8	9.3	8	
	N	319	168	151	239	151	88	
Taking part in competitions and win	Very	38.6	46.4	30.1	29.8	35.1	20.7	Gender F=16.5,<0.01 SES F=8.4, p<0.01
	Fairly	43.6	42.9	44.4	45	41.7	50.6	
	Not	17.8	10.7	25.5	25.2	23.2	28.7	
	N	321	168	153	238	151	87	
Helping me feel good about myself	Very	63.9	62.7	65.1	61.5	57.6	68.2	NS
	Fairly	28.3	31.4	25	30.1	33.8	23.9	
	Not	7.8	5.9	9.9	8.4	8.6	8.0	
	N	321	169	152	239	151	88	
Feeling more confident	Very	68.2	77.4	58.2	73.2	74.8	70.5	NS
	Fairly	27.1	19	35.9	24.3	22.5	27.3	
	Not	4.7	3.6	5.9	2.5	2.6	2.3	
	N	321	168	153	239	151	88	
Improving my physical skills	Very	69.5	74.4	64.1	67.8	64.9	72.7	Gender F=7.3 P=0.01
	Fairly	24	18.5	30.1	24.7	26.5	21.6	
	Not	6.5	7.1	5.9	7.5	8.6	5.7	
	N	321	168	153	239	151	88	
Helping reduce	Very	39.6	41.7	37.3	33.2	36.4	27.6	NS

stress	Fairly	34.9	31.5	38.6	39.9	33.8	50.6	
	Not	25.5	26.8	24.2	26.9	29.8	21.8	
	N	321	168	153	238	151	87	
Pleasing my family	Very	46.9	53.3	39.9	34.3	38.4	27.3	Gender F=12.9 p<0.01 SES F=12.1 p<0.01
	Fairly	26.9	24	30.1	30.5	33.8	25	
	Not	26.3	22.8	30.1	35.1	27.8	47.7	
	N	320	167	153	239	151	88	
Impressing other people	Very	29.3	36.9	20.9	20.2	23.3	14.8	NS
	Fairly	29.3	28.6	30.1	34.9	39.3	27.3	
	Not	41.4	34.5	49	45	37.3	58	
	N	321	168	153	238	150	88	

N: Number

NS: Not significant

Table 9. Pearson correlations between physical activity (Q1) and Psychosocial variables for PA

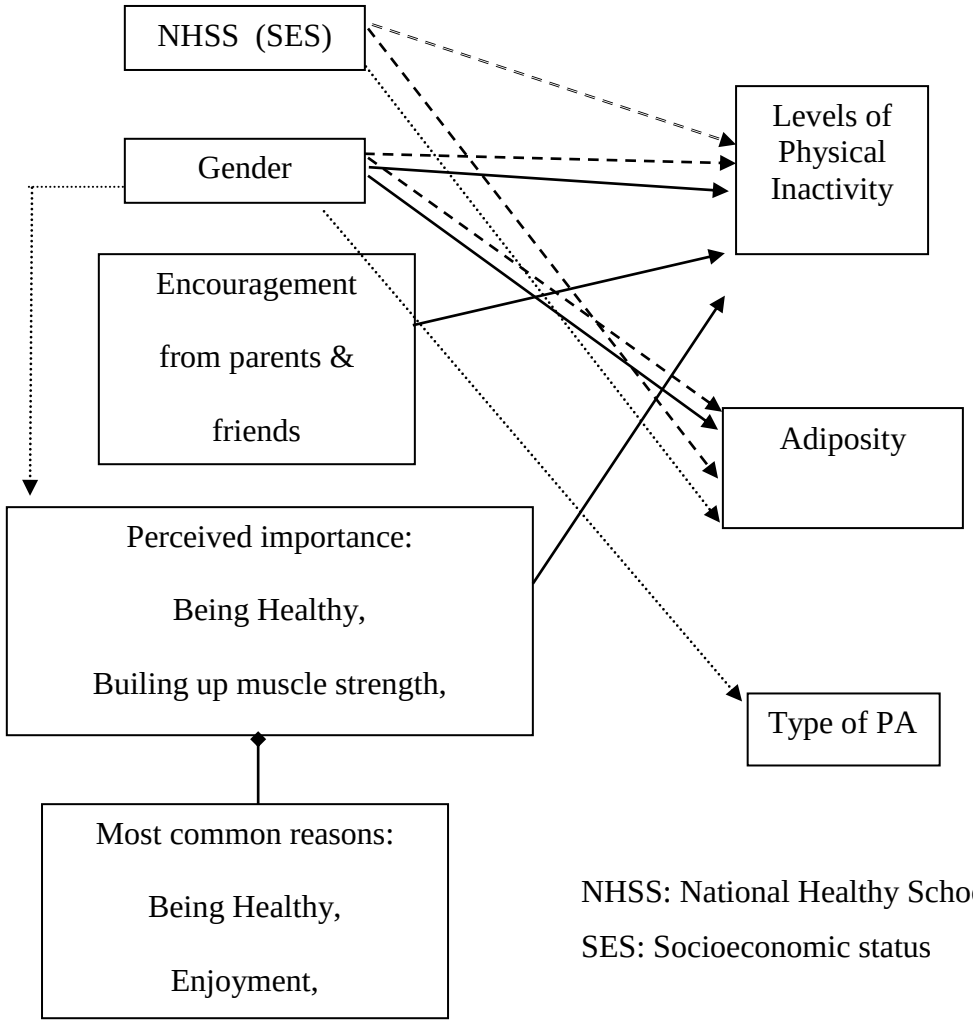
		Disadvantaged			Advantaged		
		Total	Boys	Girls	Total	Boys	Girls
Parental Encouragement	r	0.2**	NS	0.3**	0.2**	0.3**	NS
	N	306	158	148	239	152	87
Friend's Encouragement	r	NS	NS	NS	0.2**	0.2**	NS
	N	306	158	148	239	152	87
Becoming healthy	r	0.1*	0.2*	NS	NS	NS	NS
	N	312	161	154	238	151	87
Building up muscle strength	r	0.2**	0.2*	0.2*	NS	NS	NS
	N	311	161	150	237	151	86
Losing or maintaining weight	r	NS	NS	NS	NS	NS	NS
	N	311	161	150	256	150	86
Enjoying myself and having fun	r	NS	NS	NS	NS	0.2*	NS
	N	310	159	151	235	150	85
Being part of a team	r	0.2**	0.2*	0.2*	0.14*	0.2*	NS
	N	310	160	150	236	151	85
Making new friends	r	NS	NS	NS	0.1	0.2	NS
	N	310	160	150	237	151	86
Taking part in and win	r	0.1*	NS	NS	NS	0.2*	NS
	N	311	160	151	236	151	85
Helping me feel good	r	NS	NS	NS	NS	NS	NS
	N	311	161	150	237	151	86
Feeling more confident	r	NS	NS	NS	NS	NS	NS
	N	311	160	151	237	151	86
Improving my physical skill	r	NS	NS	NS	NS	NS	NS
	N	285	160	151	237	151	86
Helping reduce	r	NS	NS	NS	NS	NS	NS

stress	N	311	160	151	236	151	85
Pleasing my family	r	NS	NS	NS	0.1*	NS	NS
	N	319	167	152	239	153	86
Impressing Other people	r	NS	NS	NS	NS	NS	NS
	N	319	167	152	238	152	86

NS: Not significant

*: p<.05 **:p<.01

Figure 1. The model of associations among levels of physical activity and adiposity levels, other relevant factors



NHSS: National Healthy School Standard

SES: Socioeconomic status

Strong relationship; Correlation value was high

Statistically significant relationship;

Correlation value low but still evident

Confirmed by Literature review