Original Article

Factors associated with the subjective health complaints among adolescents: Results from the ASSO Project

ANTONINO BIANCO[1], GIUSEPPE NAPOLI[2], MARIA DI PASQUALE[2], ANNA RITA FILIPPI[2], MANUEL GÓMEZ-LÓPEZ[3] ✉, GIUSEPPE MESSINA[1], ANGELO IOVANE[1], GARDEN TABACCHI[1]

[1]*Sport and Exercise Sciences Research Unit, SPPF Department, University of Palermo, Italy*

[2]*Department of Sciences for Health Promotion and Mother Child Care "G. D'Alessandro", University of Palermo, Italy*

[3]*Department of Physical Activity and Sport, Faculty of Sports Science, University of Murcia, Spain*

ABSTRACT

Objectives. Subjective health complaints (e.g. headache and feeling low) are common among adolescents. The objective of this study was to identify the factors associated with the subjective health of adolescents from a population-based point of view. Material and methods. A sample of 712 students was recruited within the web-based Project ASSO (Adolescents and Surveillance System for the Obesity prevention), funded by the Italian Ministry of Health and piloted in Palermo. A 0-100 quantitative score (arbitrarily named "psychosomatic malaise index") based on the frequency of occurrence of seven subjective health complaints was created and used as outcome; socio-demographic characteristics, medical items and lifestyle data were collected as potential explanatory variables. Associations were evaluated through a bivariate analysis first, and a multiple linear regression model afterwards by correcting for confounders. Results. The psychosomatic malaise index averaged 49.0 within the girls and 36.8 within the boys. After adjustment, the psychosomatic malaise index was confirmed to be significantly higher in the females, subjects with a diagnosed disease, smokers and alcohol consumers. Conclusions. Beyond the female gender, incorrect lifestyles such smoking and drinking alcohol may play an important role in the quality of life of adolescents, and thus preventive

✉ **Corresponding author.** *Department of Physical Activity and Sport. Faculty of Sports Science. University of Murcia, Spain.*
http://orcid.org/0000-0002-4595-3994
E-mail: mgomezlop@um.es
Submitted for publication July 2018
Accepted for publication October 2018
Published June 2019 *(in press November 2018)*
JOURNAL OF HUMAN SPORT & EXERCISE ISSN 1988-5202

doi:10.14198/jhse.2019.142.16

actions by the public health services should be addressed mainly to avoid such habits in young populations.
Keywords: Malaise; Risk behaviors; Smoking initiation; Alcohol consumption.

Cite this article as:
Bianco, A., Napoli, G., Di Pasquale, M., Filippi, A.R., Gómez-López, M., Messina, G., Iovane, A., & Tabacchi, G. (2019). Factors associated with the subjective health complaints among adolescents: Results from the ASSO Project. *Journal of Human Sport and Exercise*, *14*(2), 443-455. doi:https://doi.org/10.14198/jhse.2019.142.16

INTRODUCTION

Adolescence is a period inadequately investigated by surveillance systems (Patton et al., 2010). However, during this period, behaviors and lifestyles may affect the health status and negatively influence later stages of the life (Sawyer et al., 2012). Among the factors influencing the health status of adolescents, there are individual aspects (e.g. age, gender, weight status) (Brener et al., 2005; Lobstein et al., 2004; Torsheim et al., 2006), risk behaviors (e.g. smoking, consumption of alcohol, coffee and tea) (Botello-Harbaum et al., 2011; Laukkanen et al., 2001; Nawrot et al., 2003) and the household socio-economic status (Richter et al., 2009).

On the other hand, an increasing scientific interest is being placed on the Subjective Health Complaints (SHCs), i.e. symptoms experienced by an individual with or without a defined diagnosis (Eriksen and Ursin, 2004), such as headache, abdominal pain, anxiety and feeling low. They are common in adolescence and occur often in cluster rather than as a single symptom (Knishkowy et al., 1995). SHCs have relevance as they are related with the physical well-being (RICHE Work Package 2, 2011) and are also an indicator of mental ill health (Erhart et al., 2009; Hagquist, 2010; RICHE Work Package 2, 2011).

SHCs are suspected of becoming chronic pain symptoms and psychological disorders in adulthood too (Jones et al., 2007; Kinnunen et al., 2010; Steinhausen and Winkler Metzke, 2007). Unfortunately, a comparison of the previous literature reports is complex because of different populations, settings and methodological approaches. Lately Ravens-Sieberer et al. (2008) tried to overcome the issues related to the different possible methodological approaches, by proposing and validating a unitary scoring system for school adolescents, enabling a cross-cultural, comparable and interval-scaled assessment of several SHCs. This approach may be useful in similar studies, such as the present one whose objective is to identify, by means of this unitary score system based on the SHC checklist, the individual, behavioral and socio-economic factors associated with the subjective health status in a sample of adolescents.

MATERIAL AND METHODS

Participants and procedures

The present paper analyzes data collected within the framework of the ASSO (Adolescents and Surveillance System for the Obesity prevention) Project, an Italian study aimed at implementing a web-based surveillance system for the assessment of health and lifestyles in adolescents (Tabacchi et al., 2014; 2016). Data were collected between November 2013 and February 2014 in seven high schools in Palermo, Italy. A multistage sampling was performed, by applying, at the first stage, a stratified sampling per type of school and, in the second stage, a cluster sampling of classes in each selected school. A final sample of 788 students aged 12-19 was recruited. The ethical committee of the Azienda Ospedaliera Universitaria Policlinico "Paolo Giaccone", in Palermo, approved the study protocol (approval code n.9/2011) and all participants provided written informed consent.

Data collection

Adolescents were asked to compile a set of web-based questionnaires developed for the purposes of the ASSO system. The information gathered through the ASSO-PIQ (ASSO-Personal Information Questionnaire) and the ASSO-PASAQ (ASSO-Physical activity, Smoke and Alcohol Questionnaire) in particular was taken into account for the purposes of the present study. They included socio-demographic characteristics (gender, age, family affluence scale, parents' education and occupation), anthropometric/medical items (weight status and presence of diagnosed diseases) and information related to lifestyle (physical activity, smoking, alcohol,

tea and coffee consumption) respectively. The schoolteachers, who had been previously trained, were in charge of measurement of weight and height of the students.

BMI was then calculated according to the BMI percentiles developed by the CDC (Cole et al., 2000). About the consumption of tobacco, students were classified into non-smokers (who had smoked up to twice in their life) and smokers (all the others). Alcohol consumers were considered all subjects who referred to drink alcoholic beverages also occasionally. In order to assess the household economic conditions, the Family Affluence Scale (FAS) II was used by considering aspects likely known by the interviewees (car, bedrooms, vacations and computers) (Boyce et al., 2006). Education of the parents was classified into high, medium and low, depending on whether they possessed a degree, a high school-leaving certificate or a junior high school-leaving certificate (or lower qualification), respectively. The SHCs were measured through an eight items checklist, which had been previously developed in the HBSC study (Health Behavior in School-aged Children) (Currie et al., 2001; Haugland et al., 2001), and adopted as such in the ASSO toolkit. The checklist assessed the occurrence of eight common symptoms in the last 6 months: “headache”, “stomach ache”, “backache”, “feeling low”, “feeling irritable or bad tempered”, “feeling nervous or anxious”, “sleeping difficulties” and “dizziness”. The interviewees answered the questions, for each SHC, by choosing one only of the following five frequency categories: “rarely or never”, “about every month”, “about every week”, “more than once a week” and “about every day”. However only seven out of these eight items were considered for the computation of the overall score, since “sleeping difficulties” was ignored according to findings from the validation study of Ravens-Sieberer et al. (2008).

Data analysis

After the responses to seven items of the SHC checklist (headache, stomach ache, backache, feeling low, feeling irritable or bad tempered, feeling nervous or anxious, dizziness) were scored 0, 1, 2, 3 and 4 (respectively for “rarely or never”, “about every month”, “about every week”, “more than once a week” and “about every day”), such raw scores were combined to summarize each adolescent, according to Ravens-Sieberer et al. (2008). In particular, the responses were mathematically combined through the use of a Rating Scale Model (RSM), a generalized form of Rasch model (Rasch, 1961) and by applying the Item Response Theory (Lord, 1968). The key of the Rasch model analysis is that the probability of a categorical answer to a certain item is a function of the difference of two parameters: “item difficulty" (that represents the items' challenge) and “person ability" (that represents the attainment level of people who are assessed). This allowed us to generate a quantitative score arbitrarily named “psychosomatic malaise index” (PMI), ranging from 0 (null level of malaise) to 100 (maximum level of malaise). PMI will represent a summary (negative) measurement of adolescents' subjective health expressed, at an individual level, through an assortment of self-reported psychic and somatic complaints. This score corresponds to the person ability parameter of the Rasch analysis. The index values were summarized as mean of scores and standard deviation (SD). Finally, potential explanatory factors of PMI were identified through a multiple linear regression model and summarized as adjusted b coefficient (adj b coef.) and standard error (SE). This was performed by including subjects characteristics that, in the preliminary bivariate analysis (Pearson’s correlation coefficient, Student’s t-test, one way ANOVA test), were found to be significantly associated with the PMI. All tests performed were two-tailed and a P-value<.05 was considered statistically significant. All data were analyzed by using R statistical software (Mair and Hatzinger, 2007) and eRm Package for R (R Core Team, 2013).

RESULTS

A total of 76 out of 788 students provided incomplete questionnaires and were thus excluded from the statistical analysis. The students included in the analysis were 712 subjects (males/females ratio 1.76) aged

between 12 and 19 years (mean age 15.7, SD 1.4). The left-hand two columns of Table 1 show the study population composition by individual characteristics, risk behaviors and household socio-economic status. Overall, there were 146 (22.2%) overweight and 36 (5.5%) obese adolescents. Smokers were 103 (14.5%) and alcohol consumers 461 (65%). 93 (13.1%) of the interviewed adolescents had a disease diagnosed by a physician. About half of the students (320, 45.13%) consumed coffee and one-third (251, 35.40%) consumed tea. Only 28 (3.9%) students had low FAS. Parents' education frequencies were equally distributed among low, medium and high classes. With regards to father's occupation, the main represented class was "manager and armed forces" (287, 41.1%), while most of the mothers were included in the category "unemployed, retired, housewife" (300, 42.6%).

Table 1. Characteristics of the 712 subjects included in analyses and group-specific psychosomatic malaise index mean levels

Characteristics	**Sample No. (%)**	**PMI [a] mean, standard deviation**
Total	712 (100)	41.4, 18.0
Gender [b]		
Males	454 (63.76)	36.8, 17.1
Females	258 (36.24)	49.0, 16.7
Age		
≤ 13 years	36 (5.06)	34.6, 17.3
14 years	113 (15.87)	40.1, 18.1
15 years	150 (21.07)	43.8, 18.6
16 years	203 (28.51)	39.5, 17.3
17 years	149 (20.93)	44.1, 17.3
≥ 18 years	61 (8.57)	42.4, 18.7
Weight status		
Underweight	45 (6.84)	43.7, 18.9
Normal weight	431 (65.50)	42.0, 17.2
Overweight	146 (22.19)	39.2, 18.2
Obese	36 (5.47)	36.9, 19.9
Smoking habits [b]		
Non-smokers	606 (85.47)	40.3, 18.1
Smokers	103 (14.53)	48.0, 15.7
Alcohol habits [b]		
Non-drinkers	248 (34.98)	38.0, 18.6
Drinkers	461 (65.02)	43.2, 17.3
Coffee consumption [b]		
Non-consumers	389 (54.87)	39.3, 17.8
Consumers	320 (45.13)	44.0, 17.7
Tea consumption		

Non-consumers	458 (64.60)	40.6, 18.4
Consumers	251 (35.40)	43.0, 17.0
Family Affluence Scale		
High	397 (55.76)	41.9, 18.0
Medium	287 (40.31)	41.0, 17.8
Low	28 (3.93)	38.9, 20.1
Father's education level		
High	232 (33.14)	39.7, 17.6
Medium	252 (36.00)	42.2, 17.7
Low	216 (30.86)	42.0, 18.9
Mother's education level		
High	239 (33.80)	41.5, 16.7
Medium	261 (36.92)	41.6, 18.1
Low	207 (29.28)	41.6, 19.2
Father's occupation		
Manager and armed forces	287 (41.06)	41.4, 17.0
Employee and technical professions	189 (27.04)	40.4, 18.2
Manual work	144 (20.60)	41.0, 20.1
Unemployed, retired, household	79 (11.30)	43.8, 17.5
Mother's occupation		
Manager and armed forces	154 (21.84)	41.7, 16.5
Employee and technical professions	202 (28.65)	40.3, 17.1
Manual work	49 (6.95)	44.2, 19.7
Unemployed, retired, housewife	300 (42.55)	41.8, 18.8
Diagnosed diseases [b]		
No	619 (86.94)	40.3, 17.7
Yes	93 (13.06)	49.0, 17.6

a PMI: psychosomatic malaise index
b characteristic found significantly associated with the psychosomatic malaise index on bivariate analysis (P-value<.05)

The most commonly reported symptoms as "about every day" were "feeling nervous or anxious" (99, 13.8%), "feeling irritable or bad tempered" (62, 8.6%) and "feeling low" (60, 8.3%), as shown in Figure 1. The category "rarely or never" was mainly chosen for sleeping difficulties (431, 60.6%), dizziness (413, 57.9%) and backache (387, 54.4%). One boy said to suffer about every day of all seven SHCs used for the calculation of the Rasch score, while 33 subjects (4.6%) reported having suffered rarely or never of any of these, during the previous six months. The column on the right-hand of Table 1 shows the overall and group-specific PMI mean levels. The interviewed students reported a PMI mean score of 41.4, SD 18.0.

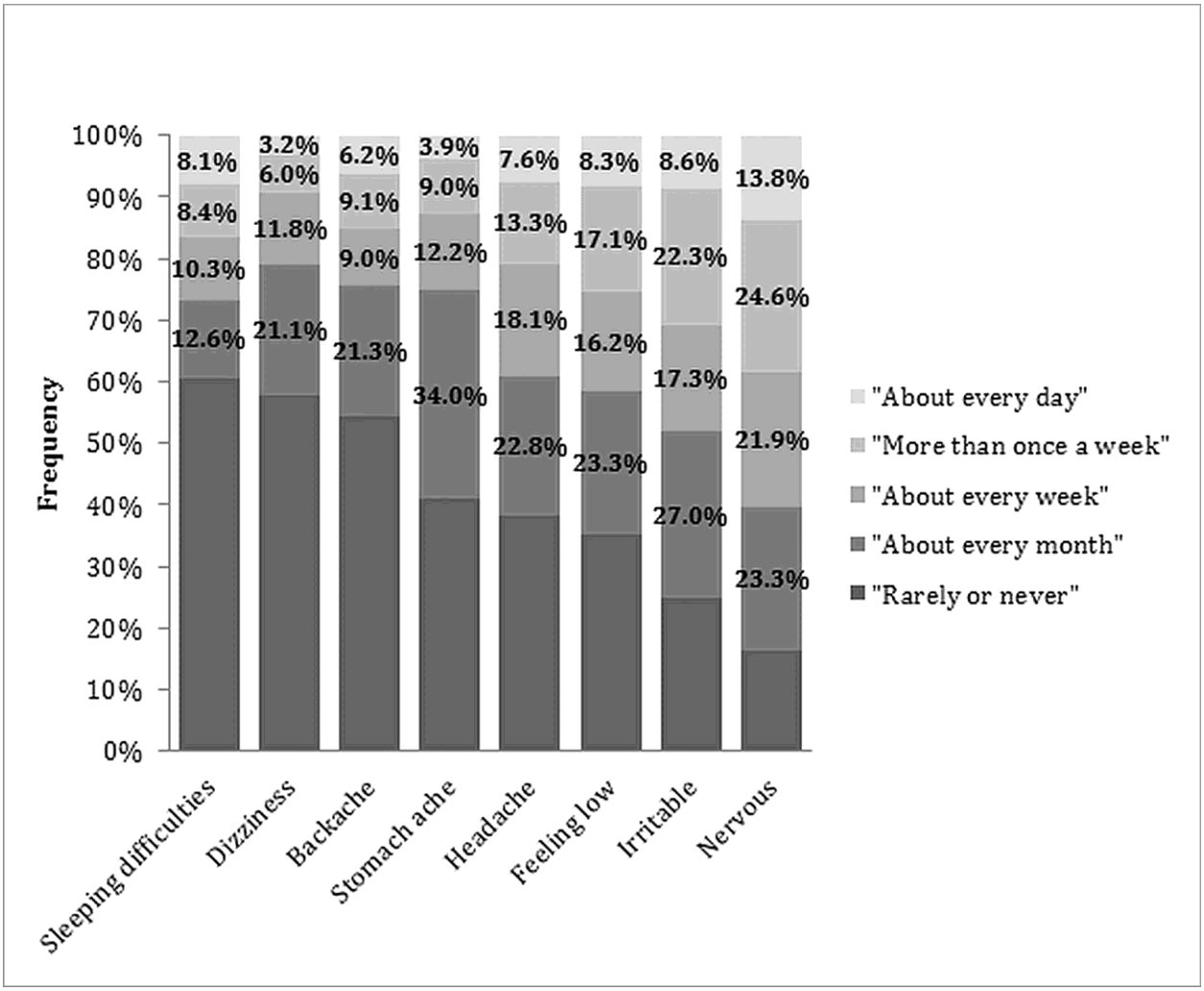

Figure 1. Subjective health complaints` frequency of occurrence stated by the 712 adolescents included in the analyses

Bivariate analysis revealed significant association between the index and the following variables: gender, diagnosed diseases, smoking status, alcohol habit and coffee consumption. Girls reported a higher mean value of PMI compared with boys (girls, mean 49.0, SD 16.7, vs. boys, mean 36.8, SD 17.1; P-value<.001). A higher mean value of malaise score was also found among subjects with a diagnosed disease, compared to those with no disease (mean 49.0, SD 17.6 vs. mean 40.3, SD 17.74; P-value<.001), smokers (smokers, mean 48.0, SD 15.7 vs. non-smokers, mean 40.3, SD 18.1; P-value<.001), alcohol consumers (consumers, mean 43.2, SD 17.3, vs. non-consumers, mean 38.0, SD 18.60; P-value<.001) and coffee consumers (consumers, mean 44.0, SD 17.7, vs. non-consumers, mean 39.3, SD 17.8; P-value<.001). Moreover, subjects smoking and consuming alcohol at the same time, showed a value of malaise 10.4 score points higher compared with non-smoker and non-alcohol consumers (mean 48.0, SD 16.0, vs. mean 37.5, SD 18.7, respectively).

The results obtained by the multiple linear regression analysis are showed in Figure 2. Ultimately the values of PMI were significantly independently associated with gender (adj b coef. 13.1; SE 1.3; P-value<.001), diagnosed diseases (adj b coef. 8.6; SE 1.9; P-value<.001), smoking (adj b coef. 6.7; SE 3.5; P-value<.001)

and alcohol habits (adj b coef. 5.6; SE 4.1; P-value<.001). No interaction was found between these variables. The final regression model explained 18.0% of the PMI values variance (adjusted R-squared=.18).

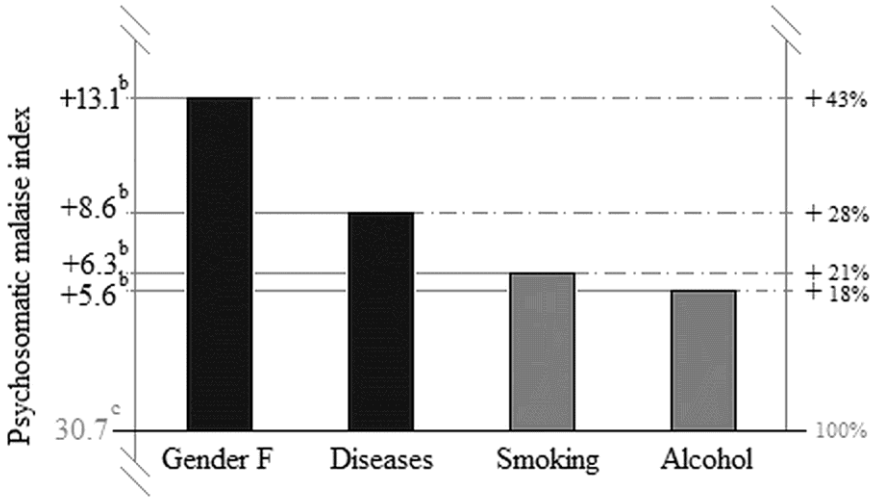

Figure 2. Increase of psychosomatic malaise index level by significant explicative variables

DISCUSSION

By comparing the prevalence of major risk conditions with the national population (Istituto Superiore di Sanità, 2013), comparison only feasible for the 15-years class, the respondent students show more frequent weight excess (overweight or obese) (26.8% vs. 19%) and alcohol consumption (61.7% vs. 54.2%). Only the smoking habit is less frequent: 14.1% vs. 26.6%. By comparing our study population to a large international sample including 34 countries (HBSC 2001-2002 survey), the overall PMI level of our sample (mean 41.4, SD 18.0) is higher than the European mean (mean 38.5, SD 12.1), but lower than the reported value among Italian adolescents (mean 43.9, SD not available) (Ravens-Sieberer et al., 2008). With regard to the variables found to be independently associated with the PMI, it is to be noted that in our study it was possible to compare the extent of association between these different explicative variables, thanks to such quantitative score that allows interval-scaled assessments.

According to many other studies (Torsheim et al., 2006), females were also found to be at a significantly higher risk of malaise; moreover we can say that, according to Figure 2, the gender was the most relevant predictor of PMI, indeed resulting in an extent of association greater than that given by the presence of a diagnosed disease. According to some authors, in the female adolescents, the role of hormonal changes, of the self-esteem and of body image, as well as their higher willingness to express emotions could play a role in increasing the differences in comparison with the male adolescents (Patton and Viner, 2007). Moreover, this pattern of symptoms seems to suggest some connection with the expression of eating disorders, which are also related to a psychosocial stress (Polivy and Herman, 2002). It would be relevant, from a public health point of view, to follow the girls' PMI levels over time and check whether they comply with the boys' levels or not, in the post-adolescent age. After the gender, the presence of a diagnosed disease showed a major placing. This was an expected observation since adolescents having a general illness, by definition, have a higher chance of presenting physical symptoms. After that, our findings appear consistent with those reported by several authors who found an association between different symptoms (e.g. depression, anxiety,

headache, sleep problems) and smoking status (Arnold et al., 2014; Botello-Harbaum et al., 2011; Carceller-Maicas et al., 2014; Straube et al., 2013; Wang et al., 1994) as well as alcohol consumption (Hasler et al., 2014; Laukkanen et al., 2001; Straube et al., 2013).

In our study, both tobacco use and alcohol consumption were associated with a relevant mean increase of PMI: in particular the degree of association of these two features, although lower, has the same order of the presence of a diagnosed disease (see Figure 2). In this regard, it is also noteworthy that the estimate of the strength of association of smoking and alcohol consumption is very robust in our study as we used broad definitions of cases, for subjects' classification. However, we are not able to suggest the causal nature of the link underlying this association; in other words, it cannot be excluded that adolescents with a higher level of malaise could more frequently acquire some habits, such as smoking and alcohol consumption, and vice versa.

Some considerations should be addressed about some variables that were not found to be associated with the PMI. In particular, the socio-economic status appeared not to be associated with the malaise symptoms even though many authors showed that the lack of financial resources could increase the risk of self-reported complaint in the adolescence (Currie et al., 2012; Elgar et al., 2013; Petanidou et al., 2014). Although further investigations may be required, the very small proportion of adolescents reporting low FAS could explain this lack of association. Also, parental education and occupation did not show any role in predicting adolescents' malaise level in our study, but this observation is consistent with previous finding by other authors (Petanidou et al., 2014). Other remarkable variables as age and weight status were not found to be associated with PMI. Unexpectedly, increasing age was not associated with higher values of the PMI, in particular among girls (Currie et al., 2012; Petanidou et al., 2014). Moreover, the weight status was not associated to the index in our study, even though most studies show an association with increased headache frequency (Ravid et al., 2013), depressed mood, anxiety and depressive symptoms (D'Autume et al., 2012). Coffee and tea consumption should be plausibly related to some emotional behavioral effects, such as increased nervousness or anxiety and sleep disturbances (Nawrot et al., 2003), but an association was ruled out in our study.

This study could suffer from some potential limitations. Firstly, the sample is composed of a higher number of male adolescents compared to females; this was due to the sample stratification per type of school, which did not take into account the gender composition of each school. However, the obtained scoring system should not be affected by the gender difference, indeed, the Differential Item Functioning (DIF) across gender was found not significant in the validation study of the Rasch score for self-reported health complaints in adolescence (Ravens-Sieberer et al., 2008). Secondly, due to the cross-sectional design of the study, we could not assess causal relationships between the variables in study. Finally, the information about the presence of diagnosed diseases was based on reported data that could have led to a misclassification of students.

CONCLUSIONS

This study provides further consistency in the difference of gender as a relevant factor in the distribution of subjective health and identifies and estimates the degree of association of two modifiable factors that could have a role of paramount importance for impacting the subjective health complaints among urban adolescents. In particular, the study results suggest all those who have responsibility for the adolescent health to pay a closer attention to smoking and alcohol consumption. They are substantially associated with the adolescents' subjective health and could affect the current quality of life as well as lead to a greater burden

of chronic diseases in future life. Thus, female adolescents, smokers and alcohol consumers should be the main targets of preventive actions by the public health services.

FUNDING

The work has been performed within the Adolescents and Surveillance System for the Obesity prevention (ASSO) Project (code GR-2008-1140742, CUP I85J10000500001), a project funded by the Italian Ministry of Health.

AUTHOR CONTRIBUTIONS

A.B. and G.N. conceptualized the research and were also involved in data curation and formal analysis. Both Authors equally contributed to this task. M.D.P., G.M., and A.I. contributed on methodology definition, data collection and providing resources. A.F. and M.D.P. have been involved in manuscript writing and editing. M.G.L., G. N., A.B., and G.T contributed to project implementation, manuscript revision, and project supervision

ACKNOWLEDGEMENTS

We are grateful to Dr Laura Censi from Centro di Ricerca per gli Alimenti e la Nutrizione, CREA in Rome, who participated in the design of questionnaires and tools for data collection.

REFERENCES

Arnold, E. M., Greco, E., Desmond, K., and Rotheram-Borus, M. J. (2014). When life is a drag: depressive symptoms associated with early adolescent smoking. Vulnerable Children and Youth Studies, 9(1), 1-9. https://doi.org/10.1080/17450128.2013.797129

Botello-Harbaum, M., Haynie, D. L., Murray, K. W., and Iannotti, R. J. (2011). Cigarette smoking status and recurrent subjective health complaints among US school-aged adolescents. Child: Care, Health and Development, 37(4), 551-558. https://doi.org/10.1111/j.1365-2214.2010.01147.x

Boyce, W., Torsheim, T., Currie, C., and Zambon, A. (2006). The family affluence scale as a measure of national wealth: validation of an adolescent self-reported measure. Social Indicators Research, 78, 473-487. https://doi.org/10.1007/s11205-005-1607-6

Brener, N. D., Kann, L., Garcia, D., MacDonald, G., Ramsey, F., Honeycutt, S., ... Harris, W. A. (2007). Youth risk behavior surveillance-selected steps communities, 2005. MMWR Surveillance Summaries, 56(2), 1-16.

Carceller-Maicas, N., Ariste, S., Martínez-Hernáez, A., Martorell-Poveda, M., Correa-Urquiza, M., and DiGiacomo, S. M. (2014). Smoking as a form of self-medication for depression or anxiety in young adults: results of a mixed-methods study. Adicciones, 26(1), 34-45. https://doi.org/10.20882/adicciones.127

Cole, T. J., Bellizzi, M. C., Flegal, K. M., and Dietz, W. H. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. British Medical Journal, 320, 1240-1243. https://doi.org/10.1136/bmj.320.7244.1240

Currie, C., Samdal, O., Boyce, W., and Smith, R. (2001). Health behaviour in School-aged Children: a WHO cross-national Study (HBSC): Research protocol for the 2001/2002 Survey. Edinburgh: University of Edinburgh.

Currie, C., Zanotti, C. F., Morgan, A., Currie, D. B., de Looze, M., Roberts, C., ... Barnekow, V. (Eds.) (2012). 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. (Health Policy for Children and Adolescents). Denmark: WHO Regional Office for Europe.

D'Autume, C., Musher-Eizenman, D., Marinier, E., Viarme, F., Frelut, M. L., and Isnard, P. (2012). Eating behaviors and emotional symptoms in childhood obesity: a cross-sectional exploratory study using self-report questionnaires in 63 children and adolescents. Archives de Pédiatrie, 19(8), 803-810. https://doi.org/10.1016/j.arcped.2012.05.001

Elgar, F. J., De Clercq, B., Schnohr, C. W., Phillippa, B., Pickett, K. E., Torsheim, T., ... Currie, C. (2013). Absolute and relative family affluence and psychosomatic symptoms in adolescents. Social Science and Medicine, 91, 25 - 31. https://doi.org/10.1016/j.socscimed.2013.04.030

Erhart, M., Ottova, V., Gaspar, T., Jericek, H., Schnohr, C., Alikasifoglu, M., … HBSC Positive Health Focus Group (2009). Measuring mental health and well-being of school-children in 15 European countries using the KIDSCREEN-10 Index. International Journal of Public Health, 54(Suppl. 2), 160-166. https://doi.org/10.1007/s00038-009-5407-7

Eriksen, H. R., and Ursin, H. (2004). Subjective health complaints, sensitization and sustained cognitive activation (stress). Journal of Psychosomatic Research, 56, 445-448. https://doi.org/10.1016/S0022-3999(03)00629-9

Hagquist, C. (2010). Discrepant trends in mental health complaints among younger and older adolescents in Sweden: an analysis of WHO data 1985-2005. Journal of Adolescent Health, 46(3), 258-264. https://doi.org/10.1016/j.jadohealth.2009.07.003

Hasler, B. P., Martin, C. S., Wood, D. S., Rosario, B., and Clark, D. B. (2014). A longitudinal study of insomnia and other sleep complaints in adolescents with and without alcohol use disorders. Alcoholism Clinical and Experimental Research, 38(8), 2225-2233. https://doi.org/10.1111/acer.12474

Haugland, S., Wold, B., Stevenson, J., Aaroe, L. E., and Woynarowska, B. (2001). Subjective health complaints in adolescence. A cross-national comparison of prevalence and dimensionality. European Journal of Public Health, 11(1), 4-10. https://doi.org/10.1093/eurpub/11.1.4

Istituto Superiore di Sanità (Italy) (2013). Studio HBSC-Italia (Health Behaviour in School-aged Children): rapporto sui dati 2010 (ISTISAN 13/5). Available from: http://www.iss.it/binary/publ/cont/13_5_web.pdf Accessed 9 July 2018.

Jones, G. T., Silman, A. J., Power, C., and Macfarlane, G. J. (2007). Are common symptoms in childhood associated with chronic widespread body pain in adulthood? Results from the 1958 British Birth Cohort Study. Arthritis & Rheumatology, 56(5), 1669-1675. https://doi.org/10.1002/art.22587

Kinnunen, P., Laukkanen, E., and Kylmä, J. (2010). Association between psychosomatic symptoms in adolescence and mental health symptoms in early adulthood. International Journal of Nursing Practice, 16, 43-50. https://doi.org/10.1111/j.1440-172X.2009.01782.x

Knishkowy, B., Palti, H., Tima, C., Adler, B., and Gofin, R. (1995). Symptom clusters among young adolescents. Adolescence, 30, 351-362.

Laukkanen, E., Shemeikka, S., Viinamäki, H., Pölkki, P. L., and Lehtonen, J. O. (2001). Heavy drinking is associated with more severe psychological dysfunction among girls than boys. Journal of Adolescent Health, 28(4), 270-277. https://doi.org/10.1016/S1054-139X(00)00183-X

Lobstein, T., Baur, L., Uauy, R., and IASO International Obesity Taskforce (2004). Obesity in children and young people: a crisis in public health. Obesity Reviews, 5(Suppl. 1), 4-104. https://doi.org/10.1111/j.1467-789X.2004.00133.x

Lord, F. M., and Novick, M. R. (1968). Statistical theories of mental health scores. Boston, MA: Addison-Wesley.

Mair, P., and Hatzinger, R. (2007). Extended Rasch modeling: The eRm package for the application of IRT models in R. Journal of Statistical Software, 20(9), 1-20. https://doi.org/10.18637/jss.v020.i09

Nawrot, P., Jordan, S., Eastwood, J., Rotstein, J., Hugenholtz, A., and Feeley, M. (2003). Effects of caffeine on human health. Food Additives & Contaminants, 20, 1-30. https://doi.org/10.1080/0265203021000007840

Patton, G. C., and Viner, R. (2007). Pubertal transitions in health. Lancet, 369(9567), 1130-1139. https://doi.org/10.1016/S0140-6736(07)60366-3

Patton, G. C., Viner, R. M., Linh le, C., Ameratunga, S., Fatusi, A. O., Ferguson, B. J., and Patel, V. (2010). Mapping a global agenda for adolescent health. Journal of Adolescent Health, 47(5), 427-432. https://doi.org/10.1016/j.jadohealth.2010.08.019

Petanidou, D., Mihas, C., Dimitrakaki, C., Kolaitis, G., and Tountas, Y. (2014). Selected family characteristics are associated with adolescents' subjective health complaints. Acta Paediatrica, 103(2), 201-206. https://doi.org/10.1111/apa.12466

Polivy, J., and Herman, C. P. (2002). Causes of eating disorders. Annual Review of Psychology, 53, 187-213. https://doi.org/10.1146/annurev.psych.53.100901.135103

R Development Core Team (2011). R: A Language and Environment for Statistical Computing. Vienna, Austria: the R Foundation for Statistical Computing. Available online at http://www.R-project.org/

Rasch, G. (1961). On general laws and the meaning of measurement in psychology. In: J. Neyman (Ed.) Contributions to Biology and Problems of Medicine. Proceedings of the fourth symposium on mathematical statistics and probability (pp. 321-323). Berkeley, CA: University of California Press.

Ravens-Sieberer, U., Erhart, M., Torsheim, T., Hetland, J., Freeman, J., Danielson M, … HBSC Positive Health Group (2008). An international scoring system for self-reported health complaints in adolescents. European Journal of Public Health, 18(3), 294-299. https://doi.org/10.1093/eurpub/ckn001

Ravid, S., Shahar, E., Schiff, A., and Gordon, S. (2013). Obesity in children with headaches: association with headache type, frequency, and disability. Headache, 53(6), 954-961. https://doi.org/10.1111/head.12088

RICHE Work Package 2 (2011). Child health measurement and indicators - an update in a gaps perspective. http://www.childhealthresearch.eu/Members/ahjern/child-health-measurement-and-indicators-2013-an-update-in-a-gaps-perspective.-riche-work-package-2-1/at_download/file Accessed 9 July 2018.

Richter, M., Vereecken, C., Boyce, W., Gabhainn, S. N., and Currie, C. E. (2009). Parental occupation, family affluence and adolescent health behaviour in 28 countries. International Journal of Public Health, 54(4), 203-212. https://doi.org/10.1007/s00038-009-8018-4

Sawyer, S. M., Afifi, R. A., Bearinger, L. H., Blakemore, S. J., Dick, B., Ezeh, A. C., and Patton, G. C. (2012). Adolescence: a foundation for future health. Lancet, 379, 1630-1640. https://doi.org/10.1016/S0140-6736(12)60072-5

Steinhausen, H. C., Winkler Metzke, C. (2007). Continuity of functional-somatic symptoms from late childhood to young adulthood in a community sample. Journal of Child Psychology and Psychiatry, 48(5), 508-513. https://doi.org/10.1111/j.1469-7610.2006.01721.x

Straube, A., Heinen, F., Ebinger, F., and von Kries, R. (2013). Headache in School Children: Prevalence and Risk Factors. Deutsches Ärzteblatt International, 110(48), 811-818. https://doi.org/10.3238/arztebl.2013.0811

Tabacchi, G., Amodio, E., Di Pasquale, M., Bianco, A., Jemni, M., and Mammina, C. (2014). Validation and reproducibility of dietary assessment methods in adolescents: a systematic literature review. Public Health Nutrition, 17(12), 2700-2714. https://doi.org/10.1017/S1368980013003157

Tabacchi, G., Bianco, A., Alessi, N., Filippi, A. R., Napoli, G., Jemni, M., … Mammina, C. (2016). Design, Implementation, and Evaluation of the Adolescents and Surveillance System for the Obesity Prevention Project. Medicine (Baltimore), 95(12), e3143. https://doi.org/10.1097/MD.0000000000003143

Torsheim, T., Ravens-Sieberer, U., Hetland, J., Välimaa, R., Danielson, M., and Overpeck, M. (2006). Cross-national variation of gender differences in adolescent subjective health in Europe and North America. Social Science & Medicine, 62(4), 815-827. https://doi.org/10.1016/j.socscimed.2005.06.047

Wang, M. Q., Fitzhugh, E. C., Westerfield, R. C., and Eddy, J. M. (1994). Predicting smoking status by symptoms of depression for U.S. adolescents. Psychological Reports, 75, 911-914. https://doi.org/10.2466/pr0.1994.75.2.911