Available online at www.sciencedirect.com

Public Health

journal homepage: www.elsevier.com/puhe

Original Research

Self-rated health and health-related quality of life are related with adolescents' healthy lifestyle

A. Marques [a,b,*], M. Peralta [a], T. Santos [d], J. Martins [e,f], M. Gaspar de Matos [c,g]

[a] Centro Interdisciplinar de Estudo da Performance Humana, Faculdade de Motricidade Humana, Universidade de Lisboa, Lisboa, Portugal
[b] Centro de Investigação em Saúde Pública, Escola Nacional de Saúde Pública, Universidade Nova de Lisboa, Lisboa, Portugal
[c] Instituto de Saúde Ambiental, Faculdade de Medicina, Universidade de Lisboa, Lisboa, Portugal
[d] Faculdade de Ciências da Saúde e do Desporto, Universidade Europeia
[e] Laboratório de Pedagogia, Faculdade de Motricidade Humana e UIDEF, Instituto de Educação, Universidade de Lisboa, Lisboa, Portugal
[f] Faculdade de Educação Física e Desporto, Universidade Lusófona de Humanidades e Tecnologias, Lisboa, Portugal
[g] Faculdade de Motricidade Humana, Universidade de Lisboa, Lisboa, Portugal

ARTICLE INFO

Article history:
Received 20 November 2018
Received in revised form
13 January 2019
Accepted 22 February 2019
Available online 9 April 2019

Keywords:
Adolescents' health
Health behaviours
Lifestyle

ABSTRACT

Objectives: Self-rated health (SRH) and health-related quality of life (HRQoL) are related with health outcomes. It is expected that these constructs are also associated with healthy behaviours. Thus, the present study sought to analyse the associations between a healthy lifestyle composite score and SRH and HRQoL among adolescents.
Study design: This was an observational, cross-sectional study.
Methods: Data were obtained from the cross-sectional health behaviour in school-aged children (HBSC) 2014 Portuguese survey. Participants were 5024 adolescents (2373 boys), aged 10–17 years. A composite score of healthy lifestyle was obtained using the combination of the following factors: daily physical activity, sleep at least 8–9 h/night, daily consumption of fruit and vegetables, spend <2 h daily in screen-based behaviours, never drink and never smoke.
Results: Adolescents with a healthy lifestyle had significantly better SRH and higher HRQoL than those who were not engaged in all healthy behaviours.
Conclusions: Healthy lifestyle (composed of physical activity, sleep at least 8–9 h/night, daily consumption of fruit and vegetables, spend <2 h daily in screen-based behaviours, never drink and never smoke) is related to SRH and HRQoL. Promoting a comprehensive approach to these behaviours is a public health strategy to be considered when aiming to improve health, in general, and SRH and HRQoL, in particular.

* *Corresponding author*. Faculdade de Motricidade Humana, Universidade de Lisboa, Estrada da Costa, 1499-002, Cruz Quebrada, Portugal. Tel.: +351 214149100; fax: +351 214151248.
E-mail address: amarques@fmh.ulisboa.pt (A. Marques).
https://doi.org/10.1016/j.puhe.2019.02.022
0033-3506/

Introduction

Recently, psychosocial aspects of health have gained interest. Constructs such as health perception, and health-related quality of life (HRQoL) are included in a broader domain because they pertain to positive health.[1] Self-rated health (SRH) is a significant predictor of morbidity and mortality,[2,3] it is related to health biomarkers[2,4] and it is an indicator of physiological states among adolescents and adults.[5,6] HRQoL has been related to several physical and mental health outcomes.[7,8]

With SRH and HRQoL being related with better health outcomes,[3,4,6] it is expected that these constructs are also associated with healthy behaviours. In fact, regular physical activity, less sedentary time,[9,10] a healthy diet[11] and non-smoking habits[12–14] have been reported to be associated with better SRH and HRQoL.

Studies have focused on the relationship of SRH and HRQoL with a particular health outcome and individual behaviours.[9,10,14] To the best of our knowledge, there is no study addressing the use of a healthy lifestyle composite score with SRH and HRQoL. Combining several health behaviours to create a measure that expresses a healthy lifestyle measure could be important to public health policy. This influences the way in which programs that set up to promote healthy lifestyles are developed. Therefore, this study aimed to analyse the associations between a healthy lifestyle composite score and SRH and HRQoL among adolescents.

Methods

Participants and procedures

The data were obtained from the HBSC 2014 Portuguese survey. The HBSC survey is conducted every four years in several European and Northern American countries. The HBSC population includes adolescents aged 11, 13 and 15 years who attend regular schools.[15] The purpose of the survey is to gain an understanding of adolescents' health and well-being to describe the social and psychological determinants of their health. The survey is conducted using a self-administered questionnaire completed in public schools. The schools had been stratified by regions and were randomly selected. The methodological procedures of the HBSC study are well developed through an internationally standardised research protocol that allows cross-cultural comparisons. A detailed description of the methods and instrument can be found elsewhere.[15]

School administrators, legal guardians and adolescents gave written consent. Adolescents' participation was voluntary and anonymous, and there were no incentives for participation. Research was conducted in accordance with both the Ethical Committee of Oporto Medical School and the National Data Protection System.

The HBSC 2014 Portuguese survey sample consisted of 6026 adolescents, attending the 6th, 8th and 10th grade. For the present study, only students who reported physical activity levels, screen-based sedentary behaviours, sleeping time, fruit and vegetables consumption, alcohol consumption and tobacco use were selected. The result was a final sample size of 5024 adolescents (2373 boys and 2651 girls), aged 10–17 years (mean = 13.9 ± 1.7). Ethical approval was sought from the university ethics boards or other authorities associated with the research team in each country.

Measures

Sociodemographic characteristics

Adolescents reported sex, age, school grade and parents' education.

SRH and HRQoL

The adolescents' perception of their health was collected through the question, "You would say your health is…?" Answers were given, through selection, on a 4-point scale (poor, fair, good and excellent).[16] HRQoL was assessed by KIDSCREEN-10. It contains 10 items regarding family life, peers and school life. The items result in one global score. This one-dimensional measure represents a global score adequate for use in large (epidemiological) surveys, as described elsewhere.[17,18]

Healthy lifestyle behaviours

Adolescents were provided with a definition of physical activity,[19] accompanied by examples of some age-relevant activities. Then, they were asked to rate the number of days over the past week that they were physically active, for a total of at least 60 min per day. Answers were given on an 8-point scale (0 = none to 7 = daily). Responses were dichotomised into ≥6 times per week and daily, according to the physical activity guidelines.[20]

Watching television, playing videogames and using computers were selected as the screen-based sedentary behaviours. Adolescents were asked to indicate the average time (hours per day) they spent on each activity. Total screen-based behaviour was calculated by the sum of these three sedentary behaviours. The total sum of screen-based sedentary behaviours was dichotomised into ≥2 h and <2 h daily.[21]

Adolescents were asked how many hours they usually sleep per night on average. Based on the responses, sleep duration was dichotomised into <9 h/night and ≥9 h/night for adolescents younger than or aged 12 years and <8 h/night and ≥8 h/night for adolescents older than 12 years, according to centers for disease control and prevention (CDC).[22]

Consumption of fruits and vegetables is an important aspect of healthy living in school-aged children;[23,24] thus, adolescents were asked to report their frequency of consumption. The options were 'never', 'less than once a week', 'once a week', '2–4 days a week', '5–6 days a week', 'once every day' and 'several times every day'. The items were dichotomised into less than daily and daily.

Adolescents were asked about their alcoholic drinking habits such as beer, wine or liquor/spirits. For each alcoholic drink, response options were 'never', 'rarely', 'every month', 'every week' and 'every day'. It is important to note that the guidance on alcohol consumption among children and adolescents states that no consumption is recommended during this life stage[25] and that alcohol consumption can cause them harm.[26] Given this guidance, responses were dichotomised

into drink alcohol (irrespective of the frequency) and never drink alcohol.

Smoking status was defined based on the question, "Presently, how often do you smoke tobacco?" Possible responses were 'every day', 'at least once a week, but not every day', 'less than once a week' or 'never'. Because there is no threshold for safety of smoking, responses were recoded into current smoker (regularly or sometimes) and non-smoker.

Healthy lifestyle composite score

The healthy lifestyle composite score was obtained by combining all these healthy behaviours. Adolescents scored one point for achieving each of the following healthy lifestyle categories: a) daily physical activity, b) spent <2 h/day in screen-based sedentary behaviours, c) sleep at least 8 or 9 h/night, d) daily consumption of fruit and vegetables, e) never drink and f) never smoke. Thus, the healthy lifestyle score ranged from 0 to 6, with only a score of 6 representing a healthy lifestyle.

Data analysis

Descriptive statistics were calculated (means, standard deviation and percentages) for all variables. Independent student *t*-test was used to test the relationship of SRH and HRQoL with healthy lifestyle behaviours and the healthy lifestyle score. Finally, several models of linear regression were conducted to analyse the effect of the healthy lifestyle score on SRH and HRQoL. Variables were standardised before entering into the models. Model one was unadjusted. In model 2, the analysis was adjusted for sex, age, father's education and mother's education. In model 3, the analysis was further mutually adjusted for SRH and HRQoL. Statistical analysis was performed using SPSS 24. The significance level was set at $P < 0.05$.

Results

Table 1 presents the characteristics of this study's sample and the prevalence of healthy lifestyle behaviours. Prevalence ranged from 14.9% (95% confidence interval [CI]: 13.9–15.9%) for those engaging in daily physical activity and 92.3% (95% CI: 91.5–93.0%) for those reporting to be non-smokers. Only 1.4% (95% CI: 1.1–1.8%) of adolescents could be considered having a healthy lifestyle, achieving all six healthy behaviours.

The relationship between SRH, HRQoL, healthy behaviours and healthy lifestyle composite measures is presented in Table 2. Adolescents who engage in physical activity every day, sleep at least 8/9 h per night, consumed fruit and vegetables every day, did not drink alcohol and did not smoke tobacco presented better SRH and higher HRQoL. For the healthy lifestyle composite score, adolescents with a healthy lifestyle had significantly better SRH (3.7, 95% CI: 3.5–3.8 vs 3.3, 95% CI: 3.2–3.2; $P < 0.001$) and higher HRQoL (43.7, 95% CI: 42.5–44.8 vs 38.8, 95% CI: 38.6–39.9; $P < 0.001$) than those who were not engaged in all healthy behaviours.

The parameters that estimate the relationship between SRH, HRQoL and the healthy lifestyle composite score are presented in Table 3. SRH is related with healthy lifestyle composite score in the unadjusted analysis ($\beta = 0.22$, 95% CI: 0.19–0.24). When the analysis was adjusted to the sociodemographic variables ($\beta = 0.18$, 95% CI: 0.15–0.21), and further for HRQoL ($\beta = 0.09$, 95% CI: 0.06–0.11), the relationship remained significant. HRQoL was also significantly related with the healthy lifestyle composite score. Adolescents who were engaged in more healthy lifestyle behaviours had higher HRQoL in the unadjusted model ($\beta = 0.31$, 95% CI: 0.26–0.34) and in the adjusted models for sociodemographic variables ($\beta = 0.24$, 95% CI: 0.21–0.26) and further for SRH ($\beta = 0.17$, 95% CI: 0.15–0.20). It is clear that the healthy lifestyle composite score was strongly related with HRQoL.

Table 1 – Participants' characteristics ($n = 5024$).

Characteristic	Total M ± SD or % (95% CI)
Sex	
Boys	47.2 (45.9–48.6)
Girls	52.8 (51.4–54.1)
Age (years)	13.9 (13.9–14.0)
School grade	
6th grade	32.6 (31.3–33.9)
8th grade	40.0 (38.6–41.3)
10th grade	27.4 (26.2–28.7)
Father's education	
Primary education	20.7 (19.6–21.8)
Middle school	35.9 (34.5–37.2)
Secondary education	25.0 (23.8–26.3)
Superior education	18.4 (17.4–19.5)
Mother's education	
Primary education	13.6 (12.6–14.5)
Middle school	34.9 (33.6–36.3)
Secondary education	28.2 (27.0–29.5)
Superior education	23.3 (22.1–24.5)
SRH	3.2 (3.2–3.3)
HRQoL	38.8 (38.6–39.0)
Physical activity every day	14.9 (13.9–15.9)
Screen time < 2 h/day	44.4 (43.0–45.7)
Sleep ≥8 or 9 h/night	62.5 (61.2–63.8)
Eat fruits/vegetables every day	31.5 (30.2–32.8)
Not drink	72.8 (71.6–74.0)
Not smoke	92.3 (91.5–93.0)
Healthy lifestyle score	
≤5 healthy behaviours	98.6 (98.2–98.9)
six healthy behaviours	1.4 (1.1–1.8)

M, mean; SD, standard deviation; CI, confidence interval; SRH, self-rated health; HRQoL, health-related quality of life.

Discussion

The aim of this study was to analyse the association between a healthy lifestyle composite score and SRH and HRQoL in adolescents. Those with a healthy lifestyle had better health perception and higher HRQoL. From the association between SRH, HRQoL and each healthy behaviour, engaging in physical activity every day, sleeping at least 8/9 h per night, consuming fruit and vegetables daily, not drinking alcohol and not smoking tobacco were significantly related with both SRH and HRQoL. Only screen-based time was not significantly related with SRH and HRQoL. The healthy lifestyle composite score was linearly related to SRH and HRQoL. Furthermore, it is also

Table 2 – Relationship between SRH, HRQoL, healthy behaviours and the healthy lifestyle composite measure.

Variables	SRH		HRQoL	
	M (95% CI)	*p*	M (95% CI)	*p*
Physical activity		<0.001		<0.001
≤6 days/week	3.2 (3.2, 3.2)		38.4 (38.2, 38.6)	
Daily	3.5 (3.5, 3.6)		41.2 (40.8, 41.7)	
Screen-based time		0.426		0.162
≥2 h/day	3.2 (3.2, 3.3)		38.7 (38.4, 39.0)	
<2 h/day	3.2 (3.2, 3.3)		38.9 (38.7, 39.2)	
Sleep duration		<0.001		<0.001
Sleep <8 h/day	3.1 (3.1, 3.1)		39.9 (36.7, 37.4)	
Sleep ≥8 h/day	3.4 (3.3, 3.3)		37.1 (39.7, 40.1)	
Fruit and vegetable consumption		<0.001		<0.001
Not daily	3.2 (3.2, 3.2)		38.3 (38.1, 38.5)	
Daily	3.3 (3.3, 3.4)		40.0 (39.7, 40.4)	
Drink alcohol		<0.001		<0.001
Drink	3.1 (3.1, 3.1)		36.3 (36.0, 36.7)	
Do not drink	3.3 (3.3, 3.3)		39.8 (39.5, 40.0)	
Smoking		<0.001		<0.001
Smoke	2.9 (2.8, 3.0)		34.6 (33.9, 35.3)	
Do not smoke	3.3 (3.2, 3.3)		39.2 (39.0, 39.4)	
Healthy lifestyle score		<0.001		<0.001
≤5 healthy behaviours	3.3 (3.2, 3.2)		38.8 (38.6, 38.9)	
six healthy behaviours	3.7 (3.5, 3.8)		43.7 (42.5, 44.8)	

SRH, self-rated health; HRQoL, health-related quality of life; CI, confidence interval; M, mean.
Tested by independent sample *t*-test.

important to highlight that only 1.4% of Portuguese adolescents had a healthy lifestyle, when considering all healthy behaviours together. Taking into account that a healthy lifestyle has positive impacts on health outcomes and prevents early onset of chronic diseases,[27] most Portuguese adolescents are potentially at risk. The behaviour choices of adolescents may put at risk their future health.

SRH is a multidimensional concept. For adolescents, it is associated with the comprehensive spectrum of variables reflecting personal, social, psychological, behavioural and medical factors.[6,28,29] Similarly, physical activity, time spent in screen-based behaviours, sleep duration, fruit and vegetable consumption, alcohol consumption and smoking tobacco are associated with health outcomes.[15,27,30–32] Therefore, the positive and significant relationship between SRH and the healthy lifestyle composite score suggests that this score reflects the adolescents' health status. It is also important to highlight that the highest value for SRH was observed for those who had a healthy lifestyle (achieving all six healthy behaviours). Supporting that a multibehavioural healthy lifestyle should be promoted, instead of only individual behaviours, is noteworthy from a public health view point.

HRQoL is a multidimensional construct that reports to a person's self-perceived health, comprising several ratings of well-being, including physical well-being/functioning, emotional well-being, self-esteem, family relations and social functioning.[33] Previous studies have related HRQoL with some individual health behaviours, such as physical activity and sedentary behaviour,[9,10] diet,[11] smoking[13,34] and alcohol consumption.[35] Thus, it is not surprising that HRQoL was associated with the healthy lifestyle composite score, a composite measure of those behaviours. Hence, HRQoL is related to several physical and mental health outcomes.[7,8] Results suggest that the healthy lifestyle composite score may reflect the adolescents' health status. Also, similar to SRH, those who had a healthy lifestyle had better HRQoL, reinforcing the importance of promoting a multibehavioural healthy lifestyle from a public health stance.

Although the association of a healthy lifestyle composite score with both SRH and HRQoL was significant, the relationship with HRQoL was stronger. It can be due to the fact

Table 3 – Parameter estimates of the relationship between SRH, HRQoL and the healthy lifestyle composite measure.

Variables	SRH [β (95% CI)]			HRQoL [β (95% CI)]		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Healthy lifestyle score	0.22 (0.19–0.24)	0.18 (0.15–0.21)	0.09 (0.06–0.11)	0.31 (0.26–0.34)	0.24 (0.21–0.26)	0.17 (0.15–0.20)

SRH, self-rated health; HRQoL, health-related quality of life; CI, confidence interval.
Variables were standardised before entering into the model.
Model 1: Unadjusted.
Model 2: Analysis was adjusted for sex, age, father's education and mother's education.
Model 3: Analysis was adjusted for sex, age, father's education and mother's education and mutually for self-rated health and health-related quality of life.

that adolescents usually have fewer medical events. Moreover, adolescence represents a critical transition in lifespan, characterised by a huge step in growth, where profound biopsychosocial changes occur, involving a whole set of new multifaceted challenges to youth. It is a unique period of discovery, experimentation and transformations,[36] involving the different aspects included in HRQoL and probably not so much related to disease specificities, more connected with SRH.[2,3]

There is still much work to be carried out to promote healthy lifestyles and to raise awareness of the potential risk to the health status among adolescents. Given that it is already known that health behaviours are set during this developmental period, understanding how best to promote healthy lifestyles is of crucial importance during this life phase. Also, important to highlight is the fact that the lower prevalence of adolescents with a healthy lifestyle seems to corroborate that unhealthy behaviours tend to cluster together.[37] Therefore, promoting a comprehensive approach to these behaviours, instead of targeting them separately, is a public health strategy to be considered when aiming to improve health, in general, and SRH and HRQoL, in particular.

It is also important to mention that healthy lifestyle is a pattern of health behaviours based on choice from options that are available according to people's life situation.[38] It means that lifestyle is influenced by education and social context provided by chance. The potential influence of socio-economic factors, such as education, perhaps explains why the statistical relation lowers down when the models included education. Thus, there is a need to think that the concept of lifestyles promote a sense of stability for an individual by providing an anchor in a particular social constellation of style and activity.[39]

Several limitations of this study must be acknowledged. All data were self-reported, and reliability and validity have not been studied for all healthy lifestyle behaviours measured. So far, there is no consensus as to how to define a healthy lifestyle. In Europe, there are different guidelines for fruit and vegetable consumption, the guideline varies between countries, which is difficult to define a cut-off point.[23] Besides that, there is no consensus about what nutritional components constitute a healthy diet. Furthermore, the cross-sectional design of the study precludes making a causal inference for the relationship between healthy lifestyle and sociodemographic factors. Thus, results need to be interpreted with that in mind.

Conclusion

In spite of the knowledge of the health benefits of engaging in physical activity every day, minimising the time spent in screen-based behaviours, sleep time duration, daily consumption of fruits and vegetables and no alcohol and tobacco use, only 1.4% of Portuguese adolescents can be classified having a healthy lifestyle. Healthy behaviours, except screen-based time, are related with both SRH and HRQoL, and a healthy lifestyle composite score is linearly related to SRH and HRQoL. The significant relationship between a healthy lifestyle and SRH and HRQoL shows that this combination of several healthy behaviours into a composite measure of healthy lifestyle is a strong variable to analyse adolescents' health status and must be highlighted both in health and educational public policies.

Author statements

Acknowledgements

The authors thank the adolescents for their participation in the study and the teachers for their assistance in helping collecting data.

Ethical approval

Ethical approval was sought from the university ethics boards or other authorities associated with the research team in each country. This research was conducted in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Funding

None declared.

Competing interests

The authors declare that there are no conflicts of interest. HBSC is an international study carried out in collaboration with WHO/EURO.

REFERENCES

1. Grao-Cruces A, Fernandez-Martinez A, Nuviala A. Association of fitness with life satisfaction, health risk behaviors, and adherence to the Mediterranean diet in Spanish adolescents. *J Strength Condit Res/Natl Strength Condit Assoc* 2014;**28**:2164–72.
2. DeSalvo KB, Bloser N, Reynolds K, He J, Muntner P. Mortality prediction with a single general self-rated health question. A meta-analysis. *J Gen Intern Med* 2006;**21**:267–75.
3. Mavaddat N, Valderas JM, van der Linde R, Khaw KT, Kinmonth AL. Association of self-rated health with multimorbidity, chronic disease and psychosocial factors in a large middle-aged and older cohort from general practice: a cross-sectional study. *BMC Fam Pract* 2014;**15**:185.
4. Vie TL, Hufthammer KO, Holmen TL, Meland E, Breidablik HJ. Is self-rated health a stable and predictive factor for allostatic load in early adulthood? Findings from the Nord Trondelag Health Study (HUNT). *Soc Sci Med* 2014;**117**:1–9.
5. Jylha M, Volpato S, Guralnik JA. Self-rated health showed a graded association with frequently used biomarkers in a large population sample. *J Clin Epidemiol* 2006;**59**:465–71.
6. Warnoff C, Lekander M, Hemmingsson T, Sorjonen K, Melin B, Andreasson A. Is poor self-rated health associated with low-grade inflammation in 43,110 late adolescent men of the general population? A cross-sectional study. *Bmj Open* 2016;**6**:e009440.
7. Weitkamp K, Daniels JK, Romer G, Wiegand-Grefe S. Health-related quality of life of children and adolescents with mental disorders. *Health Qual Life Outcomes* 2013;**11**:129.
8. Rajmil L, Palacio-Vieira JA, Herdman M, Lopez-Aguila S, Villalonga-Olives E, Valderas JM, et al. Effect on health-related

quality of life of changes in mental health in children and adolescents. *Health Qual Life Outcomes* 2009;**7**:103.
9. Omorou AY, Langlois J, Lecomte E, Briancon S, Vuillemin A. Cumulative and bidirectional association of physical activity and sedentary behaviour with health-related quality of life in adolescents. *Qual Life Res* 2016;**25**:1169–78.
10. Wu XY, Han LH, Zhang JH, Luo S, Hu JW, Sun K. The influence of physical activity, sedentary behavior on health-related quality of life among the general population of children and adolescents: a systematic review. *PLoS One* 2017;**12**:e0187668.
11. Bolton KA, Jacka F, Allender S, Kremer P, Gibbs L, Waters E, et al. The association between self-reported diet quality and health-related quality of life in rural and urban Australian adolescents. *Aust J Rural Health* 2016;**24**:317–25.
12. Wang HM, Bell JF, Edwards TC, Patrick DL. Weight status, quality of life, and cigarette smoking among adolescents in Washington State. *Qual Life Res* 2013;**22**:1577–87.
13. Dube SR, Thompson W, Homa DM, Zack MM. Smoking and health-related quality of life among U.S. Adolescents. *Nicotine Tob Res* 2013;**15**:492–500.
14. Heshmat R, Qorbani M, Safiri S, Eslami-Shahr Babaki A, Matin N, Motamed-Gorji N, et al. Association of passive and active smoking with self-rated health and life satisfaction in Iranian children and adolescents: the CASPIAN IV study. *Bmj Open* 2017;**7**:e012694.
15. Currie C, Zanotti C, Morgan A, Currie D, Looze M, Roberts C, et al. *Social determinants of health and well-being among young people: health behaviour in school-aged children (HBSC) study : international report from the 2009/2010 survey*. Copenhagen: WHO Regional Office for Europe; 2012.
16. Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. *J Health Soc Behav* 1997;**38**:21–37.
17. Ravens-Sieberer U, Erhart M, Rajmil L, Herdman M, Auquier P, Bruil J, et al. Reliability, construct and criterion validity of the KIDSCREEN-10 score: a short measure for children and adolescents' well-being and health-related quality of life. *Qual Life Res* 2010;**19**:1487–500.
18. Matos MG, Gaspar T, Simoes C. Health-related quality of life in Portuguese children and adolescents. *Psicol Reflexão Crítica* 2012;**25**:230–7.
19. Caspersen C, Powell K, Christenson G. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Publ Health Rep* 1985;**100**:126–31.
20. Global WHO. *Recommendations on physical activity for health*. Geneva: World Health Organization; 2010.
21. American Academy of Pediatrics. American academy of pediatrics: children, adolescents, and television. *Pediatrics* 2001;**107**:423–6.
22. Hirshkowitz M, Whiton K, Albert SM, Alessi C, Bruni O, DonCarlos L, et al. National Sleep Foundation's updated sleep duration recommendations: final report. *Sleep Health* 2015;**1**:233–43.
23. Agudo A. *Measuring intake of fruit and vegetables*. Kobe, Japan: World Health Organization; 2005.
24. WHO. *Global action plan for the prevention and control of noncommunicable diseases 2013-2020*. Geneva: World Health Organization; 2013.
25. Donaldson L. *Guidance on the consumption of alcohol by children and young people*. Department of Health; 2009.
26. Ewing SW, Sakhardande A, Blakemore SJ. The effect of alcohol consumption on the adolescent brain: a systematic review of MRI and fMRI studies of alcohol-using youth. *Neuroimage Clin* 2014;**5**:420–37.
27. Rayner M, Wickramasinghe K, Williams J, McColl K, Mendis S. *An introduction to prevention of non-communicable diseases*. Oxford: Oxford University Press; 2017.
28. Breidablik HJ, Meland E, Lydersen S. Self-rated health in adolescence: a multifactorial composite. *Scand J Publ Health* 2008;**36**:12–20.
29. Vingilis ER, Wade TJ, Seeley JS. Predictors of adolescent self-rated health. Analysis of the national population health survey. *Can J Public Health* 2002;**93**:193–7.
30. Brownson RC, Remington PL, Wegner MV. *Chronic disease epidemiology and control*. Washington, DC: American Public Health Association; 2010.
31. Liu M, Wu L, Yao S. Dose-response association of screen time-based sedentary behaviour in children and adolescents and depression: a meta-analysis of observational studies. *Br J Sports Med* 2016;**50**:1252–8.
32. Marques A, Calmeiro L, Loureiro N, Frasquilho D, de Matos MG. Health complaints among adolescents: associations with more screen-based behaviours and less physical activity. *J Adolesc* 2015;**44**:150–7.
33. Ravens-Sieberer U, Erhart M, Wille N, Bullinger M, Bs group. Health-related quality of life in children and adolescents in Germany: results of the BELLA study. *Eur Child Adolesc Psychiatry* 2008;**17**(Suppl 1):148–56.
34. Tian J, Venn AJ, Blizzard L, Patton GC, Dwyer T, Gall SL. Smoking status and health-related quality of life: a longitudinal study in young adults. *Qual Life Res* 2016;**25**:669–85.
35. Kisic-Tepavcevic D, Gazibara T, Popovic A, Trajkovic G, Pekmezovic T. The impact of alcohol on health-related quality of life in Belgrade University students. *Am J Drug Alcohol Abuse* 2013;**39**:130–5.
36. Meeus W, Iedema J, Maassen G, Engels R. Separation-individuation revisited: on the interplay of parent-adolescent relations, identity and emotional adjustment in adolescence. *J Adolesc* 2005;**28**:89–106.
37. Ha S, Choi HR, Lee YH. Clustering of four major lifestyle risk factors among Korean adults with metabolic syndrome. *PLoS One* 2017;**12**:e0174567.
38. Cockerham WC. Bourdieu and an update of health lifestyle theory. In: Cockerham WC, editor. *Medical sociology on the move New directions in theory*. New York: Springer; 2013. p. 127–54.
39. Cockerham WC, Rutten A, Abel T. Conceptualizing contemporary health lifestyles: moving beyond Weber. *Socio Q* 1997;**38**:321–42.