

Patterns of Physical Activity and Multiple Risk Behaviour in Adolescents from Visegrad Countries

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Abstract

The aim of this paper is to present the patterns of the health behaviour in adolescents from Visegrad countries (Czech Republic, Hungary, Poland, Slovakia). The data concerning 5,588 15-year-old students were used, surveyed during the 2009/10 school year within HBSC study (Health Behaviour in School-aged Children). Five clusters with different behaviour patterns were found. The most positive model (high level of physical activity and a low level of risk behaviours) was found in 35.6% of adolescents from those countries. However, in 26.7%, relatively high physical activity co-exists with a high or very high level of risk behaviours. In all the countries, more negative models can be found in poor families and students with poor academic achievements. Adolescents categorised into more positive behaviour patterns are more satisfied with their lives. Members of different clusters should be approached with different prevention programmes, taken into account the specifics of each country.

Key words: adolescents, international comparisons, patterns of behaviour, physical activity, psychoactive substances,

Słowa kluczowe: aktywność fizyczna, młodzież, porównania międzynarodowe, substancje psychoaktywne, wzory zachowań

Introduction

Research indicates that lifestyle and behaviour affects human health. Childhood and adolescence are important periods for the development of health behaviour [1]. Profiles of behavioural patterns may show positive or negative traits, which may have strong and weak points.

Smoking, alcohol, poor diet, and low physical activity are considered to be the main life-style factors that if abused [2], can cause chronic disease and premature mortality.¹ Usually these factors have been studied independently of each other and the distribution of risk factors in different populations has been shown. Adolescents and

adults often engage in more than one health compromising behaviour at a time. It is important to examine and analyse the interactions between various behaviours. If there is no linear correlation between behaviours under study, there is no reason for the simplified division into only one negative and one positive pattern. In the mixed model, the negative influence of certain unfavourable for health behaviours may be reduced by the positive impact of engaging in certain kinds of pro-health behaviours. There may also be situations where the negative impact of risky behaviour is reduced by other protective factors [3, 4]. Once behaviour patterns are identified, one may be able to specify the psychological, social, and

environmental determinants and correlates, and devise intervention measures [5–7].

Researching the co-occurrence of specific behaviours associated with health is a serious methodological challenge. Usually, authors decide to limit the scope of information by categorising respondents into “engaging” and “not engaging” in specific behaviours at a recommended or health-risk level. An alternative division (as applied in the rules for interpreting the results of the CHIP-AE² questionnaire) includes three levels: negative, neutral (average) and positive [8]. However, problems arise in identifying the cut-off points, as the external criteria to enable such a classification may be not well-established. Alternatively, summarising behaviour indices (raw or standardised) can be designed to retain the comprehensiveness of the collected information.

McAloney et al. [9] published a scoping review of 50 selected papers including co-occurrence analyses of at least two out of four previously mentioned health behaviours, which comprised papers published in 2000–2011.³ Two main approaches were identified: (1) a simple analysis of the co-occurrence of health behaviours; (2) a complex classification of populations according to the level of involvement in health behaviours. In the first case, one can quantify risk behaviours, or include all the possible combinations of investigated behaviours [10, 11], the number of which is 2^n (n being the number of behaviours; the dichotomy between the norm and the risk level). For example, eight combinations of three behaviours, some of which may be rarely observed, can be created. The second approach involves a more frequent occurrence of a combination of behaviours than specified by their probability, or the use of advanced statistical methods of group classification [12, 13]. Factor analysis enables researchers to identify behaviours that form homogenous groups. A cluster analysis, which is a simple exploratory method that makes it possible to divide the investigated sample into groups containing elements which are similar and yet different from other groups, is usually used. However, recognised clustering techniques do not provide a clear solution, which would indicate the number of internally homogenous groups.

In the review of McAloney [9], there were fewer papers on school-aged children who are more often the target of health promotion programmes than on adults. The relevance of parallel research on changes in pro-health and risk behaviours, typical in adolescents, can be confirmed by the results of the longitudinal Canadian study conducted in 1994–2007 on a sample of 640 adolescents (aged 12–15 years at starting point). This study showed that drop in healthy behaviours usually coincided with an increase in risky behaviours [14]. In time, with increasing biological and psycho-social maturity, these behaviours may change. Public health efforts as health promotion and education activities targeted prevention and/or reduction of substance use by children and adolescents and other risk behaviours that are fairly prevalent and powerful in most industrialized countries. A few efforts in terms of public health to counteract the decrease in physical activity in the transitional period to adulthood

were made. The consequence of paying not enough attention to that phenomenon leads to the continuation of the known health effects of low physical activity in the adult population [15].

The international Health Behaviour in School-aged Children (HBSC) survey conducted every four years is a unique source of information about the health behaviour of school-aged children [16]. Currently, the HBSC research network comprises 43 countries in Europe and North America.⁴ The most recent international data available is from 2009/2010 [17]. The standard HBSC questionnaire consists of mandatory questions used in all participating countries as well as some optional questions. Besides the four previously mentioned behaviours (smoking, alcohol, diet, physical activity and sedentary behaviours), the HBSC previous or current questions included some on the use of cannabis and other addictive substances; violence (fighting, bullying, weapon carrying); risky sexual behaviours; road safety and other unhealthy dietary habits (unfounded dieting). It includes indicators of problems in performing developmental tasks and of poor interpersonal relations (poor school performance, excessive time with friends, parental disconnectedness, delinquency, and other negative school experience). On the basis of these studies, many associations between multiple risk behaviours are described [18–20].

The current report is among the first ones to include data from the four member states of the Visegrad Group (V4): Czech Republic, Hungary, Poland, and Slovakia. Simple comparisons between these countries can be found in international reports [17]; however, they do not interpret the results from the perspective of the four states. These post-communist and transforming countries represent a geographic unit with a similar historical and cultural background, and common problems. Cross-country analyses allowed us to identify common relationships and distinguish them from local phenomena [21, 22].

The aim of this study is to identify adolescent behaviour patterns including various levels of pro-health behaviours and health compromising behaviours. The working hypothesis is that the adolescent population should display at least four basic patterns reflecting combinations of low and high levels of physical activity as well as frequent and infrequent use of psychoactive substances. The following questions were posed:

- Is the frequency of engaging in various health behaviours and the occurrence of specific behaviour patterns significantly different in individual V4 countries?
- How do adolescents displaying specific behaviour patterns differ in terms of their affluence, family relationships, school performance, and general life satisfaction?
- Are the main determinants of the identified patterns common for all four countries?

Material and methods

Data collection and sample

Data from 5,588 students surveyed in the 2009/10 school year as part of the international HBSC study in the four Central European member states of the V4 group were used. The sizes of the samples are as follows: 1,356 in the Czech Republic; 1,529 in Hungary; 1,274 in Poland; and 1,429 in Slovakia. An age-homogenous group of adolescents was used as a model group; inclusion criteria took account of age 15–16 years and being in the same educational grade, the most typical for this age group in each country. The mean age is 15.50 years (SD = 0.33), varying from 15.39 years in Slovakia to 15.68 years in Poland.

Measures

The items were obtained from the mandatory component of the protocol for this round of the HBSC survey. The advantages of the HBSC survey include its international character and the use of a multi-topic questionnaire that enables to test complex relationships. The uniform questionnaire and standard methodology provides representative and comparable data. All variables were self-reported and collected within the school setting. More information can be retrieved from the international protocol and HBSC website – www.hbsc.org.

Health behaviour patterns were based on three questions about physical activity (pro-health behaviour – PA) and three questions on psychoactive substance use (risk behaviours – RB). The first step included calculating the raw and standardized PA and RB indices. The second step consisted of cluster analysis on the basis of the combined sample from all four countries.

The physical activity index is based on one question about moderate physical activity (MVPA), taken from the Prochaska screening test⁵ and two questions on vigorous physical activity (VPA)⁶. At first, children were asked about the number of days in the preceding week when the respondent allocated at least 60 minutes for physical activity, including school physical education (PE) classes. Subsequently, the respondents were asked how often and how many hours a week they perform physical activity in their free time. The summary index, with scores ranging from 0 to 18, for international data is of a single-factor structure and satisfactory reliability (Cronbach's alpha: 0.755).

The index of psychoactive substance use was based on questions about: (1) current smoking habits; (2) episodes of drunkenness throughout the lifetime; (3) marijuana smoking in the preceding 12 months. Each of these questions were assigned a score from 0 to three, thus the summary index had a range 0–nine. It also has a single-factor structure and satisfactory reliability (Cronbach's alpha: 0.700).

Behaviour patterns were described in the following contexts:

- Family structure (living with both biological parents);
- Family affluence, measured using the FAS (*Family Affluence Scale*)⁷ composed of four questions about hav-

- ing one's own room, the number of cars and computers, and holiday trips outside the place of residence;
- School achievements compared with other students in the same class, using a four-point scale from *below average* to *very good*;
- Other risk behaviours not included in the RB index, such as participation in fights and early sexual initiation;
- General life satisfaction measured on a scale from 0 to 10 on the Cantril scale; ratings were made on the 10-point scale ranging from the worst-possible life (0 points) to the best-possible life (score 10).

Statistical analyses

Behavioural patterns were identified through k-means cluster analysis using the PA and RB indices standardized separately for the population of boys and girls as gender-specific z-scores.⁸ In search for the optimal division into clusters, the division in 4–6 groups was compared. In choice of the optimal solution, the theoretical model, the number of clusters and their homogeneity were considered. In accordance with an approach used in other studies, the analysis of concordance of classifications performed on the full sample and a random half-sample was applied as an additional criterion (with the kappa coefficient).

To compare the mean indices of physical activity and psychoactive substance use, a one-factor analysis of variance (ANOVA) and Tukey's post hoc test of multiple comparisons (a comparison of pairs of countries and pairs of clusters) were used.

The basic characteristics of surveyed adolescents from the V4 countries

The characteristics of the examined samples are presented in **Table I**. Samples of 15-year-olds in the four V4 countries do not show significant gender differences. Some differences in the characteristics of the surveyed students' families were found. More than a quarter (26.1%) of respondents did not live with both biological parents, and the percentage varied from 18.3% in Poland to 33.6% in the Czech Republic. The percentage of families categorised as low affluent (FAS below 4 points on a 0–7 scale) ranged from 15.9% in the Czech Republic to 29.0% in Slovakia, with a group average of 22.7%. Compared to macroeconomic indicators (GDP per capita, HDI), the position of Slovakia was lower than expected. World Bank or Eurostat indicators usually place Poland at almost the same economic level as Hungary, just behind the higher-level Visegrad countries – Czech Republic and Slovakia.

The percentage of students who perceived their school performance as below average compared to other children in the class was 6.3% in the whole sample, ranging from 4.3% in Slovakia to 8.1% in Hungary. The results from the V4 countries also varied when the general life satisfaction measured with the Cantril visual scale was concerned. One in five 15-year-olds from the four Central European countries feels dissatisfied with their life, choosing a score

	Czech Rep. N = 1356	Hungary N = 1529	Poland N = 1274	Slovakia N = 1429	P
Boys	47.9	44.7	47.1	48.4	0.187
Living with both parents	66.4	70.2	81.7	78.2	< 0.001
Low family affluence (FAS)	15.9	23.0	22.9	29.0	< 0.001
Poor school achievements	5.7	8.1	6.9	4.3	< 0.001
Low life satisfaction	16.2	20.4	25.6	16.9	< 0.001

Table I. Characteristics of national samples of 15-year-old adolescents surveyed in V4 countries (%).

Source: Own elaboration.

below six the dissatisfaction criterion. The percentage of those dissatisfied with their lives is highest in Poland (25.6%) and lowest in the Czech Republic (16.2%).

Physical activity of adolescents from the V4 countries

The basic data concerning physical activity of the students from the four countries is shown in **Table II**. The mean PA index is 9.91 for the entire group of 15-year-olds (SD = 4.20), which is 55% of the highest possible score. When pair-wise comparison was carried out, Poland and Hungary did not differ significantly (post-hoc test; $p = 0.898$). The lowest index was found in Poland, and the highest in Slovakia. In all countries, girls are significantly less physically active than boys, with the significant gender differences in the components of the physical activity index. Looking at these components, one can draw the conclusion that the adolescents find it more difficult to engage in systematic (every-day) moderate activity than meet the criteria regarding occasional intensive activity.

The risk behaviours of adolescents from the V4 countries

Basic data on psychoactive substance use is shown in **Table III**. In the surveyed group, 14.4% smoked ciga-

rettes every day, 37.5% were drunk at least twice in their lifetime; and 6.8% smoked marijuana more than twice in the preceding year. The mean RB index was 1.98 for the entire group of 15-year-olds (SD = 2.40), on a scale from 0 to 9. Adolescents from Poland showed the lowest risk of psychoactive substance use, while the risk was the highest in adolescents from Hungary. However, in pair-wise comparison of countries no significant difference between Slovakia and Hungary was noted (post-hoc test; $p = 0.086$). In the entire respondent group, boys used psychoactive substances more frequently than girls do. The Czech Republic was the only country where differences between the genders were not significant ($p = 0.686$).

No linear correlation between the PA and RB indices was found. In the entire international sample, the Spearman correlation coefficient is 0.023 ($p = 0.090$). Low (but statistically significant) and unexpectedly positive correlation appeared only in Poland ($r = 0.090$).

Patterns of health-related behaviours

According to the previously indicated hypothesis, there should be at least four behaviour patterns in the adolescent population reflecting a combination of low and high levels of the analysed PA and RB indices. Three alternative classifications (from four to six clusters) were compared to test this theoretical assumption.

	MVPA = 7 days (%)		VPA at least twice a week (%)		VPA at least 2 hours a week (%)		Unstandardized Physical Activity Index (mean ± SD)	
	boys	girls	boys	girls	boys	girls	boys	girls
Czech Rep.	23.8	14.2	78.0	63.6	46.8	28.5	10.89 ± 3.81	9.34 ± 3.52
Hungary	20.0	8.1	74.4	51.1	60.5	36.5	10.99 ± 4.44	8.31 ± 4.15
Poland	23.5	9.9	71.8	41.2	48.5	27.7	10.95 ± 4.16	8.05 ± 4.09
Slovakia	27.4	12.1	82.0	58.1	58.4	37.5	11.99 ± 3.76	9.51 ± 3.87
Total	23.7	11.0	76.6	53.6	53.7	32.8	11.20 ± 4.08	8.79 ± 3.97

MVPA – moderate-to-vigorous physical activity; VPA – vigorous physical activity; SD – standard deviation.

Table II. Physical activity of 15-year-old adolescents in V4 countries.

Source: Own elaboration.

	Every day tobacco smoking (%)		Drunkenness at least twice in the life time (%)		Cannabis more than twice in the past 12 months (%)		Unstandardized Risk Behaviours Index (mean ± SD)	
	boys	girls	boys	girls	boys	girls	boys	girls
Czech Rep.	15.3	19.9	47.6	41.2	10.3	10.4	2.35 ±2.55	2.41 ±2.55
Hungary	20.5	17.2	46.9	34.8	6.6	3.0	2.39 ±2.52	1.82 ±2.23
Poland	11.4	7.9	33.4	26.0	10.8	4.0	1.84 ±2.44	1.35 ±2.07
Slovakia	14.0	8.4	41.0	32.6	8.6	4.0	2.12 ±2.50	1.63 ±2.10
Total	15.4	13.5	42.4	33.8	9.0	5.0	2.18 ±2.51	1.81 ±2.28

SD – standard deviation.

Table III. Selected risk behaviours in 15-year-old adolescents in V4 countries.

Source: Own elaboration.

		Cluster 1 rather high PA rather high RB N = 960	Cluster 2 very high PA low RB N = 1876	Cluster 3 low PA high RB N = 390	Cluster 4 high PA very high RB N = 447	Cluster 5 low PA low RB N = 1604
Total						
PA index	Mean	11.12	13.09	4.76	12.11	6.11
	SD	(2.51)	(2.58)	(2.69)	(2.92)	(2.63)
RB index	Mean	3.30	0.54	5.74	6.88	0.59
	SD	(1.03)	(0.81)	(1.59)	(1.37)	(0.90)
Czech Republic						
PA index	Mean	11.16	12.89	5.22	11.45	6.51
	SD	(2.29)	(2.30)	(2.48)	(2.55)	(2.60)
RB index	Mean	3.23	0.61	6.10	7.01	0.66
	SD	(1.03)	(0.80)	(1.74)	(1.43)	(0.92)
Hungary						
PA index	Mean	10.89	13.19	4.29	12.33	5.84
	SD	(2.72)	(2.77)	(2.69)	(3.17)	(2.56)
RB index	Mean	3.36	0.61	5.60	6.78	0.70
	SD	(1.01)	(0.89)	(1.48)	(1.16)	(0.99)
Poland						
PA index	Mean	11.18	12.91	4.83	12.55	5.73
	SD	(2.27)	(2.51)	(2.48)	(3.14)	(2.82)
RB index	Mean	3.30	0.41	5.54	6.82	0.48
	SD	(1.04)	(0.71)	(1.62)	(1.41)	(0.79)
Slovakia						
PA index	Mean	11.26	13.28	5.04	12.50	6.63
	SD	(2.71)	(2.66)	(3.02)	(2.79)	(2.32)
RB index	Mean	3.31	0.52	5.75	6.85	0.50
	SD	(1.04)	(0.80)	(1.55)	(1.46)	(0.85)

PA – physical activity; RB – risk behaviour; PA and RB indices presented as unstandardized scores.

Table IV. Health behaviour clusters defined in 15-year-old adolescents.

Source: Own elaboration.

The optimal solution includes five clusters. High concordance of the classification based on the full sample and random half-sample was found at the level of kappa = 0.507.

In the alternative model with four clusters, we failed to identify a group, which is important from the point of

view of prevention and in which low levels of physical activity co-occur with a frequent use of psychoactive substances. Also, the division into six groups, where two out of six have identical RB-index values, was rejected.

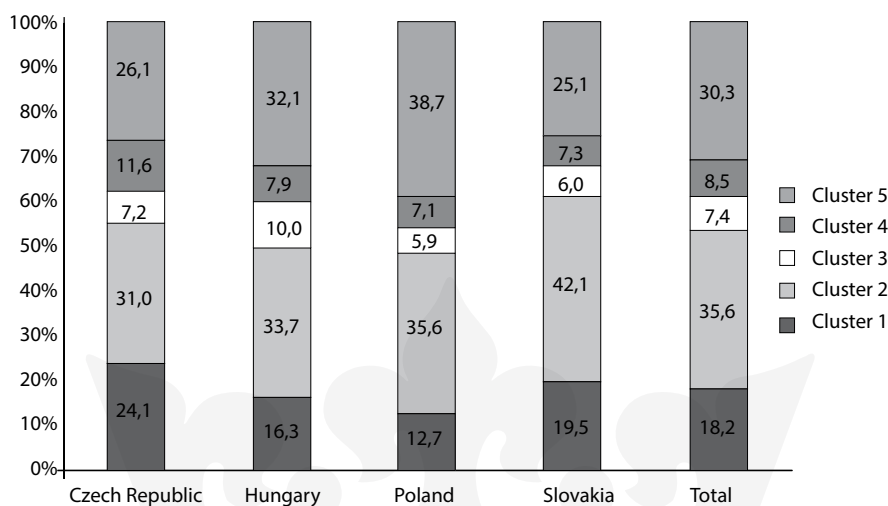


Figure 1. Prevalence of clusters related to health behaviour in 15-year-old adolescents from V4 countries (description of clusters in Table IV).

Source: Own elaboration.

A description of the optimal division into five groups is presented in **Table IV** and **Figure 1**, together with the proportions of the clusters in individual countries.

In the whole international sample, the frequency of the individual clusters in the populations of boys and girls did not differ significantly. Some gender differences in the Czech Republic and Poland were noted and in these countries Clusters 4 and 5 were more visibly determined by gender.

The most positive behaviour pattern can be seen in the second group (Cluster 2), which comprised 35.6% of the respondents (35.9% of boys and 35.3% of girls), these are adolescents with a very high level of PA and a low level of RB. The frequency of this pattern varied from 31.0% in the Czech Republic to 42.1% in Slovakia.

The third (Cluster 3) was found as negative and opposing pattern, that represented adolescents with a very low level of PA and a high level of RB. This group included 7.4% of all respondents (7.1% of boys and 7.6% of girls) and the frequency of this pattern varied from 5.9% in Poland to 10% in Hungary.

The fifth pattern (Cluster 5) was very frequent with 30.3% of all respondents (28.9% of boys, and 31.7% of girls). These adolescents (called lazy) report a serious deficiency of physical activity, but the lowest risk of psychoactive substance use. The share of this pattern varied from 25.1% in Slovakia to 38.7% in Poland.

The remaining two behaviour patterns (Cluster 1: 18.2%; Cluster 4: 8.5%) were characterised by above-average levels of physical activity and a frequent or very frequent use of psychoactive substances. These clusters were common in the Czech Republic. The value of the index of psychoactive substance use in Cluster 4 was even higher than in Cluster 3, previously identified as the most negative behaviour pattern. In Cluster 1, the mean RB index is higher than the average for the entire respondent group, but not as high as in Clusters 3 and 4.

The statistical analysis using post-hoc tests (one-factor ANOVA) confirmed statistically significant differences between all cluster pairs when compared to the PA index. An analogical comparison of the mean RB scores indicated a lack of difference between Clusters 2 and 5 only, i.e. between groups where extremely low and high values of the PA index were noted.

Figure 2 shows differences among clusters, using the standardised PA and RB z-scores. The individual pattern-related label was assigned to the country where each behavioural model was particularly widespread. Standardised data makes it possible to compare the investigated phenomena with the mean values noted in these four countries, which is zero for the z-score. Labels assigned to V4 countries are relative, as Cluster 2 is dominant in all countries, while negative Cluster 3 can be rarely found everywhere. However, the above-average representation of a disquieting pattern may help to identify factors that encourage a certain lifestyle. At the same time, our results can be used as a guideline for public health experts studying on the strengths and weaknesses of adolescents in a given country.

Detailed comparison between the V4 countries

Several country-specific characteristics were identified:

- The Czech Republic is the most affluent country of the group, and the Czech adolescents are the most satisfied with life by comparison with adolescents from other V4 countries. The frequency of incomplete families is higher than in other countries, which raises some concerns. In analysing health behaviour, an attention should be drawn to a particularly high percentage of adolescents who have experienced several episodes of substance use. The Czech Republic is also the only country in the V4 group where girls and

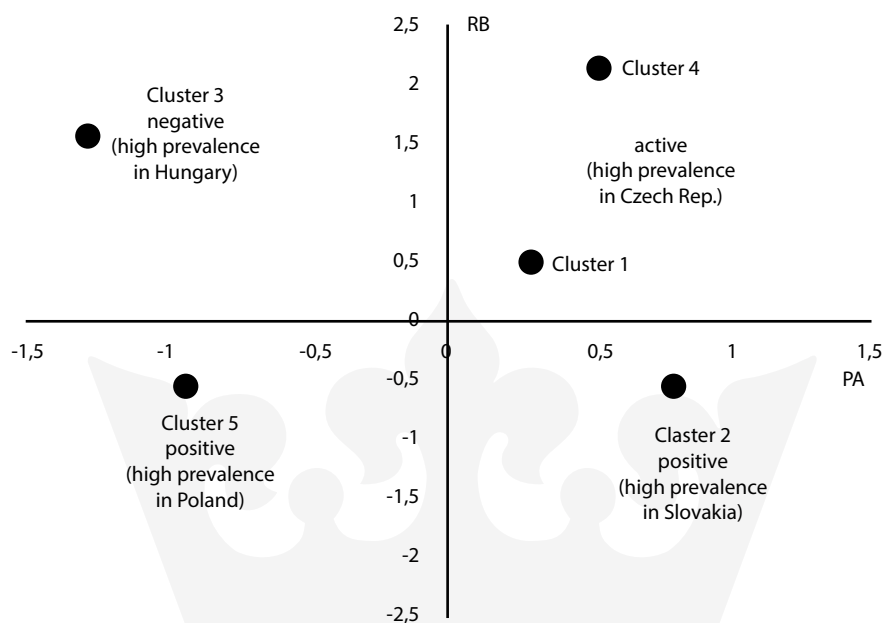


Figure 2. Comparison of identified clusters by standardized risk behavior (RB) and physical activity (PA) indices.

Source: Own elaboration.

boys engage in risk behaviours with similar frequency. Compared to the other countries, Clusters 1 and 4, i.e. high levels of physical activity co-occurring with a frequent use of psychoactive substances, is more frequent. In these clusters, physical activity fails to provide protection against risk behaviours. The high incidence of Clusters 1 and 4, and the low percentage of adolescents categorised into Cluster 2 (i.e. the most positive one), is worrisome.

- By comparison with the other V4 countries, Hungary has a higher percentage of adolescents who perform poorly in schools. This may be a worrying finding, considering that the weakness of the education system is corroborated by the PISA surveys.⁹ Hungarian students were characterised by high levels of physical activity outside school (VPA) and low levels of moderate physical activity (MVPA). After attention was drawn to this problem, every day physical education has been included in the national basic curriculum and it has been compulsory in all schools since the academic year 2013/2014. Thus, an improvement is expected in this field. There is a greater incidence of tobacco smoking in Hungary than in other V4 countries, although the adolescents smoke marijuana less frequently. In general, the level of risk behaviours is high, compared to the other countries, especially in boys. High prevalence of smoking in the whole Hungarian population is a long-standing public health problem. There were a lot of governmental and non-governmental efforts (i.e. tax increases, severe restrictions of smoking in public places, prevention programs from preschool ages) in order to reduce smoking rates in the recent years. Hopefully significant positive outcomes in

all age groups will be observed as a consequence of these endeavours. When the occurrence of behaviour patterns was compared, Cluster 3 (considered the least positive) was common. In this group, there is frequent use of psychoactive substances with low levels of physical activity.

- In Poland, a relatively high percentage of young people are dissatisfied with life. The frequency of incomplete families was lower than in other countries, which may be considered as a protective factor. Polish adolescents were characterised by the lowest levels of physical activity among the V4 countries, mostly due to the results of poor indicators among girls. The risk of psychoactive substance use was lower than in other countries and as a result, behaviour pattern number 5, i.e. low levels of both the PA and RB scores, was common.
- In Slovakia, the highest percentage of low affluent families is observed. The strengths of this country included a relatively low percentage of individuals expressing dissatisfaction with life (similar to the Czech Republic) and a better perception of school performance when compared to the other V4 countries. The favourable level of physical activity was observed in both genders, while the frequency of psychoactive substance use was moderate. As a result, behaviour pattern number 2, i.e. the most positive one, is frequent in Slovakia.

Selected characteristics of clusters

In **Table V**, selected characteristics of adolescents categorised into specific patterns of health behaviours are shown.

	Total	Cluster 1 rather high PA rather high RB N = 960	Cluster 2 very high PA low RB N = 1876	Cluster 3 low PA high RB N = 390	Cluster 4 high PA very high RB N = 447	Cluster 5 low PA low RB N = 1604
Living with both parents	74.0	70.0	78.7	60.7	60.2	78.1
Low family affluence (FAS)	22.7	18.9	21.4	29.8	21.4	25.0
Academic achievements below average	6.2	6.4	3.3	18.0	14.0	4.3
Physical fight more than twice in last year	17.6	23.7	14.0	29.1	40.0	9.0
Sexual initiation	19.9	28.3	11.4	48.3	62.3	7.5

PA – physical activity; RB – risk behaviour.

Table V. Comparison of identified clusters by selected factors describing family, school and behavioral context (%).

Source: Own elaboration.

The percentage of affluent families is significantly lower in Clusters 3 and 5, which are characterised by lower levels of physical activity.

A relatively low percentage of adolescents who live with both biological parents, is observed in Clusters 3 and 4. These groups are characterized by a very high RB index. The distinctive feature of these two clusters is a high percentage of adolescents with poor school performance.

In the three groups characterised by frequent use of tobacco, alcohol and marijuana, the percentage of adolescents displaying other risk behaviours (such as aggressive behaviours or early sexual initiation) is relatively high.

General life satisfaction among adolescents, categorised in the behaviour patterns was investigated. The mean score of life satisfaction ranges from 6.60 in Cluster 3 to 7.36 in Cluster 2 and the extreme values were in groups previously identified with opposing patterns. Lower quality of life may be associated with

a significant engagement in risk behaviours (Clusters 3 and 4), and to a lesser extent in slightly above average engagement (Cluster 1). The quality of life profile developed according to behaviour patterns takes a similar form in all four countries (**Figure 3**). In all countries, adolescents displaying the most positive behaviour pattern are more satisfied with their lives than their peers from the other groups. Analogical international comparisons (data not shown) indicated similar cluster profiles related to other problematic behaviours (such as fighting, early sexual initiation) in the V4 countries.

Discussion

This paper deals with the age-homogenous group of 5,588 adolescents living in the four countries of Central Europe who participated in the international HBSC survey. The V4 group represents countries with similar history, social, political and economic background. This is

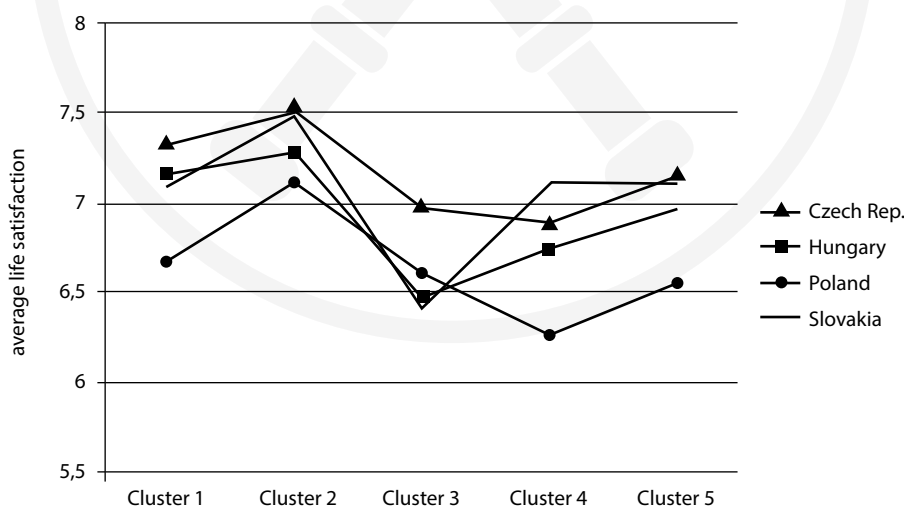


Figure 3. Life satisfaction profile by cluster membership and country (description of clusters in Table IV).

Source: Own elaboration.

the first (in addition to GYTS – [23]) joint study oriented at various pro- and anti-health behaviours in adolescents in these countries. The common “Central European” patterns of adolescent health behaviours were used and some deviations from average patterns were investigated and recorded in the individual countries. In the discussion, the following aspects deserve special attention: (1) similarities and differences among the countries together with the strengths and weaknesses of each country (called as country profiles); (2) strengths and limitations of this study, especially from the methodological point of view; (3) specificity of individual behaviour patterns and the resulting implications for practical measures and future research.

Country profiles

Contrary to expectations, some differences between the V4 countries were found, both in terms of the frequency in engaging in health behaviours and other indicators related to general quality of life and the social context of health. The use of a combined sample from several countries to identify behaviour patterns had several strong points. We consider our study based on data collected from a large multicentre sample of over 5,000 students as providing better classification possibilities than the analysis of separately collected national data.

The sample was age-homogeneous, and excluded students who attended classes with younger or older peers in order to identify health behaviour patterns. Gender differences did not affect the results and we based the division into clusters on standardised scores of physical activity and risk behaviours, specific to boys and girls. Behavioural patterns were studied in terms of their determinants (family background) and in terms of psychosocial and health consequences (other risk behaviours, general well-being).

Significant differences among the investigated countries in the frequency of adolescents engaging in risk behaviours, which include smoking, alcohol and marijuana abuse, were noted. Countries with high (Czech Republic, Hungary) and low (Slovakia, Poland) rates of risk behaviours were identified, which is supported in other research reporting that adolescents in Poland smoked cigarettes and drank alcohol less frequently than adolescents in the V4 countries [23, 24]. We still deem such rates in Poland and Slovakia as too high, considering they concern 15-year-olds.

With the exception of the Czech Republic, girls in the investigated countries partake in risk behaviours less frequently than boys. However, a recent analysis from Europe (also based on the HBSC data) have indicated that behaviour patterns among girls and boys are becoming more similar [25, 26]. This phenomenon, observed previously in many western countries, is now visible in Central and Eastern Europe. It has been noted that adolescents from the latter countries undergo initiation into risk behaviours at an increasingly younger age. The number of young people who drink large amounts of alcohol on a single occasion has also been rising [23, 24, 27]. Our research shows that this risk group may include individu-

als who express pro-health attitudes in relation to high levels of physical activity [28]. Their incoherent attitude towards their own health puts them at risk for other unhealthy behaviours and may reduce their general life satisfaction. Subsequent research should aim to investigate the determinants of such “incoherent” behaviour patterns, and take into account personal characteristics and motivating factors. It may be that social motives related to group functioning and the sensation or pleasure seeking might explain some behaviour patterns [29].

Social and cultural determinants and life situations may explain similarities and differences in adolescent involvement in behaviours related to smoking tobacco and drinking alcohol. The report *Closing the health gap in the European Union* claims that some health indicators in countries who joined the European Union (EU) after 2003 are much worse than in the more long-standing member countries. At the beginning of the 21st century, life expectancy rose and the incidence of cardiovascular diseases fell in those countries. Premature mortality related to smoking and drinking continues to be a worrying phenomenon. In Hungary, premature mortality rates due to smoking are among the highest in the EU. The countries of Central Europe continue to show high death rates from liver cirrhosis and other alcohol-related diseases.¹⁰

Analyses conducted as part of the ESPAD¹¹ research confirmed a negative situation in terms of cannabis use. The Czech Republic is among the group of countries with a high percentage of adolescents using cannabis, while its use in risky ways is not so big problem in Poland. The law on drug use varies in different countries and adults have diverse views on prohibition and punishment for the possession of marijuana for personal use.

The presented here analyses concern countries that share many common factors decisive for the health of its citizens. Human health is not merely the sum of pro-health and anti-health behaviours, but it also comprises a value system, a life philosophy, attitudes, skills and knowledge, being under influence of the socioeconomic situation and government policies. It is expected that the new EU countries, including the V4, will note a further decrease in health indicators related to psychoactive substance use and that there will be tangible benefits resulting from policy changes related to nicotine and tobacco. However, it should be borne in mind that the role of the state is not limited to establishing regulations but that it also has an important role in creating conditions for improved performance by families. The continuous improvement in the effectiveness of preventive measures in schools is not without significance. In Poland, the Centre for Education Development¹² at the Ministry of National Education as well as other institutions such as the KBPN (National Bureau for Drug Prevention) and the PARPA (State Agency for the Prevention of Alcohol-Related Problems) supervises the quality of implemented programmes that receive government assistance. The Ministry of Sport promotes the principle of educating young people through sport and preventing risk behaviours. The focus of interest of these institutions includes enhancing local measures, promoting good practice, disseminating

and evaluating prevention programmes. These organisations may want to consider the results of our research, which identifies pro-health and anti-health behaviours, and implement relevant measures with regard to adolescents displaying unusual and contradictory patterns of attitudes to their health in some areas of their lives.

Strengths and limitations

The basic limitations of these studies result from their cross-sectional nature, narrow age group and shortcoming of the self-administered questionnaire. It may be difficult to draw conclusions concerning causal relationships on the basis of a cross-sectional study. Also, it is impossible to observe how behaviour models change in successive years of life and under the influence of various factors. The selection of analyzed examples of pro and anti-health behaviour may raise some objections. In the first group only physical activity was analyzed, while food related behaviours as well as limiting contacts with the media were not taken into consideration. Other risky behaviours, which could also be taken into account, include violence and risky sexual behavior. Moreover, some young people may tend to conceal socially unacceptable risky behaviours. As previously indicated by Spengler *et al.* in their own, similar studies, by describing only observed health behaviours we tend to overlook an important aspect of the attitude to health [12].

Certain advantages of our study may nonetheless be indicated, which ought to balance the abovementioned limitations. International nature of the study has already been mentioned. Another advantage of our study is its firm reliance on cooperation within the framework of a constantly developing network of scientists. Similar analyses may be replicated on the basis of new HBSC data, in other age groups and in other regions. The research results translate into practical activities, setting directions for further studies. It is possible, although not particularly easy, to align successive studied groups to already defined models. It is also possible to use the already developed distinction into five behaviour models and correlate alignment with the model with dozens of indicators available in the HBSC questionnaire. Awareness of the existence of various behavior models may help to interpret the results of correlation studies, for instance those related to the association between physical activity and the psycho-social features of young people.

Implication for practice and future research

At the level of HBSC network some efforts were made to translate the research evidence into action (the WHO/HBSC Forum series). Forum series focuses on increasing know-how to scale-up inter-sectoral policies and interventions; reduce health inequalities; and involve young people in the public health initiatives [30].

We report here substantial differences in physical activity between girls and boys, in particular, the frequency of boys and girls meeting MVPA and VPA recommendations, and overall PA index. This tendency was observed

in Poland and Hungary, with differences exceeding 10%. In the Czech Republic and Slovakia, the situation was more favourable with differences between the physical activity of boys and girls at less than 10%. The number of hours of PE in the core school curriculum in each country, as well as the availability of free organised sports and recreational activities may influence these results.

There seems to be a firm relationship between physical activity and the risk behaviours of adolescents and the financial capacity and affluence of their families. However, the nature of the association between family affluence and substance use is more complicated and less clear. We noticed the effects of the cultural patterns of openness and of social contact, which differentiated adolescents in Clusters 3 and 5 into types of “lazy antisocial” and “lazy social” who are with different levels involved in risk behaviours.

There are two dimensions shaping the process of health behaviours. Socialisation, where adolescents develop values, habits, attitudes and behaviours through the influence of the physical and social environment and the impact of modelling, and nurture and upbringing and the conscious, intentional effects on the adolescents’ personality, targeted on a specific purpose. Peer groups are an important modelling and educational influence on boys and girls, in a specific environment.

Physical activity is a behaviour that fosters health, connects teenagers with their childhood, and is a natural, integral part of their behaviour. Risk behaviours may be considered as an attempt to break free from childhood, test and tap into the adult world. A multi-threaded process and multifaceted analysis of health behaviour will allow us to estimate a profile of teenagers and to design targeted preventive action or intervention.

Conclusion

Our study shows that complex patterns of life-style related behaviour exist in adolescents, and we conclude that we should provide members of different clusters with a range of prevention programmes. The usefulness of defining behavioural models on the basis of the standard „European” population has been indicated. The results obtained may provide a starting point to further, more profound studies concerning a particular country or a group of countries. Specifically, the selected psycho-social features of young people representing various behavior models ought to be compared.

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Notes

¹ *The European health report 2005; public health action for healthier children and populations*. WHO Regional Office for Europe, Copenhagen 2005.

² CHIP-AE – Child Health and Illness Profile – Adolescent Edition. It comprises six domains: satisfaction, discomfort, disorders, risk avoidance, resilience and achievement.

³ With no examples from Central or Eastern Europe.

⁴ More information on the www.hbsc.org

⁵ <http://www.drjamesallis.sdsu.edu/Documents/PAMeasureinfo.pdf>, access: 14.02.2014.

⁶ The MVPA (moderate-to-intensive) screening measure is recommended for clinical practice with adolescents as well as for research purposes. VPA means vigorous physical activity.

⁷ FAS scale was validated in numerous studies. It correlates with more objective measures of family wealth, such as family income reported by parents.

⁸ Standardized indices were estimated by principal component method in factor analysis.

⁹ PISA – Programme for International Student Assessment.

¹⁰ Zatoński W. (ed.) with M. Mańczuk and U. Sułkowska and the HEM Project team, available from www.hem.waw.pl, access: 14.02.2014.

¹¹ ESPAD – European School Survey Project on Alcohol and Other Drugs.

¹² www.ore.edu.pl; In the section for the health promotion at school database of good practices was developed.

References

- World Health Organization. *Prevention in children and youth of adult cardiovascular disease: time for action*. WHO, Geneva 1990 (WHO Tech. Rep. Series 792).
- Branca F., Nikogosian H., Lobstein T. (eds.), *The challenge of obesity in the WHO European region and the strategies for response: Summary*. WHO Regional Office for Europe, Copenhagen 2007.
- Balogh K.N., Mayes L.C., Potenza M.N., *Risk-taking and decision-making in youth relationships to addiction vulnerability*, "Journal of Behavioral Addictions" 2013; 2(1): 1–9.
- Stanton W.R., Lowe J.B., Silva P.A., *Antecedents of vulnerability and resilience to smoking among adolescents*, "Journal of Adolescent Health" 1995; 16(1): 71–77.
- Rusby J.C., Westling E., Crowley R., Light J.M., *Psychosocial correlates of physical and sedentary activities of early adolescent youth*, "Health Education & Behavior" 2014; 41(1): 42–51.
- Swahn M.H., Bossarte R.M., Palmier J.B., Yao H., Van Dulmen M.H., *Psychosocial characteristics associated with frequent physical fighting: findings from the 2009 National Youth Risk Behavior Survey*, "Injury Prevention" 2013; 19(2): 143–146.
- Lacaille L.J., Dauner K.N., Krambeer R.J., Pedersen J., *Psychosocial and environmental determinants of eating behaviors, physical activity, and weight change among college students: a qualitative analysis*, "Journal of American College Health" 2011; 59(6): 531–538.
- Alonso J., Urzola D., Serra-Sutton V., Tebé C., Starfield B., Riley A.W., Rajmil L., *Validity of the health profile-types of the Spanish Child Health and Illness Profile-Adolescent Edition (CHIP-AE)*, "Value Health" 2008; 11(3): 440–449.
- McAloney K., Graham H., Law C., Platt L., *A scoping review of statistical approaches to the analysis of multiple health-related behaviours*, "Preventive Medicine" 2013; 56(6): 365–371.
- Quintiliani L., Allen J., Marino M., Kelly-Weeder S., Li Y., *Multiple health behavior clusters among female college students*, "Patient Education and Counseling" 2010; 79(1): 134–137.
- Keller S., Maddock J.E., Hannover W., Thyrian J.R., Basler H.D., *Multiple health risk behaviors in German first year university students*, "Preventive Medicine" 2008; 46(3): 189–195.
- Spengler S., Mess F., Mewes N., Mensink G.B., Woll A., *A cluster-analytic approach towards multidimensional health-related behaviors in adolescents: the MoMo-Study*, "BMC Public Health" 2012; 12: 1128.
- Veloso S.M., Matos M.G., Carvalho M., Diniz J.A., *Psychosocial factors of different health behaviour patterns in adolescents: association with overweight and weight control behaviours*, "Journal of Obesity" 2012; 2012: 852672.
- Kwan M.Y., Cairney J., Faulkner G.E., Pullenayegum E.E., *Physical activity and other health-risk behaviors during the transition into early adulthood: a longitudinal cohort study*, "American Journal of Preventive Medicine" 2012; 42(1): 14–20.
- Haapanen N., Miilunpalo S., Vuori I., Oja P., Pasanen M., *Characteristics of leisure time physical activity associated with decreased risk of premature all-cause and cardiovascular disease mortality in middle-aged men*, "American Journal of Epidemiology" 1996; 143(9): 870–880.
- Roberts C., Freeman J., Samdal O., Schnohr C.W., de Looze M.E., Nic Gabhainn S., Iannotti R., Rasmussen M., *International HBSC Study Group. The Health Behaviour in School-aged Children (HBSC) study: methodological developments and current tensions*, "International Journal of Public Health" 2009; 54 (Suppl. 2): 140–150.
- Currie C., Zanotti C., Morgan, A. et al. (eds.), *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*. WHO Regional Office for Europe, Copenhagen 2012.
- Harel-Fisch Y., Abdeen Z., Walsh S.D., Radwan Q., Fogel-Grinvald H., *Multiple risk behaviors and suicidal ideation and behavior among Israeli and Palestinian adolescents*, "Social Science & Medicine" 2012; 75(1): 98–108.
- Pickett W., Garner M.J., Boyce W.F., King M.A., *Gradients in risk for youth injury associated with multiple-risk behaviours: a study of 11,329 Canadian adolescents*, "Social Science & Medicine" 2002; 55(6): 1055–1068.
- Mazur J., Tabak I., Gajewski J., Dzielska A., *Nadwaga i otyłość wśród uczniów gimnazjum w zależności od wybranych czynników behawioralnych. Zmiany w latach 2006–2010*. "Przegląd Epidemiologiczny" 2012; 66(3): 503–508 (in Polish).
- Hublet A., Schmid H., Clays E., Godeau E., Gabhainn S.N., Joossens L., Maes L., *HBSC Research Network. Association between tobacco control policies and smoking behaviour among adolescents in 29 European countries*, "Addiction" 2009; 104(11): 1918–1926.

22. Vereecken C., Dupuy M., Rasmussen M., Kelly C., Nansel T.R., Al Sabbah H., Baldassari D., Jordan M.D., Maes L., Niclasen B.V., Ahluwalia N., HBSC Eating & Dieting Focus Group, *Breakfast consumption and its socio-demographic and lifestyle correlates in schoolchildren in 41 countries participating in the HBSC study*, "International Journal of Public Health" 2009; 54 (Suppl. 2): 180–190.
23. Baska T., Sovinová H., Nemeth A., Przewozniak K., Warren C.W., Kavcová E., *Findings from the Global Youth Tobacco Survey (GYTS) in Czech Republic, Hungary, Poland and Slovakia - smoking initiation, prevalence of tobacco use and cessation*, "Sozial und Präventivmedizin" 2006; 51(2): 110–116.
24. Hibell B., Guttormsson U., Ahlström S., Balakireva O., Bjarnason T., Kokkevi A. and Kraus L., *The 2011 ESPAD report. Substance use among students in 36 European countries*, The Swedish Council for Information on Alcohol and other Drugs (CAN), 2012.
25. Kuntsche E., Kuntsche S., Knibbe R., Simons-Morton B., Farhat T., Hublet A., Bendtsen P., Godeau E., Demetrovics Z., *Cultural and gender convergence in adolescent drunkenness: evidence from 23 European and North American countries*, "Archives of Pediatrics & Adolescent Medicine" 2011; 165(2): 152–158.
26. Simons-Morton B.G., Farhat T., ter Bogt T.F., Hublet A., Kuntsche E., Nic Gabhainn S., Godeau E., Kokkevi A., HBSC Risk Behaviour Focus Group, *Gender specific trends in alcohol use: cross-cultural comparisons from 1998 to 2006 in 24 countries and regions*, "International Journal of Public Health" 2009; 54 (Suppl. 2): 199–208.
27. Warren C.W., Lea V., Lee J., Jones N.R., Asma S., McKenna M., *Change in tobacco use among 13-15 year olds between 1999 and 2008: findings from the Global Youth Tobacco Survey*, "Global Health Promotion" 2009; 16 (2 Suppl.): 38–90.
28. Luo J., Agle J., Hendryx M., Gassman R., Lohrmann D., *Risk Patterns Among College Youth: Identification and Implications for Prevention and Treatment*, "Health Promotion Practice" 2014, Feb 10. (in press, available online).
29. Lammers J., Kuntsche E., Engels R.C., Wiers R.W., Kleintjan M., *Mediational relations of substance use risk profiles, alcohol-related outcomes, and drinking motives among young adolescents in the Netherlands*, "Drug and Alcohol Dependence" 2013; 133(2): 571–579.
30. Koller T., Morgan A., Guerreiro A., Currie C., Ziglio E., *International HBSC study group. Addressing the socioeconomic determinants of adolescent health: experiences from the WHO/HBSC Forum 2007*, "International Journal of Public Health" 2009; 54 (Suppl. 2): 278–284.

