Diet, physical activity, sedentary behaviour and perceptions of the environment in young adults

Abstract

Background

Few studies have explored both food behaviour and physical activity in an environmental context. Most research in this area has focused on adults; the aim of this study was to describe perceptions of the environment, diet, physical activity and sedentary behaviour patterns in 16-20 year olds in full-time education (Newcastle, England).

Methods

Participants (n=73) recruited from a college and sixth-form college completed a UK version of the Youth Neighbourhood Environment Walkability Survey which included measures of sedentary behaviour. A validated food frequency questionnaire was completed and a factor applied to produce an estimated mean daily frequency of intake of each item which was converted to nutrient intakes. A rank for Index of Multiple Deprivation was assigned to their home post-code. Analysis explored associations between sedentary behaviours and nutrient intake.

Results

In this descriptive cross-sectional study, most reported being physically active for at least 1 hour per day on 3-4 (n=28) or 5-7 days (n=31). There were no significant differences in nutrient intake according to sample quartile IMD position. Sedentary behaviours were significantly associated with less healthy eating patterns. Higher total energy (*p*=0.02), higher fat (*p*=0.005), percentage energy from fat (p=0.035) and lower carbohydrates intakes (p=0.004) were significantly associated with more time spent watching DVDs at the weekend.

Conclusions

This combination of sedentary behaviour and less healthy eating patterns has important implications for long term health, e.g. the tracking of overweight and obesity from adolescence into adulthood. Understanding behaviour relationships is an important step in developing interventions in this age-group.

Introduction

Britain has been described as an 'obese society' (Foresight, 2007). The prevalence of obesity in the UK has tripled over 20 years and continues to increase at an alarming rate (National Audit Office, 2001). The health consequences of overweight and obesity are high; once developed, obesity is difficult to treat, therefore prevention programs aimed at young people are considered a high priority (Summerbell et al., 2005). Changes in the pattern of Body Mass Index (BMI) between 2-25 years appears to have a stronger effect on adult overweight than birth weight and adult lifestyle factors (Guo et al., 2000). There is a lack of research about the eating habits (Wills, 2005), physical activity and sedentary behaviour patterns in this period of transition from adolescence to adulthood (Nelson et al., 2006). This life-stage has been shown to be a period of increased risk of development of obesity (Gordon-Larsen et al., 2004).

The causes of obesity are complex and multifaceted (Foresight, 2007) and it is recognized as a broad issue that includes physical, economic, political and socio-cultural factors (Swinburn and Egger, 2002). 'Obesogenic environments' have been described as 'the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations' (Swinburn and Egger, 2002). Genetic and environmental factors influence both sides of the energy balance equation (Loos and Bouchard, 2008). Examples of environmental factors include: availability and accessibility influence food choice and energy intake, while availability of greenspace may influence physical activity and energy expenditure. They are considered to be a significant driving force behind today's escalating obesity crisis (Swinburn et al., 1999), yet the evidence remains unclear about *which* environmental factors influence obesity (Jones et al., 2007).

Research has tended to focus either on the interactions between physical activity and the environment or, to a lesser extent, between nutrition behaviour and the environment. Research needs to focus on both sides of the energy balance equation. Few studies have explored food, physical activity and sedentary behaviour together within an environmental context.

Often adolescence is associated with engagement in 'risky' behaviours such as drinking and smoking (Wills, 2005) and unhealthy diets (Henderson et al., 2002). Research on the influence of the environment on obesity in young people is limited, although adult data does provide some insight (Jones et al., 2007). For example, in adults there are consistent associations between the physical environment and physical activity (e.g. physical distance and accessibility of facilities) (Humpel et al., 2002), yet limited research exists on this interaction in young people (Jago et al., 2005, Kerr et al., 2006). A recent American study of adolescent males found sidewalk characteristics, such as location, material, presence of street lights, and presence of trees, to be positively associated with light-intensity physical activity (Jago et al., 2005). European research found objective measurements of the residential environment such as high levels of graffiti and litter to be associated with physical inactivity and obesity (Ellaway et al., 2005).

Being overweight in adolescence is associated with numerous factors, including sedentary behaviour (Patrick et al., 2004). As young people progress through adolescence there is an increase in computer use and a decrease in moderate to vigorous physical activity (Nelson et al., 2006). Adolescents spend approximately three hours per day watching television or playing video games (Motl et al., 2005). Previous research has associated ‘screen behaviour’ with increased consumption of sugar-sweetened drinks (Kremers et al., 2007) and unhealthy eating patterns (Vereecken et al., 2006).

Parallel to increases in sedentary behaviour, young people’s participation in physical activity is low (Council on Sports Medicine and Fitness and Council on School Health, 2006). There are associations between a sedentary lifestyle and both individual (Sundquist et al., 1999) and neighbourhood socio-economic characteristics (Frank et al., 2006). In the US, neighbourhoods with low socio-economic status (SES) usually have fewer physical activity resources than medium to high SES neighbourhoods (Gordon-Larsen et al., 2006). Studies of associations between SES and access to healthy foods are largely inconclusive (White, 2007).

The purpose of this cross-sectional study is to firstly report physical activity, sedentary behaviour, perceptions of, the environment and nutrient intakes. Secondly provide information on, and descriptions of the environments in which the sample live and to examine the associations between these factors. These analyses seek to further the understanding of health related behaviours in this age group in a North East of England context.

Materials and Methods

Participants were invited to take part in the questionnaire pre-testing (a convenience sample from a youth club) and the study (college and a sixth–form college) through a brief presentation and information sheets. Respondents were given opportunities to ask further questions and informed consent was obtained. Around 100 students at the sixth-form college were approached and a similar number at the college of further education. The response rates were higher at the college (sports and non-sport students) where the questionnaires were completed during class-time rather than in the student's own time. The study went through a local ethical process for approval.

Questionnaire

The North American tool 'Youth NEWS' (Neighbourhood Environment Walkability Survey) (Kerr et al., 2006) was used. It included questions designed to assess several environmental characteristics, including proximity and ease of access to facilities for walking or cycling, neighbourhood aesthetics, traffic and crime safety issues (Brownson et al., 2004). The questionnaire was adapted for use in the North East of England, including; American to UK translations, removal of irrelevant and addition of context specific questions. Pre-testing used cognitive methods (Jobe, 2003) to ensure questions were comprehensible. to the target audience. A sample of eleven 16-18 year olds (6 male, 5 female) were asked to describe, in their own words, what specific questions were asking and their understanding of particular words or phrases. Any difficulties in responding were noted and the questionnaire adapted.

Nutritional assessment

The European Prospective Investigation of Cancer (Bingham et al., 2001) food frequency questionnaire (FFQ), adapted for use in the Eating and Shopping in Newcastle Study (White et al., 2004), had 134 items and assessed dietary intake over the past year. The FFQ asked how often items were consumed from a fixed set of responses, ranging from ‘never or less than once a month’, to ‘more than six times per day’. A factor was applied to these responses to produce an estimated mean daily frequency of intake of each item which was converted to nutrient intakes (Bingham et al., 1994). Using an in-house ACCESS database, standard UK food composition tables were used to allocate the nutrient composition to each separate food using the Supplements to McCance & Widdowson’s Composition of Foods (Holland et al., 1993, Holland et al., 1988, Holland et al., 1989, Holland et al., 1991a, Holland et al., 1992a, Holland et al., 1992b, Holland et al., 1991b, Chan, 1996, Chan et al., 1994, Chan et al., 1995). The nutrients listed in Table 2 were selected for analysis, with vitamin C and folate used to reflect fruit and vegetable intake.

Deprivation

The Index of Multiple Deprivation (IMD) is a summary measure of area-level deprivation that combines weighted scores in seven deprivation domains at the Lower Super Output Area level (LSOA) (Noble et al., 2004). These domains are: Income deprivation, employment deprivation, health deprivation and disability, education, skills and training deprivation, barriers to housing and services, living environment deprivation and, crime. The IMD rank was identified for each of the participant's LSOA from their home postcode. These ranks were subsequently divided into sample quartiles, where a rank of 1 was 'most deprived' and 4 was 'least deprived'.

Data collection and analysis

Consenting volunteers (n=25, Nov 05 – Jan 06 n= 48, Jan 07) completed both questionnaires. FFQ data were entered onto an ACCESS database. Questionnaire data was coded and analyzed using SPSS Version 14. All continuous variables are expressed as mean with the standard error of the mean. Nutritional data were checked for normal distribution. Normally distributed dietary data were analyzed using either independent t-tests or ANOVA, followed by Bonferroni post hoc test (p<0.05). Non-parametric Kruskal-Wallis and Mann-Whitney tests were used to explore possible associations between % Energy from Alcohol (which was interval non-normal) and the perception variables. However, because of the skewed nature of the distribution of % Energy from Alcohol the decision was taken to exclude this from the analysis. Chi-squared testing (χ^2) and Spearman test for correlation was used to investigate possible associations amongst the other categorical variables (ordinal and nominal; e.g. descriptives, demographics, physical activity, sedentary behaviours and perceptions).

All variables were tested for interactions with IMD scores, physical activity, gender and subject studied. Any statistically significant outcomes have been reported in the results section.

Results

Descriptives and demographics

Seventy-three students, (44 male, 29 female, mean age 17 years, range 16-20 years SD 0.97) completed both the questionnaire and FFQ. All were in full time education and 64% (n=47) had a part-time job, 32 were studying sport (24 male, 8 female) and the remaining 41 were studying a range of subjects, described as non-sport subjects (20 male, 21 female). There were gender differences between the two groups of students; significantly more males than females were represented in the sports students (χ^2 =5.2 , df=1 , p=0.023).

The IMD rankings for the sample ranged from 119 to 30318 out of 32482 LSOAs in England, covering a wide range of neighbourhood deprivation. There were significantly more individuals from the most deprived areas studying non-sports subjects (14 compared with 4, χ^2 =8.11 df=3, p=0.044).

For the following analysis, all results were checked for interactions by IMD scores, physical activity, gender and subject studied, unless stated there were no interactions or significant findings.

Physical activity

Most respondents reported they were active for a total of at least 1 hour per day on 3-4 (n=28) or 5-7 (n=31) days per week. As expected, a greater proportion of respondents studying sport reported being more active compared with the non-sport students (χ^2 =6.3 df=2, p=0.043).

Sedentary behaviour

Respondents were asked about their time spent ('0-30 minutes', '1-2 hours', '3-4+ hours') in a range of sedentary behaviours on week and weekend days. Most (48%) spent 1-2 hours during weekdays 'watching TV, videos, DVDs or listening to music', while 51% spent 3-4+ hours on these activities at the weekend. There was not a clear pattern for time spent 'playing computer or video games or using the internet'; 39% spent 0-30 minutes and 40% spent 1-2 hours during weekdays. At the weekend most spent either 0-30 minutes or 3-4+ hours (34% and 37%). The majority (62%) spent 1-2 hours 'doing homework' during weekdays but at weekends the behaviour was more widely distributed with 36% reporting 0-30 minutes and 45% reporting 1-2 hours. The largest proportion of respondents (44%) reported spending 0-30 minutes 'sitting talking on the phone, texting or hanging out with friends and family', during weekdays. While at the weekend most (37%) spent 3-4+ hours. Most spent 0-30 minutes on weekdays and weekend days doing 'inactive hobbies' such as reading, music, art, crafts, clubs and going to the cinema (59% and 45% respectively). Most of the 61 participants who worked or did voluntary work reported 0-30mins as 'time spent sitting at work' both during weekdays and at the weekend (58% and 56% respectively). 'Sitting in or driving in a car' had a similar response pattern for during weekdays and the weekend, most spent 0-30 minutes (66% and 68% respectively). Each of the sedentary behaviours weekend / weekday pairs were compared and all were found to be both statistically significantly different and significantly positively correlated.

Perceptions of their environment and barriers to walking or cycling

A four point likert scale, ranging from strongly disagree to strongly agree, was condensed to two groups and used to explore perceptions of environment and barriers to walking or cycling in their neighbourhood. There was generally a positive attitude; almost all agreed (96%) that bus, metro or train stops were easy to reach from their home. Most agreed that there were many places to go within walking distance from their homes (66%). The majority disagreed (80%) that there were many barriers to walking in their neighbourhood (examples of barriers given in the questionnaire were: main roads, rivers and train lines) and the majority disagreed that their route to local shops/pubs/restaurants/friend's houses was boring (70%). Most agreed (62%) that there were pedestrian crossings to help with crossing busy streets. Most perceived their neighbourhoods to have cycle lanes and pavements (88%). A minority (8%) perceived that 'getting hot and sweaty' was a barrier to walking or cycling. Similarly, only 7% perceived that cycling or walking not being 'cool' (perceived state to which respondents aspire (Danesi, 1994)) was a barrier. Only 23% perceived having too much stuff to carry limited their ability to walk or cycle. Asked if it was easier for someone to drive them (rather than cycle or walk), 43% respondents felt it was easier to be driven compared with 57% those who did not. While 8% reported that walking or cycling required too much planning, the majority didn't perceive it as a barrier, yet having somewhere safe to leave a bike was perceived as a barrier by 56% of respondents.

Deprivation, physical activity, sedentary behaviour and perceptions

Associations between perceptions (of their environment and barriers to walking or cycling in their neighbourhood) and deprivation, physical activity and sedentary behaviours were explored (Table 5). Although numbers were small it was surprising that those living in the most deprived areas were significantly more likely to disagree with the statement "the route is boring", than those from the least deprived areas.

Those living in the least deprived areas were more likely to agree with the statement “it’s easier for someone else to drive me” than those from the most deprived areas.

Those who were least active (at least one hour on 0-2 days/ week) were less likely to perceive that they had “too much stuff to carry” to walk or cycle, than those who were most active (at least one hour 5-7days/ week).

Twenty-eight of the 40 respondents who spent 0-30 minutes during the week ‘sitting or driving in a car’ disagreed with the statement “its easier for someone to drive me” while four of the five who spent the longest in the car (3-4+ hours) agreed with the statement. Similarly, 38 respondents who spent 0-30 minutes during the week ‘sitting or driving in a car’ disagreed with the statement “walking or cycling required too much planning”, all those who spent the 3-4+ hours in the car disagreed.

Deprivation, physical activity, sedentary behaviour, perceptions and nutrient intake

Average nutrient intakes are presented in Table 1. There were significant differences in nutrient intake by gender and course. Females had significantly higher intake of vitamin C than males (p=0.012). The sport students reported a significantly lower intake of fat (99.5g) compared with non-sports students (124.9g p=0.031) & a significantly higher % energy from protein compared with the non-sports students (16.4% versus 14.4% respectively, p=0.030).

There were no significant differences in nutrient intake according to sample quartile IMD position or physical activity.

The significant associations between sedentary behaviour patterns and nutrient intakes are discussed below. Time spent ‘watching TV, videos or DVDs and listening to music’ during the week was significantly associated with percentage energy from fat (p=0.006); intake was lower in individuals who reported watching TV/DVDs or listening to music throughout the week for 0-30 minutes compared with those who spent 3-4+ hours. For weekend ‘TV, video or DVD viewing and listening to music’, total energy intake, fat intake, percentage energy from fat, and percentage energy from carbohydrate was significantly different between the three time groups. Those who reported greater amounts of screen time or listening to music had higher intakes of fat and percentage energy from fat, lower percentage energy from carbohydrates and higher total energy intakes (Table 2).

Individuals who reported spending 3-4+ hours on their homework during the week had a significantly higher intake of vitamin C than those spending 0-30 minutes and 1-2 hours. There were significant differences in intake of energy, fat, carbohydrate, total sugars, vitamin C and folate according to reported time spent doing homework at the weekend (Table 3).

Those who reported spending 0-30 minutes at the weekend ‘sitting talking on the telephone, texting or hanging out with family or friends’ had a lower percentage contribution to total energy from fat (31%) compared with those spending 1-2 (35%) or 3-4+ hours (34% p=0.035).

Those who spent 1-2 hours 'sitting at work' at the weekend had higher percentage energy from protein compared with those who spent 0-30 minutes or 3-4+ hours (22% compared with both 15% p=0.012).

More reported time spent 'sitting or driving in a car' during the week was associated with higher fat intake and lower carbohydrate intake (Table 4). Respondents reporting more time spent 'sitting or driving in a car' at the weekend was associated with significantly higher energy intake and higher fat intake.

Perceptions of their environment and barriers to walking and cycling were significantly associated with NSP, folate, vitamin C, energy and fat intake (Table 5). Disagreeing with the statement (n=65) "the streets in my neighbourhood are hilly" was associated with a significantly higher intake of NSP and a higher intake of folate. Individuals who agreed with the statement (n=46) "there are many places to go within easy walking distance from home" had a higher vitamin C intake. Individuals who disagreed with the statement (n=31) "there is nowhere to leave bike safely" had a higher energy and fat intake.

Discussion

Relative to other age-groups, less is known about health related lifestyle patterns in this age group (Nelson et al., 2006). This study has provided descriptions of young peoples' perceptions of their environment, levels of physical activity and sedentary behaviour as well as nutrient intake and the associations between these behaviours.

While high energy intakes were observed in both genders, females met the national dietary reference value (Department of Health, 1991) for percent contribution from fat. Both genders had a high reported sugar, fibre (NSP), vitamin C and folate intakes. This may simply be a result of over-reporting using the FFQ. While the FFQ is relatively straightforward to complete over-reporting of food consumption can be encountered and it does not allow for variations in portion size (Lietz et al., 2002).

Sedentary behaviours and unhealthy diets are known risk factors for the tracking of overweight and obesity from adolescence into adulthood (Viner and Cole, 2006). Longitudinal research has indicated that television viewing in adolescence can be associated with overweight, poor fitness, smoking, and raised cholesterol in adulthood (Hancox et al., 2004). In a systematic review of ninety studies published in English language journals between 1949 and 2004 Marshall et al (2006) found young people spend 2-2.5 hours/ day watching TV, 0.5 hours using computers and 0.75 hours using video games. The respondents in the current study spent at least 1-2 hours on weekdays, and 3-4+ hours/day during the weekend, ‘watching TV, videos, DVDs and listening to music’. Those who spent more time on this behaviour had a higher contribution from fat to their energy intake. Across a number of countries, young people who watched more TV were more likely to consume sweets and soft drinks and less likely to consume fruit and vegetables (Vereecken et al., 2006). Generally those who were more sedentary had higher energy and fat intakes and lower carbohydrate intakes, which could be interpreted as less healthy but without energy expenditure measurements this is difficult to state with confidence. Higher fat intakes and lower carbohydrate intakes were also associated with more time spent ‘sitting or driving in a car’. This combination of sedentary behaviour and less healthy eating patterns has important implications for long term health. Those who spent longer time periods doing homework on weekdays had a higher vitamin C intake which can be interpreted as an indicator of higher fruit and vegetable intake, or potentially an intake of fruit flavoured drinks (Subar et al., 1998). Weekend homework patterns and food intake showed a less clear pattern. More time being spent on homework at the weekend was related to higher intakes of energy, fat, carbohydrates, total sugars, folate and vitamin C, suggesting that higher intakes of food and possibly less healthy foods, high in sugar and fat, were associated with more time being spent on homework. .

This study highlighted that the sample had an overall positive attitude towards their neighbourhood environment. Barriers to walking or cycling in their neighbourhood included not having a safe location to leave bicycles. However, this study lacked objective measures such as crime statistics to relate this to perception to bike crime. There is also the possibility that this was a perception of the general safety of the environment which warrants further investigation. Importantly these perceptions were also related to deprivation, physical activity, sedentary behaviours and diet. While numbers were small and some results were surprising, this is an area which merits further investigation. Most individuals disagreed that walking or cycling required too much planning. These individuals had higher fibre intakes, higher folate intakes and reported spending less time sitting in the car.

Longitudinal studies have reported that the largest decrease in physical activity occurs during the adolescent years (Sallis, 2000). Unsurprisingly the young people studying sport reported being more active than the non-sport students. The Health Survey for England (2003) reported that 51% of young men, and 28% of young women, aged 16-24 years, were active for at least 30 minutes on 5 or more days per week. This study found that 48% of males, and 34% of females reported being moderately active for at least one hour, on 5-7 days per week. While this study was biased with a high proportion of the respondents studying sport, the male: female distribution of activity follows similar patterns.

Research in adults has indicated that people are more likely to walk and cycle when their neighbourhoods have a mixture of land use and a higher residential density (Saelens et al., 2003). Research on obesity and urban housing patterns has reported higher levels of obesity in neighbourhoods where the car is the dominant means of transportation (Sallis et al., 2004). Findings from this study showed that the adolescents did not report spending a great deal of time travelling in a car and reported living close to public transport, yet time spent in the car was associated with less healthy eating patterns and negative perceptions of their environment.

While the sample size of this study is relatively small and biased with a large proportion of the sample being sports students, this is the first UK study to explore the diet, physical activity, sedentary behaviour and perceptions of the environment in 16-20 year olds. This age group proved challenging to recruit, hence the recruitment of students studying a related subject. The sports students were generally more active and there were some dietary differences between these two groups. Respondents were largely a homogenous group of white English individuals with very little ethnic variation, reflective of the environments they were recruited from. Participants lived in different neighbourhoods as demonstrated by the range in deprivation scores. Clearer assumptions and conclusions might have been drawn if the participants were all recruited from the same neighbourhood or stratified by areas with similar characteristics. This study used a self-reported questionnaire to measure young people's perceptions of their environment. It did not objectively measure the "quality" of the environment. Individual perceptions of the environment vary, and only fair to low agreement has been demonstrated between self-reports of neighbourhood environments and objective environmental audits (Booth et al., 2005). However, perception is a vital factor and future work should include a combination of both perceptions and objective measures (Ball et al., 2008). The questionnaire gave an indication of the adolescents' levels of activity. However the use of objective measurements such as accelerometers would give a more complete picture of physical activity levels and sedentary behaviour (Basterfield et al., 2008). The North East of England has the largest percentage of its population (37.8%) living in the most deprived 20% of the Super Output Areas in England (Noble et al., 2004), therefore the deprivation scores of the sample were skewed towards the more deprived areas, despite the wide range of deprivation values.

This current study provides sufficient evidence to support the need for further research of the environmental interactions with health behaviours in this age group. While this study has reported perceptions of the environment, future work plans to address objective measurements of the environment in addition to the perceived environment, such as the use of GPS monitors to measure geographical location (Wiehe et al., 2008, Rainham et al., 2008) and accelerometers to measure physical activity (Trayers et al., 2006). The FFQ, validated in adults but not in this age group, was used in the study as it was a time efficient and un-intrusive method with less respondent burden upon the young people. Additional measures such as BMI and details of eating behaviour and food environments would be more illustrative of environmental influences.

Understanding the diet, physical activity, sedentary behaviours and perceptions of the environment in this age-group is an important step towards developing effective interventions for the prevention of obesity. Although numerous interventions have been conducted, 'effective obesity prevention remains elusive' (Livingstone et al., 2006). Interventions tend to focus on changing individual behaviours while few have tried to change environments in ways that support and enhance individual level behaviour change (Flynn et al., 2006), for example changes to the food environment (White, 2007, Burgoine et al., in press). Few studies have investigated PA, eating behaviour and the wider environment simultaneously (Lake and Townshend, 2006, Townshend and Lake, 2009). These results suggest that there is some relationship and interaction between these behaviours. While this study provides a description of young peoples' perceptions of their environment, dietary intake, and levels of physical activity and sedentary behaviour, further development is required to fully understand this complex interaction between individual behaviours, environmental contexts and obesity prevention.

Conflicts of interest

None

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Table 1 Mean nutrient intakes by gender (n=73) compared with national recommendations (15-18 where appropriate)(Department of Health 1991)

		Male (n=44)	Female (n=29)	Recommendations male	Recommendations female
Nutrients	Energy KJ (SE)	12792 (757)	11804 (924)	11510	8830
	[a]Fat (g)	119 (8)	106 (10)		
	[b]Protein (g)	118 (9)	97 (8)	55.2g/d	45.0g/d
	Total sugars (g) % energy from total sugar	173 (11) 23%	182 (15) 26%	10% total energy from NME sugars	
	% energy from fat	34 (1)	33 (1)	33% total energy	
	[ac]% energy from protein	15 (1)	15 (1)	Average intake 15% total energy	
	% energy from carbohydrate	48 (1)	50 (1)	47% total energy	
	[d]% energy from alcohol	2 (0)	2 (0)	Average intake 5% total energy	
	Non-starch Polysaccharides (NSP) (g)	20 (1)	21 (2)	18g/ day	
	[e]Vitamin C (mg)	136 (11)	184 (16)	40mg/d	40mg/d
	Folate (ug)	357 (21)	346 (25)	200 ug/d	200ug/d

[b]Not normally distributed, analysis conducted with natural log transformation.

[c]Not normally distributed, analysis conducted with Box-Cox transformation.

[d]Very skewed distribution and excluded from analysis

[e]Outliers removed n=70 ♦ females had significantly higher intake than males (*p*=0.012)

[a]The sport students reported a significantly lower intake of fat (99.5g) compared with non-sports students (124.9g *p*=0.031) & a significantly higher % energy from protein compared with the non-sports students (16.4% versus 14.4% respectively, *p*=0.030).

Table 2 Weekday (n=73) and Weekend (n=72) time spent 'watching TV, videos, DVDs or listening to music' and nutrient intake

			n	Mean	Standard Error of Mean	*p*
WEEK DAY Watching TV/videos/DVDs or listening to music	[a]0 to 30 mins	%E Fat	6	28	2	0.006
	1-2 hours		35	33	1	
	[a]3-4+hrs		32	35	1	
WEEKEND Watching TV/videos/DVDs or listening to music	0 to 30 mins	Energy(KJ)	12	11895	1082	0.02
	1-2 hours		23	9995	934	
	3-4+hrs		37	13990	851	
	0 to 30 mins	Fat(g)	12	99	11	0.005
	1-2 hours		23	88	9	
	3-4+hrs		37	135	9	
	0 to 30 mins	%E Fat	12	30	1	0.035
	1-2 hours		23	33	1	
	3-4+hrs		37	35	1	
	0 to 30 mins	%E CHO	12	54	2	0.004
	1-2 hours		23	49	2	
	3-4+hrs		37	47	1	

[a]Bonferroni post-hoc indicated significant differences between the groups (*p*=0.005)

Table 3 Week day (n=70) and Weekend (n=73) time spent ‘doing homework’ and nutrient intake

			n	Mean	Standard Error of Mean	*p*
WEEK DAY Doing homework	[a]0 to 30 mins	Vit C(mg)	23	138	10	0.016
	1-2 hours		43	155	13	
	*[a]3-4+hrs		4	257	36	
WEEKEND Doing homework	0 to 30 mins	Energy(KJ)	26	12121	91	0.002
	1-2 hours		33	10913	710	
	3-4+hrs		14	16421	1720	
	0 to 30 mins	Fat(g)	26	111	9	0.009
	1-2 hours		33	100	8	
	3-4+hrs		14	151	18	
	0 to 30 mins	CHO(g)	26	362	22	<0.001
	1-2 hours		33	331	20	
	3-4+hrs		14	511	53	
	0 to 30 mins	Total Sugars(g)	26	169	11	<0.001
	1-2 hours		33	154	11	
	3-4+hrs		14	244	24	
	0 to 30 mins	Vit C(mg) n=70	24	142	16	0.044
	1-2 hours		32	145	13	
	3-4+hrs		14	201	22	
	0 to 30 mins	Folate(ug)	26	349	27	0.04
	1-2 hours		33	321	20	
	3-4+hrs		14	431	42	

[a]Bonferroni post-hoc indicated significant differences between the groups (p=0.013)

Table 4 Weekday and Weekend time spent sitting or driving a car compared with nutrient intake

			n	Mean	Standard Error of Mean	*P*
WEEK DAY Sitting or driving a car	[a]0 to 30 mins	%E Fat	40	32	1	0.014
	1-2 hours		15	34	1	
	[a]3-4+hrs		5	39	1	
	0 to 30 mins	%E CHO	40	50	1	0.036
	1-2 hours		15	47	2	
	3-4+hrs		5	43	1	
WEEK END Sitting or driving a car	0 to 30 mins	Energy (KJ)	40	11888	664	0.035
	1-2 hours		17	13935	1247	
	3-4+hrs		3	18735	5532	
	[b]0 to 30 mins	Fat(g)	40	105	7	0.016
	1-2 hours		17	135	15	
	[b]3-4+hrs		3	181	54	

[a]Bonferroni post-hoc indicated significant differences between the groups (*p*=0.015)

[b]Bonferroni post-hoc indicated significant differences between the groups (*p*=0.05)

Table 5 Perceptions compared with deprivation, PA, sedentary behaviour and nutrient intake.

Perception	factor			n	χ^2	Degrees of freedom	*P*
The route is boring	Deprivation Score	Most deprived	agree	10	10.13	3	0.017
		Least deprived	disagree	14			
It is easier for someone to drive me	Deprivation Score	Most deprived	disagree	4	10.16	3	0.017
		Least deprived	agree	13			
	WEEK DAY Sitting or driving a car	0-30 mins	disagree	28	10.98	2	0.004
		3-4+hours	agree	4			
Too much stuff to carry	One hour of PA on:	0-2 days/ week	disagree	12	7.24	2	0.027
		5-7 days/ week	agree	19			
Walking or cycling requires too much planning	WEEK DAY Sitting or driving a car	0-30 mins	disagree	38	6.29	2	0.043
		3-4+hours	disagree	5			
	Mean NSP (g)	21g (SE 1)	disagree	65			0.018
The streets in my neighbourhood are hilly		14g (SE 2.7)	agree	8			
	Mean folate (ug)	366 (SE 17)	disagree	65			0.016
		244 (SE 38)	agree	8			
There are many places to go within walking distance from home	Mean vitamin C (mg)	128 (SE 13)	disagree	24			0.035
		169 (SE 12)	agree	46			
There is nowhere to leave a bike safely	Mean Energy intake KJ	13857 (SE 1018)	disagree	31			0.029
		11257 (SE 657)	agree	41			
	Mean fat (g)	129 (SE 11)	disagree	31			0.031
		102 (SE 7)	agree	41			