Health behaviours of 17- to 19-year olds in North East England: assessing adherence to current recommendations for young people at the adolescent-adult boundary

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Abstract

Aims: Late adolescence/young adulthood represents a transition to independence, with increasing control over health behaviours (HB). However, HB data of late adolescents are often reported in wide and inconsistent age brackets, making comparisons with age-targeted guidelines difficult. We aimed to characterise important HB (body composition, physical activity (PA), diet) of late adolescents from North East England.

Methods: A total of 145 17- to 19-year olds from the Gateshead Millennium Study birth cohort participated in 2017 to 2018. Measurements including height, weight, body fat, accelerometer-measured PA and sedentary behaviour, and 24-hour dietary recall were taken. Comparisons with current global age-appropriate recommendations were made for four variables: (1) 60 min moderate-vigorous intensity PA (MVPA)/day (age 17 years old) or 150 min MVPA/week (18- to 19-years old); (2) body fat (<25% for males, <30% for females); (3) free sugars <5% total energy intake; (4) five portions fruit and/or vegetables/day.

Results: Most recommendations were not met: MVPA averaged 37 min/day, 20% of 17-year olds met 60 min/d, and 55% of 18- to 19-year olds met 150 min/week. About 26.5% of participants had excess body fat. Daily fruit/vegetable consumption was 2.7 portions; 12% consumed '5-a-day' portions of fruit and/or vegetables, 13.5% consumed <5% energy from free sugars. Together, 43% of participants met 0/4, 44% met 1/4%, and 0% met 4/4 age-appropriate health recommendations.

Conclusion: These novel empirical data reveal concerning HB in this population of late adolescents, suggesting targeted health messaging to improve HB is needed.

INTRODUCTION

A wealth of data on health behaviours (HB) of children and adults exists, but late adolescents in the age bracket 16–19 years often fall between age categories, or are inconsistently included in either or both. The World Health Organization (WHO) classes adolescence as between ages 10 and 19 years, but late adolescents are often

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included with all other adults. For example: the Health Survey for England uses 0–15 years and 16 years+, but splits overweight prevalence into ranges including 16–24 years, the UK's National Diet and Nutrition Survey (NDNS) uses ranges including 11–18 years and 19–64 years, England's 'State of the Nation' report uses ages 10–15 years/16–24 years for well-being, and 14–15 years/17–19 years for girls' psychological health. These differences mean that age-appropriate data are lacking on late adolescents' modifiable HB (dietary and physical activity (PA)), leading to incorrect estimates of prevalence and meeting guidelines, hindering efforts to improve HB.

PA is well established as a current and future marker of health. Current WHO PA guidelines are for 5- to 17-year olds to average 60 min of moderate-to-vigorous intensity physical activity (MVPA)/day, and for 18+ to accumulate at least 150 min MVPA/week.[1] This 270 min/week difference between 17- and 18-year olds has biological repercussions/consequences. It also demonstrates the confusion in categorising late adolescence even within an organisation (e.g. WHO), compounded by a lack of evidence of longitudinal PA changes in late adolescence.

The UK and WHO guidelines are for '5-a-day' portions of fruit and vegetables (F&V) to prevent ill health[2,3] and that dietary intakes of free sugars should not exceed 5% total energy.[3,4] The most recent findings from NDNS, showed that free sugars intake in 11- to 18-year olds exceeded the recommendation at 12.3%. The recommended intake of AOAC fibre is 30 g/day, but intakes were 16.0 g. However, although an indication of dietary intake in adolescence, these results were reported in the broad age group 11–18 years, so do not necessarily represent the late adolescent population.

This study aimed to quantify modifiable behaviours that directly affect health in a contemporary cohort of 17- to 19-year olds and compare these to global age-appropriate recommendations.

METHODS

Newcastle University Faculty of Medical Sciences Research Ethics Committee approved the study (01258/12316/2017). The Gateshead Millennium Study (GMS) is a well-characterised longitudinal birth cohort of 1029 babies born June 1999–May 2000 in Gateshead, Northeast England. This study (April 2017–August 2018) included late adolescents from the GMS cohort who had not previously opted-out (n = 648). Participants aged 18+ gave written consent, those under 18 had parental consent and individual assent.

Duplicate measures of height (to 0.1 cm, Leicester height measure), weight (to 0.1 kg), and body fat (Tanita TBF 300MA) were made. Body mass index (BMI) was derived (weight (kg)/height (m)^2) and z-scores estimated relative to UK 1990 population reference data.[5] Proportions of underweight, healthy weight, overweight/obesity were calculated using the following population monitoring centiles: underweight ⩽2, healthy weight > 2 < 85, overweight/obesity ⩾85. High body fat at 18 years was calculated (⩾25% for males, 30% for females[6]). Socioeconomic status was assessed using Townsend score at birth and divided into quintiles.

PA and sedentary behaviours (SB) were measured using Actigraph GT1M (Actigraph, Pensacola, FL, USA) accelerometers during waking hours for 7 days. Data were downloaded and analysed using the Actilife programme (v 6.13.3) (Actigraph LLC, Pensacola, FL, USA) and corresponding log sheets. To calculate time spent in SB and MVPA, the cutpoints of ⩽100 cpm and ⩾2296 counts per minute (cpm) were used, respectively. Participants were requested to wear the accelerometer all day except for sleeping or getting wet. Three days of ⩾10 hours wear/day were the minimum inclusion requirements. Adherence to guidelines for either children (17-year olds, average 60 min/d MVPA) or adults (18- to 19-year olds, 150 min/wk MVPA) were assessed.

Participants completed two retrospective online dietary recalls through Intake24 (intake24.co.uk), a web-based 24-h recall system[7] validated for use in 11- to 24-year olds in a comparison study with interviewer-led 24-hour recalls[7] and used in NDNS.[8] Average daily intake data were calculated from the two recalls. Englyst fibre intakes (g) were multiplied by a conversion factor of 1.33 to give an estimate of AOAC fibre intakes. Adherence to '5-a-day' and consuming <5% total energy intake from free sugars, were assessed.

SPSS version 21 (IBM Corp.) was used for analysis. Differences between sexes were tested using the independent samples median test or T-tests. Statistical significance was set at $p < 0.05$. Adherence to four age-appropriate recommendations was assessed: (1) 60-min MVPA/day or 150-min MVPA/week; (2) body fat (<25% for males, <30% for females); (3) Free sugars <5% total energy intake; and (4) five portions F&V/day.

RESULTS

Despite considerable effort, n = 141 late adolescents participated (22% of those eligible), n = 60 male and n = 81 female. Four participants reported a different gender identity to that at birth – data were analysed according to self-reported gender. Ages ranged from 17.0–19.2 years, 24.5% were in the most affluent quintile, followed by 30.9, 23.0, 12.9, and 8.6% from the most-deprived quintile. Participation from the most-deprived quintiles decreased (at birth, proportions were 15%, 20%, 23%, 22%, 19% from most to least affluent). Around 29% had overweight/obesity, although there was no sex difference (chi-square $p = 0.341$). Excess body fat was recorded in more females (41%) than males (9%).

Valid accelerometry data were available for 84/141 participants. Average wear time was 781 min/day. There were no statistically significant differences in PA/SB between sexes. Adherence to accumulating 60 min MVPA/day was accomplished by 9/46 (20%) 17-year olds, 31% of males and 13% of females, and to 150-min MVPA/week by 21/38 (55%) 18- to 19-year

olds, 43% of males and 63% of females.

A total of 141 participants (58% female) completed at least one dietary recall, 73 completed two. Average daily energy intake for the group was 1810 kcal; 1504 and 2223 kcal for females and males, respectively, $p < 0.001$ (Table 1). Males reported a higher intake of AOAC fibre (20.1 g vs 14.5 g, $p < 0.001$) and iron (12.3 mg vs 7.7 mg, $p < 0.001$) than females. Only 17 of the 141 (12%) met the '5-a-day' portions of F&V: mean daily intake was 2.7 portions, 1.4 portions being from fruit, and 1.3 from vegetables, there was no significant difference between sexes. The proportion meeting the recommended <5% total energy from free sugars was 19/141 (13.5%). Few guidelines were met (Table 1); 43% met none, and none met all four.

DISCUSSION

This novel study aimed to gather information on important HB from a contemporary cohort of 17- to 19-year olds, and compare their PA and diet with current recommendations using an age-appropriate approach. We found that most did not meet the PA recommendations for either children or adults, consumed insufficient quantities of fruits/vegetables and more-than-

Table 1.

Results of anthropometry, physical activity, diet, weight status and adherence to health behaviour recommendations.

	All		Male (n = 60)		Female (n = 81)		
Anthropometry	**Median**	**IQR**	**Median**	**IQR**	**Median**	**IQR**	**p**
Age (y) (n = 141)	17.9	0.7	17.9	0.8	18.0	0.7	0.610
Body fat (%) (n = 134)	20.6	16.0	12.0	7.5	27.4	13.7	<0.001
BMI[a] (kg/m^2) (n = 141)	22.1	5.6	21.9	4.8	22.8	6.1	0.922
BMI z-score[b] (n = 141)	0.35	1.9	0.27	1.6	0.49	1.9	0.661
	All (n = 84)		**Male (n = 30)**		**Female (n = 54)**		
Physical activity (daily)	**Median**	**IQR**	**Median**	**IQR**	**Median**	**IQR**	**p**
Mean MVPA min	36.8	29.8	35.2	37.8	37.3	17.0	0.820
Mean sedentary min	584.0	101.9	601.9	94.9	575.4	104.6	0.255
Mean MVPA %	4.6	3.2	4.2	5.4	4.9	2.5	0.495
Mean sedentary %	76.2	11.1	77.9	12.7	75.2	10.0	0.111
	All (n = 141)		**Males (n = 60)**		**Females (n = 81)**		
Dietary intake	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**p**
Energy (E, kcal)	1810	830	2223	880	1504	642	<0.001
Total fat (%E)	31.4	7.7	32.3	6.6	30.7	8.4	0.207
Saturated fat (%E)	11.6	4.3	12.5	3.8	11.0	4.6	0.043
Total carbohydrates (%E)	52.3	9.0	50.3	7.5	53.8	9.8	0.020
Free sugars (%E)	15.4	11.4	13.7	8.6	16.6	13.0	0.139
Calculated AOAC Fibre (g)	16.9	8.4	20.1	9.6	14.5	6.5	<0.001
Iron (mg)	9.63	5.47	12.29	5.81	7.66	4.28	<0.001

(Continued)

Table 1. (Continued)

Portions fruit/veg (n = portions)	2.7	2.5	2.8	2.7	2.6	2.4	0.886
	All		**Males**		**Females**		
Weight status	**n**	**%**	**n**	**%**	**n**	**%**	**X^2 p**
Underweight	8	5.7	6	10.0	2	2.5	0.341
Healthy weight	92	65.2	39	65.0	53	65.4	
Overweight and obesity	41	29.1	15	24.9	26	32.1	
	All		**Males**		**Females**		
Meeting specific recommendations	**n**	**%**	**n**	**%**	**n**	**%**	
Body fat (<25% for males, <30% for females)[c]	103	77	55	91	48	59	
60 min MVPA/day (17-year olds)	9/46	20	5/16	31	4/30	13	
150 min MVPA/week (18- and 19-year olds)	21/38	55	6/14	43	15/24	63	
Free sugars (<5%E)	19	14	8	13	11	14	
5-a-day portions of fruit/veg	17	12	7	2	10	12	
Total age-appropriate recommendations met	**All (n = 141)**						
	n			**%**			
0	60			43			
1	62			44			
2	16			11			
3	3			2			
4	0			0			

[a]BMI = body mass index.
[b]Compared with UK 1990 reference data.[5]
[c]body fat was also assessed using birth sex but the results were unchanged.

recommended free sugars. The HB of this age group are thought to be sub-optimal, but data interpreted against age-appropriate guidelines and benchmarks are lacking; we have highlighted the inconsistencies that exist within both surveys and organisations and demonstrated that most recommendations targeting HB are not met. WHO published comprehensive guidance on multisectoral approaches to obesity prevention, which should be used with this population to improve HB.[9]

There are few comparable cohorts with PA/SB data. Unpublished results also from North East England in 2005/6[10] of 16- to 18-year olds found that males averaged of 1.3 h of moderate/vigorous activity and females 0.9 h.[10] Around 34% of males and 25% of females completed at least 60 min MVPA/day,[10] more than our participants (21%). Outside the UK, the Iowa Bone

Development Study (IBDS) is a long-running cohort that has measured PA. The participants in IBDS recorded considerably more MVPA (59 and 56 min (females), and 84 and 79 min (males) at 17 and 19 years, respectively[11]) than the GMS; however, the cutpoint for MVPA in IBDS was lower at ⩾297 counts/10 s (equivalent to 1782 cpm).[11] In the Brazilian Pelotas cohort,[12] 73% of males and 52% of females achieved at least 60 min MVPA/day at age 18, again higher than GMS.

Low PA of participants is concerning regards healthy body weight; 18.5% had obesity, compared with 14% at 15 years.[13] MVPA at younger ages protected against obesity at 15 years,[13] something also demonstrated in later adolescence/young adulthood in the Pelotas[12] and IBDS cohorts.[11]

There is no 'maximum amount' of recommended sedentary time[1] so 5- to 17-year olds should 'limit the amount of time spent being sedentary'[1]: the 76% of their waking day our participants spent sedentary would likely surpass any threshold. This is similar to Norwegian 16-year olds' 9.5 h of accelerometer-measured SB.[14]

Dietary intake is comparable to 11- to 18-year old NDNS data.[15] Fibre was just over half of recommended 30 g/day for 16- to 18-year olds and adults, but similar to NDNS (16.9 g compared with 16 g). Free sugars intake was conversely slightly higher than the 12.5% in NDNS. Just 13.5% of participants met the recommended <5% free sugars, and 12% consumed '5-a-day' F&V, the same proportion as measured in the NDNS 11- to 18-year olds,[15] and more than United States' 14- to 18-year olds (7% for fruit and 2% for vegetables[16]): the issue of under-consumption of F&V extends beyond the United Kingdom.

Strengths include empirical evidence of an important but neglected problem in this specific population, using age-appropriate recommendations for PA and obesity, from a well-characterised birth cohort, with representation across a range of socioeconomic status. HB variables were carefully age-matched to the correct recommendation or guideline. Problems included attrition leading to low recruitment and incomplete data; further research will discover the generalisability of the findings.

In this contemporary group of late adolescents from North East England, most did not meet current guidelines for a range of HB including PA, dietary choices and body composition. Future public health efforts to improve these important behaviours will need innovative and targeted methods.

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DECLARATION OF CONFLICTING INTERESTS

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ETHICAL APPROVAL

Newcastle University Faculty of Medical Sciences Research Ethics Committee approved the study (01258/12316/2017).

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DATA AVAILABILITY STATEMENT

Data are available from the corresponding author upon reasonable request, prior to data being added to a repository.

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