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Gender, smoking and weight concerns: Relationship to self-reported body mass index (BMI)

Płeć, palenie i troska o masę ciała: Związek z samo
ocenianym wskaźnikiem masy ciała (BMI)

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Concerns about weight have been identified as one motive for cigarette smoking among adolescents, especially females. In this paper we describe a study that links smoking related weight concerns with actual weight, testing if smoking adolescents' weight concerns are reflected in actual weight differences. We surveyed 1738 students (age 11-20) from 12 public schools in Kiel, Germany, assessing smoking status, weight concerns, body satisfaction as well as height and weight. Height and weight measures were transformed into age and sex adjusted body mass index (BMI percentiles). We confirmed a positive association between smoking and weight concerns as well as a profound gender difference in the absolute frequency of weight concerns, with female students having weight concerns almost 4-times as often as male students. However, we found no gender-specific association between smoking and weight concerns. In addition, smoking was completely unrelated to actual weight. If female students had no weight concerns, they were strongly biased towards reporting BMIs far below their respective age group. Unlike weight concerns of males, female weight concerns did not vary with actual deviations from the BMI norm. Together, this study indicates that females are less realistic than males regarding their weight appraisals. One supplementary strategy of preventing females from starting to smoke should be an adjustment of these weight appraisals.

Troska o masę ciała została rozpoznana jako jedna z przyczyn palenia papierosów wśród nastolatków, zwłaszcza wśród dziewcząt. W niniejszej pracy przedstawione zostały badania, które podejmują kwestię obawy o masę ciała powiązaną z paleniem tytoniu w porównaniu do rzeczywistej masy, w celu sprawdzenia czy obawy te mają odzwierciedlenie w faktycznych różnicach masy. Ankieta, z pomocą której określono status palacza, obawy o masę ciała, zadowolenie z ciała jak również wzrost i masę ciała, objęto 1738 uczniów (w wieku 11-20 lat) z 12 szkół publicznych w Kilonii (Niemcy). Wzrost i masa zostały przeliczone na uwzględniający wiek i płeć wskaźnik masy ciała (percentyl BMI). Potwierdzony został związek między paleniem a obawami o masę ciała, a także znaczna różnica między płciami w przypadku bezwzględnej częstości występowania tych obaw, z niemal 4-krotnie większą częstotliwością u płci żeńskiej. Nie stwierdzono jednakże zależności od płci związku pomiędzy paleniem tytoniu a troską o masę ciała. Ponadto palenie było zupełnie niezwiązane z rzeczywistą masą ciała. Uczennice, które nie przejawiały obaw o masę ciała wykazywały silną skłonność do znacznego zaniżania swojego wskaźnika masy ciała, w stosunku do wartości odpowiadającej ich grupie wiekowej. W przeciwieństwie do wyrażanych przez chłopców obaw o masę ciała, u dziewcząt nie odbiegały one od faktycznych odchyień od norm BMI. Podsumowując można stwierdzić, iż dziewczęta mają mniej realistyczny stosunek do oceny własnej masy ciała niż chłopcy. Dodatkowa strategia zapobiegająca podejmowaniu palenia przez dziewczęta powinna uwzględniać takie oceny masy ciała.

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Introduction

Despite extensive efforts to prevent youth from starting to smoke, adolescent smoking continues to be a significant public health problem [18]. Weight concern has been identified as one motive for cigarette

smoking among adolescents, especially for females [6,16]. Numerous studies have found an association between weight concerns and smoking, cross-sectional as well as prospective studies [2-4,7,11,14]. It is assumed that adolescents are aware of ni-

cotine's weight suppressing effects and therefore consider smoking as a means for weight control [5,10,15]. These weight-related smoking expectancies were found to be more pronounced in female adolescents.

However, the existing literature is less clear about the association between smoking, weight concerns and actual weight [3]. This is an important issue as it helps clarifying if weight concerns and body dissatisfaction are based on objective grounds (e.g., overweight) or are rather based on a distorted social-cognitive construction of the own physical self. In the former case, preventive efforts should focus on smoking as an inappropriate way to control or lose weight. In the latter case, adolescents should be taught that there is no need to control or lose weight in the first place.

We report results from a survey on German adolescents that assessed smoking status, weight concerns and body satisfaction as well as actual height and weight.

Methods

Study design and sample

A total of 2,235 students from 96 classes of 12 public schools in Kiel, northern Germany, were invited to take part in the study. All data were collected through paper-pencil questionnaires administered by trained research staff; students completed the questionnaires independently during one school period (about 45 min). Teachers were requested to stay seated at the front desk during data collection, and confidentiality was guaranteed at all stages of the study. The study was approved by the Ministry of Cultural Affairs of the Bundesland Schleswig-Holstein.

About a fifth of the students (21%) could not be assessed as they did not provide written parental consent, 1% of the students were absent on the day of assessment, leading to a final sample of 1,738 surveyed students (attainment rate 78%). The 12 participating schools included all school types and did not significantly differ in their composition from the official school statistic.

Survey measures

BMI percentiles and overweight status. BMI (kg per m²) was assessed from self-reports of height in cm and weight in kg. A large U.S. representative study reported high correlations between measured BMI and self-reports in youth (r for height = 0.94 and r for weight = 0.95) [8].

Due to physiological alterations of fat mass, BMI values of children and adolescents have to be adjusted for age and sex. We used the German reference data set of Krohmeyer-Hauschild et al. [12] to assign individual percentiles indicating the position of each student related to students of same age and sex. These BMI percentiles were used as a continuous variable to indicate a tendency towards overweight.

Additionally, according to the established definitions [1,9], students between the 85th and 95th percentile were classified as "at risk for overweight", students above the 95th percentile were classified as "overweight", all other students as "not overweight".

Weight concerns and body satisfaction. We assessed both constructs with single items. "How often are you concerned about your weight?" (response categories *never, sometimes, often, and always*), and "Would you like to have a different body?" (*yes vs. no*).

Smoking behavior. Lifetime smoking was determined through the question "How many cigarettes have you smoked in your life?". The response *none* was categorized as no lifetime smoking, all other responses (*just a few puffs, 1-19 cigarettes, 20-100 cigarettes, and >100 cigarettes*) as *tried smoking* [17]. Current smoking was assessed by asking "How often do you smoke at present?" to which respondents could answer *I don't smoke, less than once a month, at least once a month, but not weekly, at least once a week, but not daily, or every day*.

Those who reported smoking at least once a month are defined as current smokers.

Statistical Analysis

All data analyses were conducted with Stata 11.0 (Stata Corp, College Station TX). Bivariate associations between smoking and weight concerns were tested with chi-squared tests and logistic regression analyses. The

association between smoking, weight concerns and BMI percentiles was tested with a multifactorial Analysis of Covariance (ANCOVA). Logistic regressions and ANCOVA were controlled for "type of school" as this factor was significantly related to all studied variables (i.e., gender, weight concerns, smoking, and BMI). As it turned out that weight concerns and body satisfaction was highly

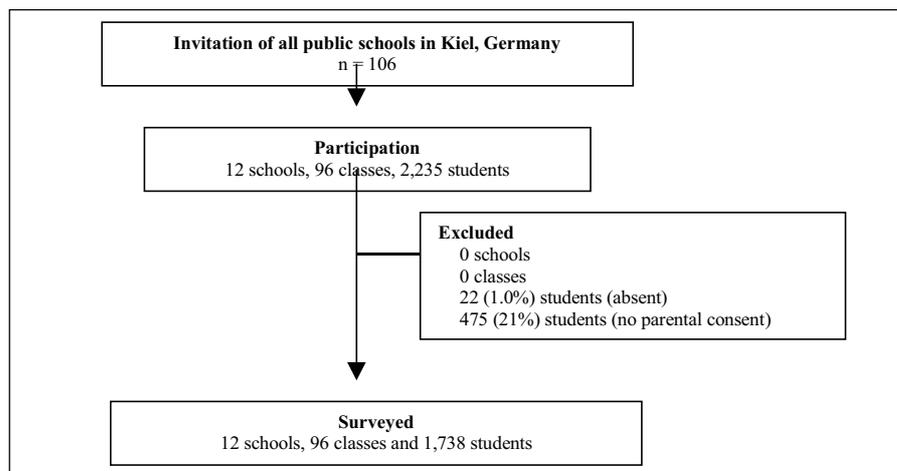


Figure 1
Study participation flow chart.

Schemat organizacyjny udziału w badaniach.

Table 1

Palenie, troska o masę ciała i zadowolenie z sylwetki w zależności od płci (n=1738).
Smoking, weight concerns, and body satisfaction depending on gender (Total N = 1738).

	Total		Males		Females		χ^2 (df)	P
	N	%	N	%	N	%		
Lifetime Smoking								
No	690	39.8	346	39.9	344	39.8	0.0 (1)	.968
Yes	1043	60.2	522	60.1	521	60.2		
Current Smoking								
No	1204	69.6	593	68.4	611	70.9	1.3 (1)	.261
Yes	525	30.4	274	31.6	251	29.1		
Weight concerns								
Never	556	32.2	435	50.1	121	14.1	361.5 (3)	.000
Sometimes	626	36.2	317	36.5	309	36.0		
Often	411	23.8	99	11.4	312	36.4		
Always	133	7.7	17	2.0	116	13.5		
Body satisfaction								
Yes	908	52.8	559	64.5	349	41.0	95.3	.000
No	811	47.2	308	35.5	503	59.0	(1)	

Note: Variations of N because of missing values; Bold figures = significant associations
Uwagi: Odchylenie n z uwagi na brak danych; Wytłuszczone dane = istotnie powiązane

		Weight concerns [*]		Body satisfaction	
		OR	P	OR	P
		(95% CI)		(95% CI)	
Lifetime smoking	Males	0.9 ^a (0.6-1.3)	.597	0.6 ^a (0.4-0.8)	.001
	Females	1.9 ^b (1.4-2.5)	.000	0.6 ^b (0.4-0.8)	.000
Current smoking ^b	Males	1.6 ^c (1.0-2.4)	.027	0.6 ^c (0.5-0.8)	.001
	Females	1.5 ^d (1.1-2.1)	.004	0.7 ^d (0.5-0.9)	.016

Table III
Gender, smoking, and weight concerns: Relation to self-reported BMI. Results of a multifactorial Analysis of Covariance (ANCOVA).

Płeć, palenie i troska o masę ciała: Związek z samo ocenianym wskaźnikiem masy ciała BMI. Wyniki wieloczynnikowej Analizy Kowariancji (ANCOVA).

	BMI percentile			Absolute mean deviation from the BMI norm		
	Adjusted Means*	F-value	P	Adjusted Means*	F-value	P
Gender						
Male	59.5			24.4		
Female	48.1	73.3	.000	23.4	1.8	.182
Lifetime smoking						
No	54.7			24.5		
Yes	54.1	0.1	.730	22.9	3.9	.047
Current smoking						
No	54.0			23.3		
Yes	55.0	0.4	.539	23.9	0.5	.498
Weight concerns						
No	45.0			22.5		
Yes	62.7	178.7	.000	25.3	13.6	.000
Gender * weight concerns						
No weight concerns	52.1			21.7		
Weight concerns	66.7			27.4		
No weight concerns	37.5	5.9	.012	23.2	15.9	.000
Weight concerns	58.5			23.2		

Note: * Means adjusted for all variables listed in the table and type of school.

Bold figures = significant associations

Uwagi: * Średnie dostosowane do wszystkich zmiennych wymienionych na liście i do typów szkół.

Wytłuszczone dane = istotnie powiązane

Table II

Płeć, palenie i troska o masę ciała: Związek z samo ocenianym wskaźnikiem masy ciała BMI. Wyniki wieloczynnikowej Analizy Kowariancji (ANCOVA). Gender, smoking, and weight concerns: Relation to self-reported BMI. Results of a multifactorial Analysis of Covariance (ANCOVA).

Note:

Bold figures = significant associations

* Variable "weight concerns" dichotomized into:

„0” = Never or sometimes weight concerns;

„1” = Often or always weight concerns

^a Reference category: Male never smokers;

^b Reference category: Female never smokers

Uwagi: Wytłuszczone dane = istotnie powiązane

*Zmienna „troska o masę ciała” rozróżniona na:

„0” = nigdy lub czasem; „1” = często lub zawsze

^a Kategoria odniesienia: płeć męska nigdy niepalący;

^b Kategoria odniesienia: płeć żeńska nigdy niepalący;

^c Kategoria odniesienia: płeć męska niepalący;

^d Kategoria odniesienia: płeć żeńska niepalący

related (Cronbachs alpha .70), the two measures were combined into a single scale "weight concerns" for the main ANCOVA to reduce redundancy.

Results

Characteristics of the study sample

The final sample consisted of 1,738 students, of whom 50.2% were male. The mean age was 15.4 years (SD 1.8) with a range of 11-20 years and a median of 15 years. Ninety-one per cent of the students reported to be of German nationality.

Smoking, weight concerns, and gender

Female and male students did not differ in smoking behavior. About 60% reported lifetime smoking, about 30% were classified as current smokers (see Table 1). We evidenced a profound gender difference regarding the frequency of weight concerns. While at least half of the male students never experience weight concerns this is true only for 14% of the females. A similar pattern can be found for body satisfaction with 59% of the females not satisfied with their body, compared to 36% of the male students.

Zero order relationships

We replicated the previously reported zero order association between smoking and weight concerns, for lifetime smoking as well as for current smoking (see Table 2). However, we did not find gender differences for this association, with the exception of weight concerns being related to lifetime smoking only in females.

Smoking, weight concerns, and actual weight (BMI percentiles)

BMI percentiles provide information on individual BMI compared to individuals of same age and same sex. The 50th percentile (median) reflects the norm of the respective age and sex group. Table 3 contains ANCOVA results with BMI percentiles as outcome variable and gender, smoking, and weight concerns as fixed factors. This analysis revealed a main effect for gender, indicating that the mean BMI percentile of female students ($M_F = 48.1$) was lower than for male students ($M_M = 59.5$). On average, female students were nearer to their age and sex norm than male students. More specifically, females reported height and weight values that were slightly lower than their norm, while males were on average about ten percentiles above the norm.

A second finding is a significant main effect for "weight concerns", meaning that students with weight concerns ($M_{wc+} = 62.7$) have higher age and sex adjusted BMIs than those without weight concerns ($M_{wc-} = 45.0$). Hence, weight concerns more often circle around being overweight than being underweight. It also shows that on average students need to be 5 percentiles lower than the norm to be not concerned with their weight. This tendency of needing to be below the norm to have no weight concerns is even more pronounced in female students, as can be seen in a significant interaction effect. Females without weight concerns are on average 12.5 percentiles below their norm, while males without weight concerns are 2.1 percentiles above their norm.

Sensitivity for deviations from the BMI norm

The reported main analysis considers averaged BMI percentiles, ignoring the fact that there are deviations from the norm in two directions, upwards and downwards. Therefore, it is not clear if male and female students also differ in their absolute deviations from the norm. Repeating the ANCOVA with absolute deviations as outcome variable revealed that there is no significant main effect for gender ($M_F = 23.4$ vs. $M_M = 24.4$; n.s). Expectedly, students with weight concerns had higher absolute deviations from the norm than students without weight concerns ($M_{wc+} = 25.3$ vs. $M_{wc-} = 22.5$; $p < .001$). However, this "realism" or "sensitivity" regarding the own BMI goes completely back to the male students ($M_{wc+} = 27.4$ vs. $M_{wc-} = 21.7$), with females having weight concerns completely independent of their absolute deviations from the norm ($M_{wc+} = 23.2$ vs. $M_{wc-} = 23.2$; p of interaction effect = .000).

Discussion

This study explored the association between smoking, weight concerns and actual weight in adolescents. We found evidence for an association between smoking and weight concerns showing that students who have ever tried smoking or are currently smoking more frequently reported weight concerns and body dissatisfaction. There was a clear gender effect in the absolute

frequency of weight concerns with female students having weight concerns almost 4-times as often as male students. However, we found no gender-specific association to smoking. Male smokers more often had weight concerns and were not satisfied with their body than male non-smokers, the same pattern as in females. Males were just generally less concerned about their weight.

Another finding of the study is that smoking was completely unrelated to actual weight, defined in terms of sex and age corrected BMI percentiles. Students' weight concerns had a positive association with BMI, indicating that weight concerns were indeed connected to some form of "objective" criterion. Yet this was only true for male students as females were strongly biased towards reporting BMIs far below their respective age group if they had no weight concerns and revealed no sensitivity for deviations from their BMI norm. This connects well to a recent German study showing that perceiving the self as being obese has more impact on quality of life than actually being obese [13].

The results of the study contribute to a further understanding of the role of weight concerns in adolescent smoking. Weight concerns influence smoking behaviour of both, males and females. The influence is stronger for females, but mainly because they more often have weight concerns. Weight concerns are based on actual deviations from the BMI norm in males, only.

There are, of course, several limitations to the current study, weakening the validity of the results. First, height and weight were measured via self-report which might have resulted in a gender-specific underreporting bias, as suggested by the lower mean BMI percentiles of female students. In general, self-report bias seems to be more relevant in studies of adults because children and adolescents have been found to report height and weight with reasonable accuracy [8]. If a bias occurred in the present case, it should not be too large as about 86% of the female students were within the 85th percentile, so the BMI values of the females are comparable to the population statistics of Krohmeyer-Hauschild et al. [12]. Second, the cross-sectional nature of the data set limits the ability to interpret any of the results as causal. For example, it might be that it is not weight concerns that contribute to the beginning of smoking, but that smoking leads to weight concerns. One way or the other, weight concerns definitely are not a sufficient cause for smoking, given the fact that the majority of students with weight concerns were non-smokers.

In summary, we have conducted an analysis that confirms an association between smoking and weight concerns. However, the smoking-weight concern link is not specifically female. What seems to be specifically female is having (unrealistically often) weight concerns.

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