FACTORS ASSOCIATED WITH TOBACCO SMOKING AND THE BELIEF ABOUT WEIGHT CONTROL EFFECT OF SMOKING AMONG HUNGARIAN ADOLESCENTS

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SUMMARY

Introduction: The relationship between body weight and smoking has been well-documented among adult populations, but the data among youth are inconsistent. This study explores the relationship among social, behavioural, body weight-related factors and adolescent smoking while identifying factors associated with the belief that smoking controls weight.

Materials and methods: Baseline data from a three-year, prospective cohort study started in 2009 in Hungary's six metropolitan cities. Randomly selected 6th and 9th grade students completed a self-administered questionnaire during the 2009−2010 school year (n=1445; 45% boys, mean age of 6th graders: 12.06 years, SD=0.63; mean age of 9th graders: 15.06 years, SD=0.63). Calculations of Body Mass Index (BMI) were based on objectively measured weight and height data of participants. Appetite-Weight Control Scale of the Short Form of Smoking Consequences Questionnaire was used to measure the belief that smoking supports weight control. Bivariate and multivariate logistic regression analyses were performed to examine the association between the perception of weight control and smoking, while controlling for potential confounding variables (e.g., gender).

Results: 24.8% of participants smoked cigarettes within the past 30 days. The odds of smoking were increased among students who were older, had smoking friends, were exposed to parental smoking, and had poorer academic performance. BMI showed positive association with smoking (increases in BMI were associated with higher odds of smoking), and the belief that smoking controls weight mediated this association. There was no difference in smoking prevalence among those motivated either to lose or gain weight (~30%), but was considerably lower among adolescents satisfied with their body weight (19%). The belief that smoking supports weight control was more common for girls, older students, and those who perceived themselves as overweight.

Conclusions: Dissatisfaction with body weight and the belief that smoking has weight controlling effects are associated with an increased likelihood of adolescent smoking, therefore they must be considered in smoking prevention programmes among youth.

Key words: smoking, adolescence, weight control belief, BMI, perceived body shape

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INTRODUCTION

Tobacco smoking is the leading preventable risk factor of Disability Adjusted Life Years for Hungarian people (1). According to the latest representative data, the prevalence of current daily smoking is 29.9% among Hungarian adults between 18 and 64 years of age with an additional 6.2% of occasional smokers (2). Recent data among youth aged 10−18 suggest that current daily smoking ranges from 21% to 33% depending on the age of the target population. Smoking trends have declined in both genders in the recent years, although current smoking among high school girls exceeds the prevalence rates of boys (3−6).

Numerous factors are associated with adolescent smoking including age, parental smoking, parental socioeconomic status, peer smoking, attitudes of family and friends, school factors, risk behaviours, lifestyle, stress, self-esteem, attitudes and health concerns (7). A comprehensive review suggests that concerns about weight can also be an important factor for smoking, especially among females (8). In modern societies the thin body ideal, and sociocultural pressures to be thin had a deep impact on the adolescent population; girls, in particular, are often dissatisfied with their body image and perceive themselves as overweight. Dieting and other weight control methods are well-known features of adolescent behaviour to achieve an idealized perfect body shape (9, 10). The youth's assumption that tobacco smoking can be used as a weight control method is based on the widespread belief that smoking is an effective weight control strategy although its anorectic effect is slow and may benefit only older individuals (11). The belief that smoking controls weight seems to be age-related and more pervasive among girls (12−15). There is conflicting evidence on the association between adolescents' body weight and smoking (8, 15). The finding of a positive interrelation or no

relationship between body weight and smoking among youth is inconsistent with findings for adults which have suggested that body weight and current smoking status are inversely associated (8, 15). Some studies propose that higher body mass index (BMI) and overweight in adolescence may be related to smoking, but the relationship to gender is inconsistent (11, 15−19). Other studies have found negative or no association between BMI and smoking (20−23). Self-perception of body weight may also play a role in initiation and maintenance of smoking (24). Numerous studies indicated that adolescents, especially girls who perceive themselves as being overweight, were more likely to smoke (13, 17, 18, 21, 23−28). Concerns about weight also show a positive relationship with smoking (19, 25, 27). Weight concerns may be more related to body image or weight perception than to the actual objective weight (15). For females, weight perception is guiding the behaviour of smoking rather than BMI calculated with self-reported data (26). When predicting regular smoking in female adolescents, individuals' self-perception is more important than their actual weight (20). Weight concerns show associations with current smoking or smoking initiation for female adolescents (27, 29). Evidence points most clearly to a positive association between smoking and dieting behaviour (8). Many studies found that girls dissatisfied with their weight and trying to lose weight and/or following specific diet are more likely to smoke (17, 23, 29−32).

This study evaluated the relationships among social, behavioural, body weight-related factors and adolescent smoking and assessed factors associated with the belief that smoking controls weight. The other aim was to explore whether a cognitive factor, namely the belief that smoking supports weight control plays a mediator role in the association between BMI and smoking.

MATERIALS AND METHODS

Sample: This research was approved by human subjects' review boards at Semmelweis University and Davidson College as a part of a larger study on building capacity for tobacco research in Hungary (1 R01 TW007927-01). The sample consisted of 2,208 6th and 9th grade students participating in the Longitudinal Study of Tobacco Smoking and Weight Management among Adolescents. Our three-year cohort study with yearly data collections started in the 2009−2010 school year in six metropolitan cities. The cluster sampling involved 78 schools including elementary, vocational and high schools. Parents were informed about the research by a passive consent procedure. Subjects' participation was voluntary and all subjects provided written and verbal consent. Trained data collectors unknown to the students asked the participants to complete the questionnaire in the classroom within one class time. Self-reported and measured weight (kg) and height (cm) were available in 65.4% of the sample. The measurement of students' weight and height was carried out with the assistance of school nurses. Twenty-eight percent of data are missing because the school refused to perform the height and weight measurements and 6.6% of adolescents either failed to answer the height and weight questions or the values were biologically implausible. Therefore 1,445 students (653 boys and 792 girls, mean age 13.95 years, SD=1.58; mean age of 6th graders: 12.06 years, SD=0.63; mean age of 9th graders: 15.06 years, SD=0.63) comprised the study sample.

Measurement: The participants' height (cm) and weight (kg) without shoes and wearing light clothing were measured by school nurses using standardized equipment and procedures. The Body Mass Index (BMI) was calculated as weight (kg)/height $(m)^2$ separately for self-reported and measured data. Although correlations between self-reported and measured weight ($r=0.96$; $p<0.001$), height ($r=0.94$; $p<0.001$) and BMI ($r=0.92$; $p<0.001$) indicated a high agreement, self-reported BMI of students was less than the actual BMI ($t_{(1444)}=13.155$, $p<0.001$; Cohen $d=0.32$), therefore BMI based on objectively measured height and weight was used for analyses. Age and gender-specific cut-off points for BMI were used to classify underweight, normal weight, overweight and obesity in the sample (33, 34).

Self-reported smoking behaviour was assessed by the Hungarian version of smoking-related questions from the Youth Risk Behaviour Survey 2009 (6, 35). In the current analysis, we used two major questions: a) Did you smoke at least one cigarette in the past 30 days, b) and if so, how many? Smoking status was dichotomized into non-smokers who did not smoke during the past 30 days (non-smokers and experimenters combined and coded "0") and smokers who smoked during the past 30 days (intermittent and regular smokers combined and coded "1") (36).

Mother/female guardian and father/male guardian smoking status was also assessed (yes, no) and the items were combined to create a dichotomous variable representing parental smoking (0=none, 1=one or both parents).

Students were asked to report how many of their five closest friends smoke at least one cigarette a day. Responses were coded "0" (none of them) and "1" (one or more friends smoking).

Weight-related smoking expectancies were ascertained by using the Appetite-Weight Control (AWC) Scale of the Short Form of Smoking Consequences Questionnaire (S-SCQ) (37). The AWC Scale included five statements ("Smoking controls my appetite," "Smoking keeps my weight down," "Cigarettes keep me from overeating," "Cigarettes keep me from eating more than I should," and "Smoking helps me control my weight.") and participants were asked to rate the likelihood of each consequence on a 10-point Likert scale from "completely unlikely" to "completely likely" (0−9). The Hungarian version of the S-SCQ was tested on an adolescent sample, and the psychometric properties of the questionnaire were found to be satisfactory, including internal consistencies and factor structure (38). In our sample, internal consistency of this scale was excellent (Cronbach $\alpha=0.91$, 95% CI 0.91–0.92). The AWC Scale was dichotomized (0=low agreement; 1=high agreement) using median split because the distribution of the scale was deviated from the normal distribution considerably.

Participants were asked about how they perceive their body shape. Response options included "much too thin, a bit too thin, about right size, a bit too overweight and much too overweight". Responses were divided into three categories (thin, about right size, overweight) as "much too" and "a bit too" options were added in the thin and overweight categories (10). A further dichotomous variable was created for logistic regression analyses (0=thin or about right size; 1=overweight). Desire to change weight and body shape was assessed with the response options "Yes, I would like to lose weight but I am not on a diet," "Yes, I would like to lose weight and I am on a diet," "Yes, I would like to gain weight," and "No, because my weight is right." For exploring weight management goals three categories were created as respondents

who reported trying to lose weight with or without diet were collapsed. While analysing dieting behaviour, answer "Yes, I would like to lose weight and I am on a diet" was coded as "1" and all the other options were coded as "0".

Self-reported family income was assessed on a 5-point Likert scale ranging from 1 ("very poor") to 5 ("very good"). Responses were dichotomized and coded "1" ("very poor", "poor") and "0" ("average", "good", "very good").

School achievement of respondents in the last semester was inquired about (in Hungary, the best mark is 5, the worst is 1) and dichotomized into "satisfactory" or "worse" (≤3.50) coded as "1" and "good" (≥3.51) coded as "0".

Analysis: Descriptive statistics of all variables in the study were conducted. Chi-square tests and independent samples t-tests were used to compare differences between those who smoked during the past 30 days and who did not, and the differences between genders. The association of smoking in the past 30 days and predictor variables were examined in bivariate and multivariate logistic regression analyses separately by gender. We also conducted these analyses to assess the association of the belief that smoking controls weight and its predictor variables. Unadjusted and adjusted odds ratios with 95% confidence intervals were calculated for smoking and the belief smoking supports appetite-weight control. Non-smokers and those with low agreement of the belief were used as references. The mediator role of smoking's weight control belief in the association between BMI and smoking was examined with a mediation analysis (39). SPSS 17.0 was used for all statistical analyses.

RESULTS

Characteristics of the sample: Table 1 shows that 24.8% (n=359) of respondents smoked in the past 30 days prior to the study. Smoking prevalence was similar for boys and girls ($\chi^2_{(1)}$=1.888, p=0.169). The proportion of smokers was much lower among 6th graders than 9th graders (5.6% vs. 36.2%, respectively; $\chi^2_{(1)}$=169.737, p<0.001). Girls consumed tendentiously less cigarettes on their smoking days than boys ($\chi^2_{(3)}$=6.334, p=0.096). Students in 6th grade smoked significantly fewer cigarettes than the 9th grade sample ($\chi^2_{(3)}$=18.763, p<0.001), however, the proportion of students consuming more than 20 cigarettes was higher among them (22.2% vs. 5.7%, respectively). Half of the participants reported that one or both of their parents were smoking. The rate of parental smoking was similar in both genders ($\chi^2_{(1)}$=1.323, p=0.250). One or more close friends' smoking occurred significantly more frequently among girls than boys ($\chi^2_{(1)}$=4.268, p=0.039). Smoking was typically more prevalent among those who reported poor family income compared to respondents evaluating their family income as average or good (31.9% vs. 24.7%, respectively, $\chi^2_{(1)}$=2.860, p=0.091). Students of poor school achievement showed significantly higher smoking prevalence than their counterparts with good school achievement (44.7% vs. 12.7%, respectively, $\chi^2_{(1)}$=176.600, p<0.001).

There was no significant difference by gender in the mean BMI (for boys mean=20.8, SD=4.37; for girls mean=20.9, SD=3.94; $W_{(1327)}$=0.380, p=0.704; Cohen d=0.02). Based on BMI, 24.0% of all students were overweight or at risk of becoming overweight, and 8.7% were underweight. The prevalence of nutritional categories was similar by gender ($\chi^2_{(2)}$=1.926, p=0.382). However, there was a significant gender difference in the proportion of perceived weight status ($\chi^2_{(2)}$=23.809, p<0.001). More than one third of girls considered themselves to be overweight compared to almost one quarter of boys. Girls reported significantly more frequently a desire to lose weight ($\chi^2_{(2)}$=69.036, p<0.001) than boys. Similar frequency of smoking were presented in adolescents whose goal was either to lose or gain weight (27.8% vs. 29.5%) and data were considerably lower among those who were satisfied with their body shape (18.7%; $\chi^2_{(2)}$=16.566, p<0.001). The odds ratio of dieting was almost two times higher among girls compared to boys ($\chi^2_{(1)}$=13.617, p<0.001; OR=1.81, 95% CI 1.32–2.49, p<0.001).

Factors associated with smoking: The results of bivariate and multivariate logistic regression analyses were similar; however, the strength of interrelations lessened considerably (Table 2). In multivariate models conducted separately by gender, the belief that smoking controls weight increased the odds of smoking in the past 30 days by 70% for girls. Higher grade was a remarkable risk factor for smoking in both gender (for boys OR=5.94, 95% CI 2.75–12.86, p<0.001; for girls OR=5.00, 95% CI 2.28–11.00, p<0.001). Students' odds of smoking who reported that one or both of their parents were smoking increased almost two times for boys and almost three times for girls. Smoking friends proved to be the most serious risk factor (for boys OR=6.35, 95% CI 2.56–15.74, p<0.001; for girls OR=10.87, 95% CI 4.18–28.22, p<0.001). Satisfactory or poorer school achievement increased three times and four times the odds of smoking for boys and girls, respectively. In bivariate models higher BMI significantly increased the odds of smoking in both gender (for boys OR=1.07, 95% CI 1.03–1.11, p=0.001; for girls OR=1.07, 95% CI 1.03–1.12, p<0.001) whereas in multivariate models the significant explanatory power of BMI was lost.

The mediator role of smoking's weight control belief in the association between BMI and smoking: series of binary logistic regression analyses were conducted to examine the potential mediator role of weight control belief of smoking related to the association between BMI and smoking. The BMI showed significant association with smoking controlled for gender and grade (OR=1.04, 95% CI 1.01–1.07, p=0.013), likewise the belief that smoking controls weight predicted increased odds of smoking (OR=1.96, 95% CI 1.49–2.58, p<0.001). However, when weight control belief of smoking was entered into the model, BMI lost its significant explanatory power for smoking (OR=1.03, 95% CI 0.99–1.06, p=0.111). This result supports that the belief that smoking controls weight plays a mediator role in the association between BMI and smoking (Fig. 1).

Factors associated with the belief that smoking controls weight: predictor variables of smoking's weight control belief (gender, grade, objective BMI, perceived body shape, dieting, parental smoking, smoking friends) were tested with binary logistic regression analyses (Table 3). In bivariate models all predictor variables except dieting and parental smoking showed significant association with the weight control belief of smoking. In the multivariate model the odds of higher agreement with the weight controlling effect of smoking increased significantly among students who perceived themselves as overweight (OR=1.63, 95% CI 1.20–2.21, p=0.002) and were older (9th grade, OR=1.42, 95% CI 1.07–1.89, p=0.016), and the odds of higher agreement increased tendentiously among girls (OR=1.27,

Table1. *Characteristics of the sample*

	Girls n=792	Boys n=653	Total n=1445
Grade (%)			
6th	47.9	52.1	37.2
9th	58.9	41.1	62.8
Smoking status (%)			
Smoker	26.3	23.1	24.8
Smoking quantity (%)			
≤1 cigarette	27.3	21.5	24.9
2–5 cigarettes	32.7	26.2	29.9
6–20 cigarettes	34.6	42.3	37.9
≥20 cigarettes	5.4	10.1	7.3
Parental smoking (%)			
One or both parent(s) smoked	51.0	47.9	49.6
Smoking friends (%)*			
One or more	67.1	61.8	64.7
Agreement with the belief smoking controls weight (%)**			
High agreement	53.3	45.8	50.0
Self-reported family income (%)***			
Poor	10.3	5.2	8.0
School achievement (%)***			
Satisfactory or worse	32.8	43.0	37.4
BMI based on measured data			
Mean (SD)	20.9 (3.94)	20.8 (4.37)	20.9 (4.13)
Nutritional status based on measured data (%)			
Underweight	9.1	8.1	8.7
Normal	68.3	66.3	67.3
Overweight	23.6	25.6	24.0
Perceived body shape (%)***			
Thin	14.9	20.9	17.6
About right size	49.4	55.0	51.9
Overweight	35.6	24.1	30.5
Weight management goals (%)***			
Lose weight	52.6	30.4	42.7
Gain weight	14.8	22.7	18.4
Stay the same weight	32.5	46.9	39.0
Dieting (%)***			
Yes	17.5	10.5	14.3

Note: *p<0.05; **p<0.01; ***p<0.001

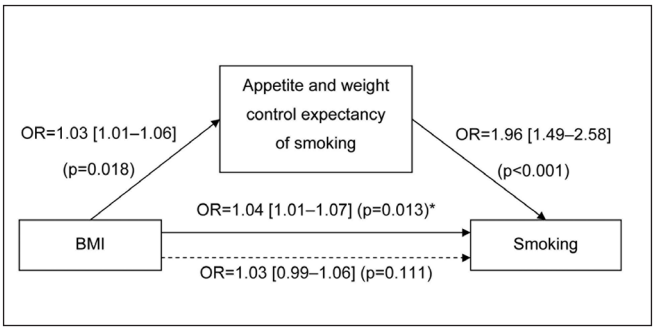

Fig. 1. *The mediator role of the belief that smoking supports weight control in the association between BMI and smoking (mediation analysis).*

Note: Odds ratios and 95% confidence intervals are shown in Fig. 1.
*Analysis without the mediator variable. All analyses were conducted controlling for gender and grade.

95% CI 1.00–1.61, p=0.051). In addition, the belief that smoking supports weight control showed weak, but significant correlation with the number of cigarettes smoked per day in the group of smokers (r_s=0.26, p=0.001).

DISCUSSION

This study examined factors associated with smoking and belief about weight control effect of smoking in a population based, cross-sectional sample of Hungarian metropolitan adolescents. The prevalence of current smoking among 6th graders resembled the latest population data of Hungarian adolescents from similar age group (3). Nevertheless, smoking rate was higher among 9th graders in our sample than findings from other studies (3−6). In

Table 2. *Factors associated with smoking*

Variables	Bivariate association		Multivariate model	
	Boys	Girls	Boys (n=467)	Girls (n=630)
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Objectively overweight	1.07** (1.03–1.11)	1.07*** (1.03–1.12)	1.00 (0.93–1.08)	1.03 (0.97–1.10)
Body shape perceived as overweight	0.94 (0.61–1.46)	1.24 (0.89–1.74)	0.88 (0.41–1.90)	0.73 (0.42–1.25)
Dieting	1.27 (0.71–2.26)	1.22 (0.81–1.86)	1.40 (0.57–3.45)	0.92 (0.51–1.66)
Agreement with the belief that smoking controls weight	1.83** (1.25–2.67)	2.35*** (1.66–3.33)	1.61+ (0.99–2.62)	1.70* (1.08–2.65)
9th grade	11.03*** (6.19–19.64)	8.43*** (4.93–14.41)	5.94*** (2.75–12.86)	5.00*** (2.28–11.00)
One or both parent(s) smoked	2.24*** (1.54–3.27)	2.93*** (2.09–4.12)	1.92* (1.17–3.16)	2.94*** (1.89–4.57)
One or more smoking friends	22.18*** (9.61–51.18)	31.95*** (12.96–78.77)	6.35*** (2.56–15.74)	10.87*** (4.18–28.22)
Poor school achievement	5.23*** (3.46–7.92)	6.32*** (4.43–9.01)	3.00*** (1.79–5.01)	4.03*** (2.62–6.20)
Poor family income	1.66 (0.79–3.52)	1.29 (0.78–2.14)	3.09* (1.06–9.00)	1.36 (0.68–2.74)
R^2 (Nagelkerke)	–	–	41.5%	43.9%

Note: +p<0.1; *p<0.05; **p<0.01; ***p<0.001

Table 3. *Factors associated with the belief that smoking controls weight*

Variables	Bivariate association	Multivariate model
	OR (95% CI)	OR (95% CI)
Girls	1.35** (1.08–1.69)	1.27+ (1.00–1.61)
9th grade	1.54*** (1.23–1.94)	1.42* (1.07–1.89)
Objectively overweight	1.21* (1.03–1.41)	1.03 (0.85–1.26)
Body shape perceived as overweight	1.62*** (1.27–2.07)	1.63** (1.20–2.21)
Dieting	1.30+ (0.95–1.78)	0.90 (0.62–1.30)
One or both parent(s) smoked	1.22+ (0.98–1.52)	1.10 (0.87–1.39)
One or more smoking friends	1.54*** (1.22–1.95)	1.17 (0.88–1.57)
R^2 (Nagelkerke)	–	4.0%

Note: +p<0.1; *p<0.05; **p<0.01; ***p<0.001

agreement with the literature suggesting that social influences are the most important determinants of adolescent smoking, we supported that smoking friends and the parents' smoking predicted most likely current smoking (7, 40, 41). Poor academic achievement in school had also a great impact on adolescents' cigarette consumption. Our findings are consistent with the literature, inasmuch social and school factors are key elements in adolescent smoking (7, 40−42).

The relevant literature indicates discrepancies for relationship between BMI and smoking. Some evidence indicates a positive association between smoking and body weight while others have found this unrelated (8). The current study found significant positive interrelation between BMI based on measured data and smoking. According to our results, the belief that smoking controls weight plays a mediator role in the above interrelation. Thus it can contribute to resolve inconsistencies of findings published in the literature about the association of BMI and smoking. Otherwise, it indicates the significance of considering cognitive factors.

Many recent studies examined overweight perception and youth smoking and most of them found that perceived overweight in adolescence is a risk factor for smoking, but the pattern of findings by gender is rather unclear (13, 17, 18, 21, 23−28). Actual dieting behaviour showed a stronger relationship with smoking and it was found to be more specific for females than males (8, 29, 30). According to our results, perception of overweight like the dieting behaviour did not indicate any association with adolescent smoking in univariate or multivariate analyses. Previous researches provided some evidence for that the belief smoking supports weight control is more prevalent among smokers than non-smokers. The association of this finding with gender is inconsistent because some studies reported the absence of gender difference while others found a stronger association among females (8, 12, 13, 15, 18, 38). In our study both girls and boys had increased risk of being current smoker based on the belief smoking controls weight.

Independent of the smoking status, the whole sample was examined to identify other factors associated with the belief that

smoking controls weight. The endorsement of this belief seems to be gender specific and age related among youth because girls and older adolescents believed that smoking can help control body weight. Our result by gender is consistent with prior studies that compared the endorsement of appetite-weight control expectancies of smoking (38). The association of the belief and age is in concordance with the findings of Boles et al. except that non-smokers as well as smokers come to believe that smoking controls weight as youth move through adolescence (13). A possible explanation for the belief's association with gender and age could be the change in body shape during adolescence and when body fat begins to be deposited the issue of weight may become more pressing for adolescent girls (13). The literature supports evidence for the positive association between perceived overweight and adolescent smoking initiation or maintenance (8). The current study identified that agreement with the weight control belief of smoking was significantly higher among overweight participants and this result was similar regarding the subjective or objective determination of overweight.

The present study is the first to document the interrelation between body-weight related factors and smoking among Hungarian adolescents. In addition, we indentified that the belief of smoking supporting weight control plays a mediator role in the association of BMI and smoking. Furthermore, the slightly investigated weight controlling belief of smoking among adolescent population was also explored.

There are some limitations that must be considered. First, this study is cross-sectional thus the level of causal inference is low, but since it is an ongoing cohort study we have the possibility to build up a predictive model to infer the real causation. Second, the present sample is limited only to urban adolescents therefore it cannot be extended to rural adolescents. Third, sampling procedure was confidential but not anonymous given the longitudinal design of the research. Thus a potential bias is related to self-reported smoking behaviour. A prior research indicates that many adolescent smokers underestimate the amount of cigarettes they smoke or even deny smoking (43). Adolescents' disclosure of cigarette smoking is also different when adolescents are promised confidentiality without anonymity compared to when the confidentiality is coupled with anonymity (43). However, other studies found that the concordance between self-reported smoking status and serum cotinine levels was above 90% (23, 44).

The results of the present study emphasize the widespread belief in weight control effect of tobacco smoking and that many adolescents try to lose weight. The epidemic of overweight and obesity is observed among Hungarian adolescents, with higher than average BMI compared to other European countries (10). Weight management goals and weight loss attempts are especially emphasized among females at the end of adolescence and in early adulthood. This period intensifies the belief that smoking may have a weight control effect (13−18, 29, 45, 46). Our results indicate that overweight youth are more prone to use tobacco for weight management which may later lead to regular smoking (11, 15, 17, 47, 48). Generally, adolescents with weight concerns, especially females, are more vulnerable to tobacco advertising targeted on youth. Thus, pro-tobacco advertising remains a key issue for tobacco industry, despite its total ban in Hungary (29, 49, 50).

Dispelling the belief that smoking controls weight must be a key element of tobacco prevention programmes for adolescents while encouraging healthy methods of weight management. Routine, well-balanced and nutritious meals control body weight and are protective against regular overeating (51). Based on prior studies, skipping breakfast regularly was associated with other unhealthy eating habits and harmful health behaviours such as smoking (52). As this study is the first in Hungary to document interrelations of smoking and body-weight related beliefs among adolescents additional research is warranted. Yet, highlighting the precautionary principle, it is advisable that dissemination of the key findings is warranted especially to professionals engaged in primary prevention programmes (physicians, public health workforce, health visitors, school nurses). Implementation could be achieved integrating tobacco prevention and cessation education into regular professional training and ongoing professional education opportunities. Finally, this knowledge should be incorporated in messages of school-based, anti-tobacco programmes.

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Statement on the Ethical Conduct of Research:
All consent documents and research protocols/study procedures were approved by the Semmelweis University Regional and Institutional Committee of Science and Research Ethics.

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