Levels and patterns of physical activity and sedentary time among superdiverse adolescents in East London: A cross-sectional study

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Abstract

Objectives: Little is known about the physical activity (PA) and sedentary time (ST) habits of adolescents from superdiverse communities in the UK. The objectives of this study are to examine and report the patterns of PA/ST among adolescents in East London living in superdiverse communities, to identify opportunities/barriers to PA and inform policy/practice. **Design**: 1,260 young people (aged 11-13) young people from 7 secondary schools in East London completed a questionnaire on PA/ST over the past 7 days as part of the Newham's Every Child a Sports Person (NECaSP) intervention. Socio-demographic and anthropometric data were obtained. Significance tests were conducted to determine differences between socio-demographic and anthropometric predictors and PA/ST. Multinomial logit regression was used to explore the effects of ethnicity, sex and BMI on PA levels. **Results**: Males were significantly more likely to engage in PA at least 5 times during school in the past week (U=5.07, z= -11.76, p< .05). Obese participants were less likely to report engaging in PA 5 times in the past week (U=4.11, z= -1.17, p< .05). Black Caribbean girls (U=5.08, z= -1.92, p< .05) were significantly more likely to report engaging in no activity. Multinomial logit regression analyses revealed that girls with higher BMI were less likely to engage in PA at least 4 times after school in the last week than boys (b=.11, Wald $X^2(1)$=9.81, p< .01). Walking (36.4%), jogging/running (29.9%), and football (28%) were the most frequently reported activities. **Conclusion**: Engaging girls in PA during and after school is important and making sports clubs and activities available and attractive to this target group may help increase engagement in PA and reduce ST. Findings support the need for more sex-specific and culturally responsive pedagogy in schools with curricula that respects diversity and individuality and has meaning and value amongst superdiverse young people. Finally, we need to extend current work presented and provide substantial evidence of the ways young people from minority ethnic groups process and act on the public health policy and the ways they understand and enact physical activity.

Key words: Superdiversity, physical activity, ethnicity, adolescent health, sedentary time

Background

Good health across the lifecourse is an important public health priority that begins in childhood. Unfortunately, the alarming increases in childhood overweight and obesity and sedentary lifestyles, and physical inactivity in the United Kingdom (UK) are associated with the development of risk factors for poor health later in life (Owen et al. 2010). These risk factors can include hypertension, high cholesterol and triglycerides, impaired glucose tolerance and decreased physical function (Gill and Malkova 2006; Shokrvash et al. 2013). Low levels of physical activity (PA), including sport, and high levels of sedentary time (ST) are known to be independently associated with the development of chronic diseases which includes cardiovascular disease, type 2 diabetes and some cancers (Bolton and Rajkumar 2001). It has been found that during adolescence young people are at increased risk for becoming inactive and/or increasing ST, making this a crucial area for research and understanding (Owen et al. 2010). This is even more prevalent in young people from ethnic minorities and those living in areas of socioeconomic deprivation (Office for National Statistics, 2011).

The prevalence of obesity in boys and girls reported in England in 2011 was 17% and 16%, respectively, an increase from 11% and 12% in 1995 (Eastwood 2014). Obesity is a complex condition with complex causes, but it is well known that continued positive energy balance significantly contributes to obesity (Aires et al. 2010). Low levels of PA and increased ST contribute to this state of positive energy balance and partially explain this increased prevalence of childhood overweight and obesity (Aires et al. 2010). Guidelines for PA for health among children and adolescents state that they should accumulate 60 minutes per day of moderate to vigorous PA (MVPA) (Varney, et al., 2014). Obesity and inactivity are determinants of many chronic diseases such as type 2 diabetes and cardiovascular disease (CVD) (Cappoccio, et al., 1997; Chiu, et al., 2010). Ethnic minorities in the UK are disproportionately affected by these diseases (Cappoccio, et al., 1997) with groups such as South Asians having a 3-6 fold increased risk of CVD when compared to the general population (Dhawan, J. and Bray C.L., 1997; Eapen, et al., 2009). Obese and inactive ethnic minority adolescents risk being obese and inactive adults, considerably increasing their risk for chronic disease morbidity and mortality (Parsons et al., 1999).

In 2012 the Health Survey for England (HSE) reported that only 21% of boys and 16% of girls aged 5-15 years old met the current PA guidelines (The Health and Social Care Information Centre 2012). This is a decrease in PA from the 2008 HSE in which 28% of boys and 19% of girls were classified as meeting PA guidelines. The Active People Survey (2013/2014) found that 20% of adolescents aged 14-6 and 18.75% of Black and ethnic minority respondents (including adults) were active for at least 30 minutes 3 times a week (Sport England, 2014). While there is much in the published literature reporting the levels of activity among adolescents, there is little research examining patterns and correlates of PA and ST among adolescents living in superdiverse communities (Phillimore 2013).

Superdiversity encompasses the varied patterns of transnational migration, legal statuses, countries of origin, socio-economic statuses, linguistic abilities, cultural and ethnic factors that amalgamate to influence the health and health behaviours of adolescents (Vertovec 2006). This population complexity has created unique challenges regarding how we identify and respond to the health and well-being needs of all members of society, and specifically those of migrant status and ethnic minorities (Cheung and Phillimore 2014). According to Vertovec (2006) the policy challenges (and for the purposes of this paper, Public Health Policy challenges) emerging from the population complexity associated with superdiversity are to cover many aspects of social life, and more importantly the need to restructure public (health) services in light of the diversity of need and experience. Thus, superdiversity challenges traditional approaches to social welfare provision (Phillimore 2013) and public health policy. The World Health Organisation (WHO) and many others have invested billions of pounds in ethnically sensitive services aimed at addressing health inequalities linked to ethnicity and migration (WHO 2010). Yet, despite decades of diversity and the emergence of multicultural approaches to the delivery of health and well-being services in the developed world, health inequalities remain pronounced (WHO 2010).

East London is an area of London known for its diversity and deprivation. In recent years East London has been described as a superdiverse community with

more than 150 languages being spoken (Phillimore 2013). On average, 58.9% of East London is composed of ethnic minority groups (Office for National Statistics 2011). The largest of these groups are those identifying as Bangladeshi (58.6%), Black African (57.7%), Indian (45.6%), and Pakistani (37.8%) (Office for National Statistics 2011). More specifically the London Borough of Newham, in East London UK, has been identified as the most diverse with 35.6% of the population born outside of the UK (Office for National Statistics 2011).

Current PA and ST surveillance has generally focused on ethnicity or socio-economic status as factors in identifying populations for research, intervention and public health programming (The Marmot Review 2008), though in recent years these factors have been recognised as possibly inadequate methods for grouping people together for investigation into PA and ST as populations are becoming increasingly superdiverse (Fenton 2014; Thompson 2014). Therefore the aim of this study was to examine and report the patterns of PA and ST among adolescents in East London living in superdiverse settings and communities in order to identify opportunities and barriers to PA participation and to inform policy and practice. In addition, this paper aims to provide further insights into informing future, culturally responsive pedagogy (Dagkas & Quarmby, 2012), PA/ST and obesity interventions for adolescents from ethnic minority backgrounds.

Methods

Data presented in this paper were collected as part of an outcome evaluation of the Newham Every Child a Sportsperson (NECaSP) school-based intervention programme in Newham in East London, UK. The NECaSP programme, funded and implemented by Newham Council, builds on the "Inspire a Generation" legacy from the London 2012 Olympics and Paralympics and aims to increase PA and sporting participation among 11-12 year-old adolescents (activeNewham 2014). The intervention included 3 phases: 1) an introductory day in schools that included the opportunity for pupils to try out a range of sport and PA, 2) a one-day 'taster' coaching session at the University of East London leisure centre (SportsDock) where pupils were coached in 5 sports by coaches from local sports clubs, and 3) a school curriculum intervention during which young people had the

opportunity to engage in a 6-week after school programme on a sport of their choice. (20 sports available to choose from). Data represent baseline intervention data collected during Phase 2. Data from Phase 2 provide valuable insights into the PA patterns and SB habits of the young people from ethnic minority backgrounds living in superdiverse communities pre-intervention.

Participants

All schools with young people aged 11-12 in Newham in East London were invited to participate in the NECaSP programme. 4,500 young people were recruited from schools (n= 18) in East London as part of the NECaSP intervention programme. Schools that participated through Stage 2 of the programme (N=7) are included in this study for a total of n=1,260 in the sample reported in this study. Participants were sampled using the convenience sampling technique as it was not possible to conduct probability samples due to time and financial constraints. Young people were eligible to participate in the programme and parental consent was sought for inclusion in the study. Verbal assent was obtained from each participant on the day of data collection. Access was also granted through gatekeepers (i.e. Head of Schools and Head of PE and Sport in each participant school). Ethics clearance was obtained by The University of East London research ethics committee before the study commenced. Finally to preserve anonymity of participant schools, letters have been assigned to the results section ranging from A to G.

Measures

All participants were invited to complete a PA questionnaire and have demographic and anthropometric measurements taken by a trained researcher during Phase 2. Demographic information included age, sex, self-identified ethnicity, and residential postcode to determine individual participant Index of Multiple Deprivation (IMD) (Noble et. al.,2008) as a measure of socio-economic status. The IMD is a UK Government measure of socio-economic status that includes assessments of income, employment, health, education, crime, housing and living environment (Noble et al., 2008). The response rate between schools ranged from 74.7% to 90.3%. The overall rate was 84.2% (n=1260) of young people who had complete questionnaire and demographic/anthropometric data.

Anthropometric data were obtained non-invasively and included weight to the nearest 0.1kg using SECA 899 digital scale, height to the nearest mm with a SECA Leicester stadiometer, and waist circumference to the nearest cm using standard protocols. Body mass index (BMI) was calculated (weight/height^2) and classified based on age and gender-specific cut points (World Health Organization 2007).

PA and ST were assessed by a questionnaire adapted from the Physical Activity Questionnaire for Older Children (PAQ-C) and the Physical Activity Questionnaire for Adolescents (PAQ-A) (Kowalski, Crocker and Donen 2004). Participants were asked to recall their activities from the previous 7 days. Outcome measures were: number of times per week participants reported engaging in PA during their physical education (PE) classes, how often participants reported engaging in PA during their lunch time, how often participants reported engaging in PA immediately after school, how often participants reported engaging in PA in the evenings, and how often participants reported engaging in PA at the weekend. Based on these, summary variables were created to examine total PA and ST reported during school time and after school.

Data Analysis

Descriptive statistics were calculated for all socio-demographic and anthropometric variables. The hierarchical natures of the data were explored through multilevel analyses since participants were nested within schools. Mann-Whitney U tests and Kruskal-Wallis tests were conducted to determine whether there were any significant differences between socio-demographic and anthropometric predictors and the outcome variables. Multinomial logit regression was used to explore the effects of sex and BMI on PA levels. Patterns of PA and ST were investigated for totals during the week and weekend and for each day of the week. Statistical analyses were conducted in PASW 22.0 (Quarry Bay, Hong Kong).

Results

A total of 1,260 participants from 7 schools provided complete data. Table 1 summarises the characteristics of the sample. The majority of participants were aged between 11 and 12 years old (n=1224, 97%), with n=4 participants aged 13 years old. 56.9% were female (n=717) and 40.4% were male (n=509). 81.7% (n=1030) of participants were categorised as being in the most deprived IMD quintile based on residential postcode (Noble et al. 2008). 18 ethnicities were self-identified with 22.8% of pupils choosing "other" as their ethnicity. Bangladeshi (19%), Pakistani (13.8%), and Black African (13.7%) were the most common ethnicities reported.

Mean waist circumference, height, weight and BMI were 47.08 cm, 152.37cm, 47.08 kg, and 21.72 kg/m^2 respectively. 22.8% of the sample was categorised as overweight or obese based on BMI. 4.5% were underweight and 57.1% were healthy weight. Table 2 shows BMI when investigated by school. School G had the most underweight participants with 36.8%. School F (23.8%) and School C (24.0%) had the most healthy weight participants. School C (22.6%) and School F (23.5%) had the majority of overweight participants. Finally, School C had the majority of obese pupils at 29.1%. This is almost 10% more than the next highest schools (Table 2).

Since this study examined young people within schools it was necessary to investigate the hierarchical nature of the data to determine if variance exists within schools (Steele 2008). Little variability between schools would indicate no need to conduct a multilevel analysis (Steele 2008). A series of 2-level random intercepts null models indicated very little variability between schools for all outcome measures, therefore no further multi-level analysis was deemed appropriate.

A Kruskal-Wallis test indicated that BMI category was significantly different depending on which school a pupil attends, $H(3)= 9.58$, $p< .05$ (Table 2). Mann-Whitney tests with a Bonferroni correction were conducted to follow up on this finding. Significant results can be seen in Table 3. Importantly School D ($U=$ 36.18, $z= -3.011$), and School E ($U= 18.48$, $z= -.280$) had significantly lower percentages of pupils in the overweight category than other schools and significantly lower percentages of pupils in the obese category than any other

school (*U*=93.90, *z*= - .780) and *U*= 38.07, *z*= -3.230) respectively. Significance level was set at $p < .05$ for all tests. A Kruskal-Wallis test indicated no significant differences in BMI category between males and females or Ethnicity and IMD quintiles.

Overall nearly one third (30.9%) of young people in this study were active 1 time during school in the last week but none were sedentary when not in lessons. When investigated by sex, there was a significant difference in total PA during school between males and females for those reporting engaging in activity at least 5 times in the past week (Table 3). Males were significantly more likely to engage in PA at least 5 times during school in the last week (*U*=5.07, z= -11.76, p< .05). No significant differences were seen between schools. No ethnic differences were found.

Table 3 also summarises the findings of the Mann-Whitney tests for significant differences in after school activity when examined by sex, school, ethnicity, IMD and BMI. Males were significantly more likely to engage in after school activity 5 times in the last week (*U*=5.05, z= -4.10, p< .05). Black Caribbean (*U*=9.61, z= -4.7, p< .05) and the Black other category (*U*=6.25, z= -3.27, p< .05) were significantly more likely to report participating in no activity in the past week. Further investigation revealed that female Black Caribbean (*U*=5.08, z= -1.92, p< .05) and the other Black category females *(U*=10.31, z= -1.35, p< .05) were significantly more likely than their male counterparts to report participating in no activity in the past week.

There were no significant differences among the bottom 2 most deprived groups within this sample. The only significant difference found among BMI category was that overweight participants were the least likely to report engaging in activity 5 times in the past week (*U*=4.52, z= -4.14, p< .05). 5.6% of participants reported being sedentary outside of school and none reported being sedentary during school. For IMD there were significant differences seen for the third most deprived quintile but caution should be taken in the interpretation of this result, as there were only 4 participants in this quintile. No other significant differences were seen between IMD quintiles. A significant difference was seen for the obese

category of BMI (U=4.11, z= -1.17, p< .05). Obese participants were less likely to report engaging in PA 5 times in the last week. After school, participants were more active. 35.4% reported being active 2 or 3 times after school in the last week.

For ease of reporting, the results for overall PA and ST levels are given in percentages with significant tests reported. 43.0% of participants reported always being active during PE. 42% of participants reported sitting or standing around during lunch. 33.8% reported being active after school 2 or 3 times in the past week and 32.5% in the evening 2 or 3 times in the past week. 32.5% of participants were active 2-3 times last weekend. Based on a summary variable for overall total PA, 39% of the sample meets recommended levels of PA of moderate to vigorous activity most days per week.

Multinomial logit regression analyses revealed significant models for total PA during school and after when examining the predictor variables school, ethnicity, sex and BMI. During school, boys in School C and F were significantly less likely to engage in PA 4 or more times per week than their female counterparts (b=-1.56, Wald $X^2(1)$ =3.32, p< .01; b=-.87, Wald $X^2(1)$ =1.17, p< .01). During school Black African girls were significantly less likely to engage in PA at least 1 time in the past week (b=.35, Wald $X^2(1)$ =9.77, p< .01). As BMI increased, Black African girls were less likely to engage in PA 2 or 3 times after school in the last week than boys (b=.12, Wald $X^2(1)$ =11.07, p< .01). Similarly, a significant model emerged for total PA 4 times in the last week after school. As BMI increased, Black African girls were less likely to engage in PA 4 times after school in the last week than boys (b=.11, Wald $X^2(1)$=9.81, p< .01).

Patterns of PA were also explored during the week. Figure 1 illustrates the patterns of activity among the total sample of participants. The percentage of participants reporting engaging in PA very often on Saturday and Sunday is greater than any other day of the week. Moreover a lower percentage of participants report engaging in no activity at all on the weekend. Friday is the weekday in which more participants report engaging in activity very often while Monday is the weekday in which participants reported engaging in little activity. Tuesday

through Thursday is fairly consistent with a little or some activity, indicating an area where improvement can be made.

Table 4 illustrates the frequency of participation in sports and activities during the previous week. Walking (36.4%), jogging/running (29.9%), and football (28%) were the most frequently reported activities pupils reported engaging in 7 or more times in the past week. Volleyball (34.9%), basketball (30.2%), and netball (23.4%) were sports that were engaged in 1-2 times per week. Ice hockey (88.8%), hockey (77.9%), rowing (80.6%) and cricket (72.8%) were the sports with the highest percentage of participants reporting they did not engage in at all.

Discussion

The data and analyses presented in this research provide important descriptions of overweight and obesity among young people in superdiverse communities in East London and the levels and patterns of PA they are currently engaging in. While it appears that the majority of participants were of a healthy weight (57.1%), 30% of these were within 2kg/m^2 of being classified as overweight. It is therefore important that these borderline overweight adolescents become or remain active in order to avoid weight gain and negative health consequences.

There were significant differences in BMI between schools, but none were found for sex, ethnicity, or IMD. Further exploration is needed to understand why this disparity exists between schools. This is particularly salient because obese adolescents in this study were significantly less likely to meet PA guidelines and overweight adolescents were significantly less likely to engage in PA 5 times after school in the last week. Furthermore, since regression analyses indicate that for Black African girls, during and after school PA is negatively affected by increased BMI, it is important to examine why some girls with higher BMI may choose not to engage in PA but others do. It is also imperative for future research to investigate the intersection of variables such as ethnicity, social class and gender to uncover structural or perceived barriers to PA participation. Due to the rates of overweight and obesity and the potential for healthy weight adolescents to become overweight it is important to continue to support adolescents', particularly girls' participation in PA through structured provision such as school sport and

extracurricular activities as well as community provision of informal play and organised PA.

Although some ethnic differences were found (Black African girls less active), sex was also indicative of activity levels in our sample. PA during school was found to be higher in boys in 2 schools (C&F) and overall a greater percentage of boys were active 5 or more times per week during school. We speculate that since activity outside of school was not significantly different between males and females, some inequality may exist between schools. More research is needed to examine these inequalities and should include examination of how boys and girls are supported to engage in PA and sport as well as which sports could be provided that girls are more likely to engage in.

The Health Survey for England (2008) has reported 28% of children 2-15 years old meet PA guidelines (The Health and Social Care Information Centre 2008). Our sample exceeded that (39%). This indicates that some ethnic minority young people within superdiverse and deprived areas may actually be more active than previously expected and documented in national health surveys. Caution, however, should be used when interpreting these results as self-report methods of measuring PA are known to suffer from recall bias (Booth et al. 2006). Asian Chinese, Black Caribbean, and participants classifying themselves as in the "other Black" category were significantly more likely than any other ethnic group to report engaging in no PA in the last week. These significant results indicate a need for further investigation into the PA behaviours of these groups and possible targeted interventions aimed at increasing their PA levels. Furthermore, since males in this study were significantly more likely to meet PA guidelines than females, future interventions should also target increasing activity among adolescent girls.

When patterns of PA are examined over the week, it is clear that adolescents in this study were more active on weekends than on weekdays. Monday-Thursday are the days when most improvement in activity participation can be made. Since 11-12 year olds are in school for the majority of their day, it may be important to take advantage of opportunities for engagement in PA during this time and provide culturally responsive curricular and school sport and PA interventions. Time spent

in PE and during lunch break can be valuable times to provide these opportunities for activity. This is supported by our findings (43% reported always being active during PE and over 42% reported being active during lunch). Increased activity during these times can contribute toward meeting PA guidelines. Additionally, 3 activities seemed to be popular among participants (walking jogging/running, and football, followed by basketball and volleyball). These activities are not normally readily available to young people in the schools participating in this study, as the NC for PE in the UK is based on the provision of 5 activities but predominantly on games provision such as Football and Netball. More research is needed to elucidate the reasons why these activities are the most popular and how to encourage engagement in other sports and activities among superdiverse adolescents in East London.

Limitations & Strengths

This study has some limitations that should be kept in mind. This sample is a convenience sample and therefore cannot be assumed to be representative of all young people in the London Borough of Newham in East London, UK. Very few participants reported being sedentary after school and none during school. ST was calculated as a summary variable based on activity responses and may not fully capture all ST during and after school. Moreover, it is known that recall of ST can be unreliable, particularly in children (Corder et al. 2010; Hong et al. 2012). Participants may have given desirable responses thus introducing bias into the data (Booth et al. 2006; Hong et al. 2012). Therefore, a cautious interpretation of these results is recommended. Further exploration of ST should be conducted, preferably using objective measures such as accelerometers to provide more accurate assessment. Recall bias may also be present for PA variables. This is common among PA questionnaires and can be avoided in the future through the use of objective measures such as accelerometers.

There are also several strengths to this research. This was a relatively large sample from a superdiverse community in East London in which participants were from a range of ethnicities, offering important cultural perspectives. This study explored important sex differences and interactions between BMI and PA, providing a picture of the areas where engagement in PA may be most affected, such and in

girls with higher BMI. This study provided insights to particular ethnic groups and their PA/ST patterns, therefore avoiding homogenization of a particular ethnic category. Various ethnic groups within this study demonstrated healthy weights in accordance to national standards, and they engage with the PA discourse in a variety of ways.

Conclusions and Implications

These results highlight important linkages between overweight and obesity and PA among superdiverse young people. Data presented here confirm that male adolescents report being more active and overweight and obese adolescents are less likely to engage in PA. Girls were significantly less likely to engage in PA after school as their BMI increased. Moreover, activity and BMI varied between schools, indicating a need for further exploration into why this is the case. These findings show that patterns of PA may not be solely explained by typical determinants such as socio-economic factors, but are the result of complex interactions that are not yet fully understood.

This study contributes to the existing body of knowledge on PA and ST among superdiverse adolescents living in superdiverse communities. We highlight the disparities between some ethnic groups as well as between boys and girls in PA engagement. Further investigation is needed into the intersection between variables that affect young people's behaviours, values and engagement with PA such as school provision of PA, ethnicity, social class locality and provision.

Future research in this area should examine more fully the interactions between adolescents, schools, communities and families, as well as explore how superdiverse communities and environments can affect health behaviours such as PA and ST. Additionally, objective measures should be utilised in an effort to more accurately measure PA and ST among superdiverse adolescents. Objective measurement can avoid the pitfalls of self-report methods by avoiding recall bias, and any language or cultural barriers that may exist among such participants.

Future interventions aimed at increasing PA and reducing ST among superdiverse adolescents should utilise existing structures such as schools' PE classes and

lunchtime. Widening the range of sports and activities offered at these times may have a positive impact on PA levels of superdiverse adolescents. Further examination is needed into the sports and activities available to adolescents living in superdiverse communities and reasons why they may not fully engage with these groups. Furthermore, engaging girls in after school PA is important and making sports clubs and activities available and attractive to this target group may help increased engagement in PA and reduce ST. Finally, our findings support the need for more culturally responsive pedagogy in schools with curricula that underpin a diversity of sports that respects diversity and individuality (Azzarito & Solomon, 2005) and has meaning and value amongst superdiverse young people. In particular, we need to extend current work presented in this paper and provide substantial evidence of the ways young people from minority ethnic groups living in superdivserse communities, process and act on the public health discourse and the ways they understand and enact physical culture within local communities and schools.

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33. Table 1: Socio-demographic variables

	% (n)
Age, n=1260	
11 years old	57.2 (721)
12 years old	39.8 (501)
13 years old	.3 (4)
Sex, n=1260	
Male	40.4 (509)
Female	56.9 (717)
School, n=1260	
A	11.6 (146)
B	14.4 (182)
C	20.6 (259)
D	6.9 (87)
E	9.0 (113)
F	20.2 (255)
G	5.6 (70)
Ethnicity, n=1226	
White English	7.6 (96)
White Northern Irish	.2 (2)
White British	1.7(21)
White Irish	.2 (3)
Any other white	9.6 (121)
Asian Indian	7.9 (100)
Asian Pakistani	13.4 (169)
Asian Bangladeshi	19.0 (239)
Asian Chinese	.6 (7)
Asian any other	5.8 (73)
Mixed White/Black Caribbean	2.3 (28)
Mixed White/Black African, White/Asian	2.5 (31)
Mixed any other	2.9 (36)
Black African	13.7 (172)
Black Caribbean	4.5 (57)
Black any other	2.8 (35)
OTHER Arab	1.1 (14)
OTHER any other	1.7 (22)
IMD, n=1206	
1 (least deprived)	.1 (1)
2	.2 (2)
3	.3 (4)
4	13.4 (169)
5 (most deprived)	81.7 (1030)

Table 2: Kruskal-Wallis significance tests for BMI category by school

	Underweight*	Healthy weight*	Overweight*	Obese*
A, n=145	14.00%	13.80%	13.00%	13.40%
B, n=163	7.00%	14.90%	15.70%	19.80%
C, n=256	12.30%	24.00%	22.60%	29.10%
D, n=80	10.50%	7.10% ++	9.6% **	7.0% **
E, n=112	36.80%	9.30%	8.7% ***	8.1% **
F, n=239	17.50%	23.80%	23.50%	18.00%
G, n=69	1.8% +	7.20 % +++	7.00%	4.70%

* Percentage of all participants;

+ significantly different from all other schools

++ significantly different from all schools except School G

+++ significantly different from all schools except School D

** significantly different from all schools except School E

*** significantly different from all schools except School D

$p < .05$ for all

Table 3: Mann-Whitney Tests for differences in total physical activity after and during school by sex, school. IMD, ethnicity and BMI

	NONE		1 time last week		2 or 3 times last week		4 times last week		5 times last week	
(n)	During	After	During	After	During	After	During	After	During	After
Sex, n=1260										
Male (509)	2.10%	6.30%	10.30%	20.30%	15.50%	32.00%	33.50%	22.90%	**38.7%***	**18.4%***
Female (717)	4.50%	8.10%	**29.7%****	22.90%	26.60%	39.60%	32.90%	20.60%	6.30%	8.70%
School, n=1260										
A (146)	2.90%	2.9%	6.50%	6.50%	20.10%	20.10%	34.60%	34.60%	36.00%	36.00%
B (182)	6.20%	6.20%	10.20%	10.20%	19.20%	19.20%	28.20%	28.20%	17.50%	36.10%
C (259)	7.50%	7.50%	19.80%	19.80%	21.80%	21.80%	31.00%	31.00%	29.80%	29.80%
D (87)	4.70%	4.70%	5.80%	5.80%	14.00%	14.00%	26.70%	26.70%	29.10%	28.20%
E (113)	4.50%	4.50%	6.30%	6.30%	20.70%	20.70%	35.10%	35.20%	33.30%	33.30%
F (255)	7.20%	7.20%	12.00%	12.00%	22.90%	26.40%	48.10%	39.20%	23.40%	15.20%
G (70)	4.30%	4.30%	4.30%	4.30%	14.30%	14.30%	31.50%	31.50%	45.70%	45.70%
Ethnicity, n=1226										
White English (96)	4.30%	4.30%	14.00%	14.00%	22.60%	22.60%	30.10%	30.10%	29.10%	29.10%
White British (21)	**0.00% *****	**0.00%*****	**0.00% *****	**0.00% *****	27.80%	27.80%	44.50%	**44.50%*****	27.80%	27.80%
Any other white (121)	6.90%	6.90%	14.50%	14.50%	26.50%	26.50%	29.00%	20.00%	23.00%	23.00%
Asian Indian (100)	8.10%	8.10%	14.30%	14.30%	23.50%	23.50%	30.60%	30.60%	23.50%	23.50%
Asian Pakistani (169)	3.90%	3.60%	6.00%	6.00%	19.80%	19.80%	40.80%	40.80%	30.00%	30.00%
Asian Bangladeshi (239)	6.50%	6.50%	9.40%	9.40%	23.90%	23.90%	33.70%	33.70%	26.50%	26.50%

Asian Chinese (7)	**14.30%*** **	**14.30%*** **	42.90%	**42.90% *** **	14.30%	14.30%	**14.30% *** **	**14.30%*** **	**14.30% *** **	**14.30%*** **
Asian any other (73)	4.20%	4.20%	11.10%	11.10%	20.80%	20.80%	34.70%	34.70%	29.10%	29.10%
Mixed White/Black Caribbean (280)	3.60%	3.60%	14.30%	14.30%	17.90%	17.90%	32.10%	32.10%	32.10%	32.10%
Mixed White/Black African, White/Asian (31)	6.50%	6.50%	6.50%	6.50%	35.50%	35.50%	19.40%	19.40%	32.20%	32.20%
Mixed any other (36)	2.90%	2.90%	17.10%	17.10%	28.60%	28.60%	28.50%	28.50%	22.90%	22.90%
Black African (172)	4.80%	4.80%	11.40%	11.40%	17.50%	17.50%	33.80%	33.80%	32.50%	32.50%
Black Caribbean (57)	**13.00%+**	**13%+**	7.40%	7.40%	16.70%	16.70%	31.50%	31.50%	31.50%	31.50%
Black any other (35)	**14.30% ++**	**14.3%++**	8.60%	8.60%	**8.6%+++**	**8.60% +++**	37.10%	34.30%	31.40%	31.40%
OTHER Arab (14)	7.10%	7.10%	7.10%	7.10%	**7.10*+**	**7.10% *+**	50.00%	35.70%	28.50%	28.50%
OTHER any other (22)	**14.30% *++**	**14.30%*++**	19.00%	19.00%	23.80%	23.80%	23.80%	33.30%	19.10%	19.10%
IMD, n=1206										
1 (least deprived) (1)	0.00%	**0.00%**+**	0.00%	100.00%	0.00%	**0.00%**++**	0.00%	**0.00%***+**	0.00%	**0.00%***+**
2 (2)	0.00%	**0.00%**+**	0.00%	**0.00%**	0.00%	100.00%	0.00%	**0.00%***++**	0.00%	**0.00%***++**
3 (4)	**0.00% **++**	**0.00%**+**	**0.00% **++**	**0.00%**	**50.00% +***	50.00%	25.00%	25.00%	25.00%	25.00%
4 (169)	4.20%	4.20%	16.40%	16.40%	21.20%	21.20%	31.60%	31.60%	26.60%	26.60%
5 (most deprived) (1030)	6.20%	6.20%	10.10%	10.10%	21.70%	21.70%	33.80%	33.80%	27.80%	27.90%

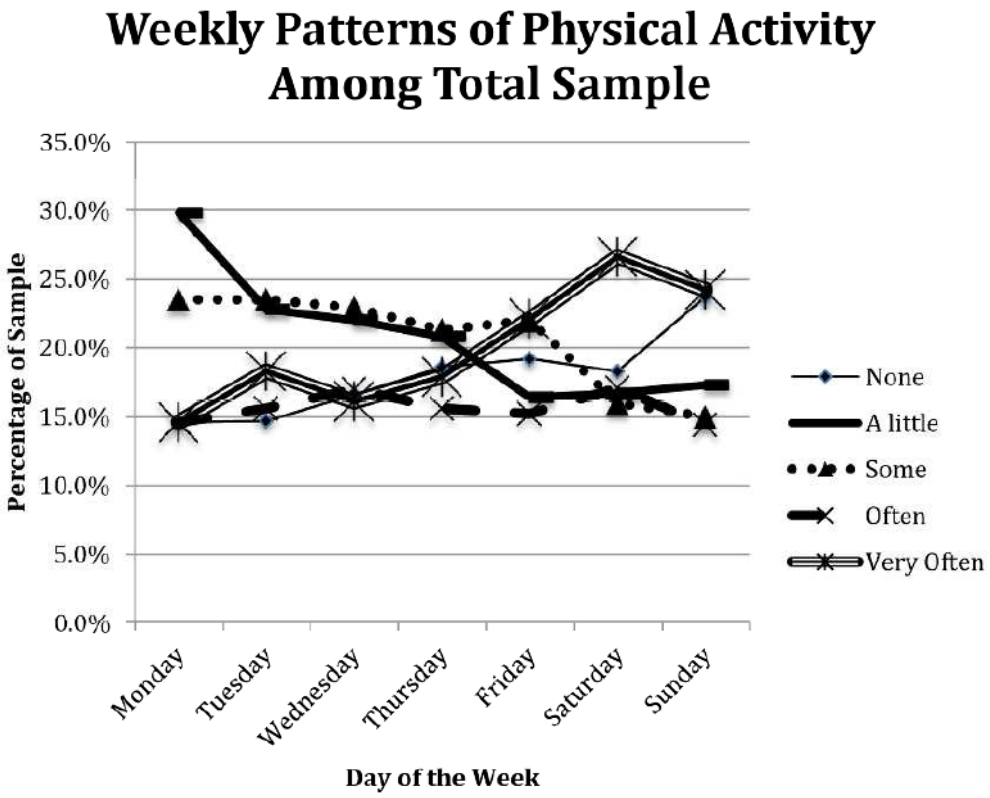
BMI, n= 1064										
Underweight (57)	5.50%	5.50%	9.10%	9.10%	21.80%	21.80%	34.50%	24.50%	29.10%	29.10%
Normal Weight (720)	5.50%	5.50%	10.30%	10.30%	21.40%	21.40%	28.10%	34.00%	28.70%	28.70%
Overweight(115)	7.20%	7.20%	13.50%	13.50%	15.30%	15.40%	30.60%	30.60%	33.30%	**33.30%*** **
Obese (172)	5.90%	6.60%	11.40%	15.00%	21.00%	22.80%	31.80%	32.10%	**24.00% *** **	24.00%

*Sig. diff. from females; **sig. diff. from males; *** sig. diff. from all other groups; + sig. diff. from “Black and other” and “Other any other” ethnicity; ++ sig. diff. from “Black Caribbean” and “Other any other” ethnicity; +++ sig. diff from “Other any other” ethnicity; *+ sig. diff. from “Black and other” ethnicity; *++ sig. diff. from “Black Caribbean” and “Black and other” ethnicity; **+ sig. diff. from all except IMD 4 and 5; **++ sig. diff. from all other IMD groups; ***+ sig. diff. from all except IMD 2; ***++ sig. diff. from all except IMD 1 $p<.05$ for all.

Table 4: Frequency of sports and activity participation during the previous week

Sport or Activity	None	1-2 per week	3-4 per week	5-6 per week	7 or more
Skipping	44.2%	24.3%	12.8%	4.5%	10.6%
Rowing	80.6%	10.6%	21.0%	8.0%	13.0%
Tag	34.4%	25.8%	11.9%	8.8%	14.5%
Walking	15.5%	17.9%	13.4%	13.0%	36.4%
Bicycling	38.0%	19.0%	12.5%	8.0%	17.9%
Jog or run	12.1%	19.2%	19.0%	15.8%	29.9%
Swimming	49.6%	24.6%	7.3%	4.8%	9.5%
Dance	39.3%	25.0%	8.7%	6.3%	16.6%
Football	22.4%	24.8%	11.9%	9.0%	28.0%
Badminton	49.9%	27.1%	7.9%	4.7%	5.6%
Hockey	77.9%	8.8%	4.3%	2.0%	2.6%
Ice Hockey	88.8%	3.3%	1.7%	9.0%	1.0%
Volleyball	43.7%	34.9%	7.5%	3.8%	6.0%
Basketball	32.9%	30.2%	12.3%	8.7%	11.7%
Netball	54.1%	23.4%	6.7%	5.4%	5.6%
Cricket	72.8%	10.7%	4.6%	3.2%	5.2%

Figure 1: Weekly Patterns of Physical Activity Among Total Sample



Percentage of sample engaging in physical activity during each day of the week.