Prevalence and correlates of meeting sleep, screen-time, and physical activity guidelines among UK adolescents [Research letter]

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among UK adolescents

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Background: There is convincing evidence that modifiable lifestyle behaviours such as sleep, moderate-to-vigorous-physical activity (MVPA), and screen-time (ST) are associated with physical, social and mental health in adolescents [1]. However, much of this evidence comes from studies examining behaviours independently. There is growing interest in the importance of combinations of these behaviours because of the potential synergistic effects on health [2]. To improve the health of adolescents we need to better understand the determinants of combinations of behaviours. There is little nationally representative data on the prevalence of meeting combinations of recommendations for sleep, ST and MVPA [3], and we know little about the associated contextual factors [4].

Methods: Data from the UK representative Millennium Cohort Study (MCS) were used [5] when cohort members were aged 14 years. Sleep duration and ST were self-reported, and MVPA was assessed using the GENEActiv wrist worn accelerometer worn for 24h on a randomly selected week and weekend day (data included if participants had ≥10 h of valid wear for both days). A behavioural risk score of zero was applied when all recommendations were met (> 8 hours of sleep on a school night; ST $\leq$2hrs/d; MVPA $\geq$60min/d [6]). The likelihood of having a behavioural risk score of zero was examined according to sex, ethnicity, weighted household income, depressive symptoms, and obesity.

Results: Data from 3,899 adolescents were included in the present analyses (37.7% of those with consent at 14y). Excluded participants tended to be from lower social strata, have higher prevalence of depressive symptoms and obesity, although differences were small. Overall, 9.7% met recommendations for sleep, ST and MVPA concurrently; 89.3% of

adolescents met guidelines for sleep, 40.5% for MVPA and 23.1% for screen-time; 21.6% met guidelines for both sleep and ST, 36.3% for both sleep and MVPA, and 10.5% met guidelines for both ST and MVPA. Adolescent girls from the lowest income quintile and those with depressive symptoms were less likely to meet all three recommendations (Table 1). Adolescent boys who were obese and those with depressive symptoms were less likely to meet all three recommendations (Table 1).

Conclusions: ST was the main driver of not meeting all three recommendations, followed by MVPA, then sleep. Combinations of behavioural risk factors are highly prevalent among British adolescents with only 9.7% meeting recommendations for sleep, ST and MVPA. This figure is higher than that reported in a study of US adolescents where only 5% met all three recommendations [6], and marginally lower than that reported in a regional study of British 9-11 year olds [3]. Differences might be due, in part, to the older age of the US sample (16-17 yrs.), and/or differences in methods used to assess the behaviours (i.e. devices to measure MVPA vs self-report). Indeed, the physical activity recommendations were developed and established based on evidence from self-reported measures, thus using objective data to classify participants may result in discrepancies.

The first step towards targeted intervention efforts is an understanding of the factors that are associated with engaging in multiple unhealthy behaviours. Similarly to the US study, our analyses showed that adolescent boys and girls with depressive symptoms had lower odds of meeting all three recommendations, although associations of other independent variables such as income and obesity appeared to differ by gender in the present study.

Given that weight status and depression are socially patterned in the UK, our findings validate the need for UK based prospective studies, using robust measures, to understand causal pathways and, importantly, the socio-economic patterning of lifestyle behaviours and health markers in girls and boys to inform interventions and policy.

References

1. Poitras VJ, Gray CE, Borghese MM, et al. Systematic review of the relationships between objectively measured physical activity and health indicators in school-aged children and youth. *Appl. Physiol. Nutr. Metab.* 2016;41(6 (Suppl. 3)):S197-S239.

2. Saunders TJ, Gray CE, Poitras VJ, et al. Combinations of physical activity, sedentary behaviour and sleep: relationships with health indicators in school-aged children and youth. *Appl. Physiol. Nutr. Metab.* 2016;41(6 (Suppl. 3)):S283-S293.

3. Roman-Vinas B, Chaput JP, Katzmarzyk PT, et al. Proportion of children meeting recommendations for 24-hour movement guidelines and associations with adiposity in a 12-country study. *In J Behav Nutr Phys Act.* Nov 25 2016;13.

4. Leech RM, McNaughton SA, Timperio A. The clustering of diet, physical activity and sedentary behavior in children and adolescents: a review. *In J Behav Nutr Phys Act.* Jan 22 2014;11.

5. Connelly R, Platt L. Cohort Profile: UK Millennium Cohort Study (MCS). *Int J Epidemiol.* Dec 2014;43(6):1719-1725.

6. Knell G, Durand CP, Kohl HW, III, Wu IHC, Pettee Gabriel K. Prevalence and Likelihood of Meeting Sleep, Physical Activity, and Screen-Time Guidelines Among US YouthPrevalence and Likelihood of Meeting Sleep, Physical Activity and Screen-Time Guidelines Among US Youth [published online February 4, 2019]. *JAMA Pediatr*. doi:10.1001/jamapediatrics.2018.4847

Table 1. Logistic regression to examine factors associated with optimal physical behaviours (score zero†) stratified by sex.

	Boys Adjusted Odds ratio (95% CI)	Girls Adjusted Odds ratio (95% CI)
Household income (quintile): 1 (lowest, Ref)	1.0	1.0
2 (middle)	0.62 (0.37, 1.04)	1.34 (0.77, 2.31)
3 (highest)	1.09 (0.68, 1.75)	2.13 (1.28, 3.54)
IOTF body mass index group: Normal (Ref)	1.0	1.0
Overweight	0.83 (0.54, 1.28)	0.64 (0.42, 0.99)
Obese	0.39 (0.15, 0.96)	1.19 (0.68, 2.10)
Depressive symptoms: MFQ<12 points (Ref)	1.0	1.0
MFQ≥12 points	0.46 (0.21, 1.00)	0.63 (0.41, 0.96)

Models are mutually adjusted for all presented variables.

†Behavioral risk factor score calculated as follows: participants scored 1 point for each of the following risk factors: sleep <8 hrs on a school night; daily screen time > 2hrs; device-measured MVPA < 60min/d (MVPA was derived from 5sec epochs, where ENMO >100 mg; 80% over 1min bout).