

Perceived teacher unfairness and headache in adolescence: a cross-national comparison

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Abstract

Objectives The present study examines the prevalence of headache in early adolescents in 21 European and North-American countries and the role of perceived teacher unfairness in predicting this health complaint across different countries.

Methods Data were taken from the “Health Behaviour in School-aged Children” study (HBSC), a World Health

Organization cross-national survey on health behaviors in 11-, 13- and 15-year-old students. Headache and perceived teacher unfairness were measured through a self-administered questionnaire filled out by 115,212 adolescents.

Results The overall prevalence of frequent headaches (at least once a week) was 28.8%, ranging from 18.9% in Slovenia to 49.4% in Israel. After adjusting for gender, grade, family affluence, school achievement, being bullied and lifestyles (drinking, smoking, eating and physical activity), teacher unfairness showed a significant association with frequent headache in all but two countries (Ukraine and Luxembourg).

Conclusions Our results show that headache is a common health symptom in European and North-American countries, even though there are substantial differences in its prevalence across countries. The study indicates that perceived teacher unfairness can be a significant predictor of frequent headache during adolescence, and this association is consistent across countries.

Keywords Headache · School · Teacher unfairness · Cross-national · Adolescence · WHO

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complaint because it is positively associated with adolescent's stress, anxiety and depression (Powers et al. 2006), while being negatively associated with well-being (Cavallini et al. 1995; Millstein 1993). Moreover, it has also been brought in connection with a more frequent use of health services and medicine (Belmaker et al. 1985).

Previous studies on the predictors of headache in adolescence have concentrated on psychiatric and biomedical risk factors (Nicholson et al. 2007), evaluating, for example, the role of temperament, psychiatric illness, as well as physiological diseases in predicting frequent headache (Anttila 2006). However, little research has investigated the role of psychosocial factors related to the characteristics of the adolescents' life contexts in influencing this health outcome. The school plays a prominent role in the life of young people, being the place they spent most of their time at during the day (Vieno et al. 2007), and thus it is likely to be associated with adolescent headache.

Several studies have examined the health impact of acts of unfairness in the adult population (e.g., De Vogli et al. 2007), concentrating on different settings such as the work environment (Tsutsumi and Kawakami 2004), but only a few of them have analyzed this relationship among adolescents (Santinello et al. 2009). The school setting represents the main context for adolescents (Vieno et al. 2007), and it can be considered similar to the workplace (Rudd and Walsh 1993). At school, adolescents may face events that they can not cope with (such as excessive demands, low academic achievement, or relational problems with classmates and teachers), or which they perceive as unfair, resulting in experiences of stress, which in turn may lead to somatic or psychological complaints (Hjern et al. 2008; Karin-Natvig et al. 2001).

Consistent with this hypothesis, Santinello et al. (2009) found that perceived teacher unfairness was associated with frequent headaches in a representative sample of Italian early adolescents. These results are in line with the general sensitization hypothesis (Ursin 1997), and support the idea that the mechanisms between stress and psychosomatic symptoms are general and unspecific, mediated by physiological activation (e.g., activation for the cardiovascular, hypothalamic pituitary adrenal, and immune systems). Additional evidence is needed to confirm these findings. Moreover, it is crucial to gather evidence from different cultural contexts in order to establish whether the association between headache and perceived teacher unfairness is universal or whether it varies across different countries (Santinello et al. 2009).

Several studies have already analyzed different psychosomatic symptoms in a cross-national comparison in order to elucidate if the studied determinants and consequences are universal or country-specific (Due et al. 2005; Holstein et al. 2009; Tsang et al. 2008). Despite great

variations in the prevalence of symptoms across European and North-American countries, there was a remarkably consistent pattern of associations between, for example, bullying at school (another school stressor) and adolescent health complaints (Due et al. 2005). Holstein et al. (2009) could further identify a significant association between family affluence and health complaints in 31 of the 37 European and North-American countries. In these studies, a differentiation between specific symptoms is not made, and instead, a cumulative index is used which sums up several symptoms (e.g., headache, stomach ache, back pain). Hence, it is difficult to understand the relation between the determinants and specific health symptoms, such as headache. To date, there are no cross-national studies that compared rates of frequent headache in adolescents across countries. Also, we are not aware of any investigation that has analyzed the relationship between teacher unfairness and headache across multiple countries.

In the present study, we compare the prevalence of headache in students across 21 European and North-American countries. We also evaluate whether perceived teacher unfairness is a consistent predictor of headache across these countries. Consistent with the "sustained activation hypothesis" (Ursin 1997), we hypothesize that students that are more likely to report being treated unfairly by their teachers will tend to report more frequent episodes of headache. Since there is strong evidence on the association between adolescents' lifestyles and headache (e.g., Milde-Busch et al. 2010), we control for multiple health-related behaviors (drinking, smoking, eating and physical activity); moreover, we control for other characteristics of the school context that can influence the adolescent psychosomatic symptoms (academic achievement, being bullied) (Gini and Pozzoli 2009).

Methods

The present paper reports data from 21 European and North-American countries in the 2005/06 Health Behaviour in School-aged Children (HBSC) survey (all the countries that included the items of interest in their national questionnaire), a standardized, cross-national study carried out in collaboration with the Regional Office for Europe of the World Health Organization (WHO) (Aarø et al. 1986). Each national study comprised students in the relevant age groups (11-, 13- and 15-year-old students) from a random sample of schools (for further details on the methodology of HBSC see also Roberts et al. 2009). In total, the present secondary analysis of HBSC 2005/06 survey data included 115,212 middle and secondary school students (49.1% boys and 50.9% girls) from a culturally and economically diverse sample of countries (see Table 1).

Table 1 Frequency and percentage of students with frequent headache by gender, grade and family affluence across countries (including the principal investigators' names for each country) of the Health Behaviour in School-aged Children (HBSC) Study 2005/06

	N	Gender n (%)		Grade (years) n (%)			Family affluence n (%)			χ^2			
		Total sample n (%)	Female	Male	11	13	15	Low	Middle		High		
												χ^2	
North America													
Canada (Boyce)	5,930	1,861 (31.7)	1,194 (38.5)	667 (24.1)	141.02***	352 (24.3)	674 (33.4)	790 (34.8)	49.69***	55 (37.2)	715 (33.4)	1,038 (30.6)	6.68*
Middle East													
Israel (Harel-Fisch)	5,686	2,543 (49.4)	1,661 (54.6)	882 (41.9)	79.75***	688 (47.1)	749 (47.4)	972 (53.3)	16.82***	306 (55.8)	1,106 (51.6)	1,065 (46.1)	23.07***
North Europe													
Denmark (Due)	5,741	1,218 (21.4)	778 (26.3)	440 (16.19)	87.12***	395 (19.1)	443 (21.9)	368 (23.8)	11.97**	22 (21.4)	374 (20.9)	757 (21.6)	n.s.
Finland (Tynjälä)	5,249	1,972 (37.7)	1,199 (43.9)	773 (31.0)	93.06***	530 (29.8)	698 (40.6)	726 (43.3)	75.39***	66 (39.3)	892 (38.2)	966 (37.5)	n.s.
Norway (Samdal)	4,711	973 (21.1)	586 (26.1)	387 (16.3)	67.27***	272 (17.7)	341 (22.0)	358 (23.5)	16.56***	11 (23.4)	198 (22.5)	737 (20.7)	n.s.
Sweden (Marklund)	4,415	1,405 (32.3)	865 (39.3)	540 (25.2)	99.49***	332 (22.5)	425 (31.8)	639 (42.2)	132.51***	40 (46.5)	461 (34.0)	883 (31.2)	11.28**
Scotland (Currie)	6,190	2,801 (25.8)	1,738 (31.3)	1,063 (20.1)	179.62***	668 (20.3)	1,024 (26.5)	1,096 (30.2)	89.01***	125 (29.7)	1,056 (27.1)	1,457 (24.8)	9.85**
Eastern Europe													
Bulgaria (Vasileva)	4,854	1,329 (27.6)	818 (33.6)	511 (21.5)	88.67***	327 (20.8)	449 (28.6)	553 (33.0)	61.31***	227 (33.7)	624 (26.7)	431 (26.1)	15.17**
Macedonia (Kostarova)	5,281	1,081 (20.6)	662 (25.1)	419 (16.0)	66.01***	265 (16.1)	294 (17.2)	520 (27.5)	87.66***	271 (25.1)	518 (18.8)	280 (20.3)	19.05***
Poland (Mazur)	5,489	1,554 (28.4)	1,000 (35.3)	554 (21.0)	137.49***	380 (24.6)	451 (27.4)	723 (31.7)	23.94***	279 (33.3)	730 (27.4)	522 (27.5)	12.17**
Romania (Baban)	4,684	1,719 (37.3)	1,162 (46.2)	557 (26.6)	186.84***	500 (31.4)	538 (37.7)	681 (42.7)	43.45***	486 (41.6)	803 (36.8)	339 (32.1)	21.25***
Slovenia (Jericek)	5,130	964 (18.9)	577 (22.5)	387 (15.2)	44.33***	260 (15.2)	386 (21.0)	317 (20.3)	22.24***	28 (21.1)	408 (19.3)	497 (18.3)	n.s.
Ukraine (Balakireva)	5,069	2,179 (44.0)	1,399 (53.2)	780 (33.6)	192.01***	670 (46.6)	706 (41.2)	803 (44.7)	9.99**	583 (47.4)	1,171 (43.7)	346 (39.9)	11.87**
South Europe													
Spain (Moreno Rodriguez)	8,891	1,931 (22.0)	1,222 (27.2)	709 (16.5)	146.53***	532 (18.1)	649 (23.2)	750 (24.7)	40.91***	140 (31.0)	823 (22.5)	942 (20.6)	27.26***
Turkey (Ercan)	5,639	2,144 (39.3)	1,237 (46.5)	907 (32.5)	112.22***	719 (36.5)	710 (40.2)	680 (41.4)	9.84**	1,109 (43.1)	776 (35.4)	188 (36.9)	30.82***
West Europe													
Austria (Dür)	4,848	1,059 (22.0)	657 (26.9)	402 (17.0)	67.63***	281 (16.8)	371 (23.6)	391 (26.2)	43.66***	32 (22.9)	458 (22.2)	496 (21.7)	n.s.

Table 1 continued

N	Total sample n (%)		Gender n (%)		Grade (years) n (%)			Family affluence n (%)			χ^2		
	Female	Male	Female	Male	11	13	15	Low	Middle	High			
Belgium (Maes, Piette) ^a	4,311	842 (19.8)	516 (24.6)	326 (15.1)	60.81***	207 (16.1)	289 (20.9)	346 (21.8)	16.07***	30 (27.0)	350 (20.7)	406 (18.4)	7.33*
France (Godeau)	7,155	2,133 (30.0)	1,370 (38.3)	763 (21.7)	233.21***	689 (28.8)	690 (28.6)	750 (33.9)	22.70***	107 (34.4)	859 (32.1)	1,114 (28.6)	11.96**
Germany (Ravens-Siebert)	7,274	1,788 (24.8)	1,097 (30.6)	691 (19.1)	128.81***	451 (20.5)	637 (26.3)	685 (27.9)	31.63***	102 (33.0)	744 (26.3)	902 (23.1)	20.39***
Luxembourg (Wagener)	4,387	1,417 (32.7)	863 (39.9)	554 (25.5)	102.67***	306 (24.7)	524 (34.6)	560 (37.5)	54.75***	44 (42.3)	424 (32.8)	885 (32.5)	n.s.
Netherlands (Vollebergh)	4,278	867 (20.5)	570 (27.0)	297 (14.1)	107.20***	191 (14.3)	319 (21.4)	342 (25.3)	50.87***	25 (26.3)	347 (23.2)	478 (18.6)	14.34**
Total	115,212	39,150 (28.8)	24,526 (35.3)	14,624 (22.0)	2,931.30***	10,356 (24.0)	13,172 (28.9)	15,248 (32.9)	859.69***	4,769 (37.3)	16,595 (29.4)	16,514 (26.5)	624.13***

^a Includes only Flemish speaking part of Belgium (Pt. L. Maes)

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

The sample was obtained through a complex multistage “sample clustering” procedure. First, the schools were randomly selected, then in selected schools one class for each age group was sampled randomly. However, due to differences in the school system across countries, national adaptations had to be made. More detailed information about the sample and the sampling plan can be obtained in the International Report of the survey (Currie et al. 2008b). Participation in the survey for the pupils was voluntary; each country respected ethical and legal requirements for this type of survey. The international HBSC protocol was approved by the World Health Organization Europe.

Due to the multistage sampling procedure, non-response may occur at different levels: at the school level, at the class level, and at the student level. In general, the response rate at the school level was high, in the majority of the countries it was above 80%. Further information on non-response at the school and student level is available in Currie et al. (2008b).

The analyses for the present paper excluded 11,408 students (9.9%) due to lack of information on one or more of the variables of interest. Moreover, since “teacher unfairness” is part of an HBSC Optional Package (Currie et al. 2002), researchers in each country can decide whether or not to include this measure. Sometimes, due to some specific research interests, it is possible to limit the inclusion of a measure to some specific age categories. Among the countries included in the present study, most of them adopted “teacher unfairness” in the questionnaire devised for all three age categories (11-, 13- and 15-year olds). Exceptions to this were Bulgaria, Romania and Spain (only 13- and 15-year olds), and Turkey (only 15-year olds). To maintain a wider range of countries in the cross-national comparison, we kept Bulgaria, Romania, Spain and Turkey in the analysis (because of the exclusion of these age categories in these countries, 11,820 students (10.3%) were not included in the analyses for the present study). We compared the sub-sample excluded from the analysis and the final sample in terms of gender and grade distribution. The excluded sub-sample differs significantly from the final sample in terms of gender distribution ($\chi^2(1) = 55.383, p < .001$). In particular, the sample excluded from the analysis has a lower percentage of females (49.4 vs. 51.6% in the final sample). Furthermore, there is a difference in age distribution, with a greater number of 11-year olds in the final sample compared to the excluded sample (respectively, 25.7 vs. 34.8%; $\chi^2(2) = 1,079.503, p < .001$).

Data were collected between 2005 and 2006 by means of a self-report questionnaire devised by the HBSC international group (Currie et al. 2002). The questionnaire focused on health behaviors of early adolescents and adolescents. The present study analyzes data on student-reported frequency of headache, socio-demographic information, perceived teacher unfairness and selected

confounding factors (school achievement, being bullied, drinking, smoking, eating behaviors, and physical activity).

Frequent headache

Headache was measured by asking adolescents to rate the frequency of headache they had experienced during the past 6 months: “In the last 6 months how often have you had a headache?” (item from the HBSC symptom checklist) (Haugland and Wold 2001). Responses were rated on a five-point scale (1 = about every day; 2 = more than once a week; 3 = about every week; 4 = about every month; 5 = rarely or never). As suggested by Fichtel and Larsson (2002), a rating of at least once a week was defined as frequent headache.

Socio-demographic information

Students reported their gender and year of school (grade). Family socio-economic status was measured by the Family Affluence Scale (FAS), a four-items measure developed in the HBSC study (Currie et al. 2008a) which includes family car ownership, having one’s own bedroom, number of computers at home, and times spent on holiday in the last 12 months. Responses were added up and the sum-scores (ranging from 0 to 9) were divided into three groups using the cut points recommended by previous studies (Currie et al. 2008a): students scoring between zero and two were grouped into the low affluence category, those with scores between three and five were placed into the moderate affluence group, and those scoring between six and nine were in the high affluence category.

Teacher unfairness

Teacher unfairness was based on the students’ perception of being treated fairly by their teachers. The item “Our teachers treat us fairly” was selected from the Teacher and Classmate Support Scale (Torsheim et al. 2000).¹ The participants responded on a scale ranging from (1) “strongly agree” to (5) “strongly disagree”, a higher score indicating higher level of unfairness.

Covariates

School achievement was assessed using one item: “In your opinion, what does your class teacher(s) think about your school performance compared to your classmates?”.

¹ The Teacher and Classmate Support Scale measures the level of adolescent perceived support from teachers and classmates. The item “Our teachers treat us fairly” was selected from the complete scale because it measures the perception of being treated fairly by teachers, based on past studies (e.g. Santinello et al. 2009).

Responses were rated on a four-point scale (1 = very good; 2 = good; 3 = average; 4 = below average). Being bullied was measured with the item: “How often have you been bullied at school in the past couple of months?”, administered after giving the Olweus definition of bullying (Olweus 1993). Responses were rated on a five-point scale (1 = never; 2 = once or twice; 3 = two or three times a month; 4 = about once a week; 5 = several times a week). Drinking behaviors were measured with the item: “At present, how often do you drink anything alcoholic, such as beer, wine or spirits?”. Participants answered separately for beer, wine, spirits or liquor and alcopops, on a 5-point scale (1 = never; 2 = rarely, 3 = every month, 4 = every week, 5 = every day); responses to these items were averaged to obtain a single score. Smoking behavior was assessed asking students: “How often do you smoke tobacco at present?” (1 = I do not smoke; 2 = less than once a week; 3 = at least once a week; 4 = every day). Regarding eating behavior, participants were asked to report how often they usually have breakfast on a scale ranging from (1) “never” to (6) “every day”; having breakfast was chosen to measure eating behavior because of its effect on students’ cognitive functions, self-report energy and fullness (Cooper et al. 2011). Finally, physical activity was measured with the item: “Over the past 7 days, on how many days were you physically active for a total of at least 60 min per day?”; students responded on a 8-point scale ranging from (0) “zero days” to (7) “seven days”. All the measures assessing confounding factors were drawn from the HBSC study (Currie et al. 2002).

The students answered a standardized self-reported questionnaire during a school lesson after instruction from a trained adult. Parental permission was required in order to be able to participate in the survey.

Prevalence of frequent headache across countries, according to gender, grade, and family affluence, was tested via χ^2 statistics. The association between unfairness in the school organization and recurrent headache, controlling for other covariates (gender, grade, FAS, school achievement, being bullied and lifestyles) (Milde-Busch et al. 2010), was analyzed via independent one-step multiple logistic regression analyses in each participating country. All analyses were conducted using the statistical program SPSS (version 17.0).

Results

Table 1 presents summary measures for the prevalence of frequent headache by country, gender, grade, and family affluence. Considering the total sample, 28.8% ($n = 39,150$) of the participants reported having suffered from frequent headache at least once a week in the last

6 months before the survey. Large differences exist between countries, whereby Israel has the highest prevalence of frequent headache (49.4%) and Slovenia the lowest (18.9%). As shown in Table 1, apart from Israel, the countries with the higher prevalence of headache are in Eastern Europe (Ukraine, 44.0%; Romania, 37.3%), and South Europe (Turkey, 39.3%), but there are also countries with a high prevalence in Northern Europe (Finland, 37.7%; Sweden, 32.3%), Western Europe (Luxembourg, 32.7%; France, 30.0%) and North America (Canada, 31.7%). The frequency of headache increases with age ($\chi^2(2) = 859.69, p < .001$). Prevalence for the total sample increased from 24.0% ($n = 10,356$) at 11 years of age to 32.9% ($n = 15,248$) at 15 years of age. This trend is consistent across countries, even if there are larger age differences in some countries (e.g., Sweden, where prevalence vary from 22.5 to 42.2% from age 11 to age 15) than in others, where the age differences are not so pronounced (Turkey, from 36.5 to 41.4%) or where they show different patterns of association compared to other countries (Ukraine, where there is the lowest prevalence, 41.2%, in 13-year olds). Frequent headache is more common in females ($\chi^2(1) = 2,931.30, p < .01$) in all of the participating countries. Gender differences in the prevalence of headache are larger in Ukraine, Poland, France and Scotland and smaller in Slovenia, Belgium, Macedonia and Norway.

In most countries, students from a highly affluent background are significantly less likely to experience frequent headache compared to those with moderate or low family affluence. However, there are some exceptions: there are no socio-economic differences in the prevalence of headache among students in Denmark, Finland, Norway, Slovenia, Austria and Luxembourg.

The results of the logistic regression analysis are shown in Table 2. After adjusting for gender, grade, family affluence, school achievement, being bullied and lifestyles (drinking, smoking, eating behaviors, and physical activity) students reporting higher rates of “teacher unfairness” are more likely to experience frequent headaches in all but two countries (Ukraine and Luxembourg) included in the study (OR = 1.12, CI = 1.10–1.13, with effects varying from OR = 1.23, CI = 1.14–1.33 in Norway to OR = 1.08, CI = 1.01–1.16 in Bulgaria and Finland).

Discussion

The current study shows that more than one quarter of the participants (28.8%) have suffered from headache at least once a week in the last 6 months before the survey. Large differences were found between countries: in some countries, especially in Eastern and South Europe, more than one-third of the respondents reported to have experienced

Table 2 Association between teacher unfairness and frequent headache (at least once a week) across Health Behaviour in School-aged Children (HBSC) countries adjusted for gender, grade, family affluence, school achievement, being bullied and lifestyles (HBSC Study 2005/06)

	OR (95% CI) for frequent headache among those experiencing higher levels of teacher unfairness Total sample
North America	
Canada	1.18 (1.11–1.26)***
Israel	1.13 (1.06–1.19)***
North Europe	
Denmark	1.15 (1.08–1.24)***
Finland	1.08 (1.01–1.16)*
Norway	1.23 (1.14–1.33)***
Sweden	1.16 (1.08–1.25)***
Scotland	1.10 (1.03–1.16)**
Eastern Europe	
Bulgaria ^a	1.08 (1.01–1.16)*
Macedonia	1.15 (1.08–1.23)***
Poland	1.18 (1.11–1.25)***
Romania ^a	1.14 (1.05–1.23)**
Slovenia	1.12 (1.05–1.20)**
Ukraine	1.01 (0.95–1.07)
South Europe	
Spain ^a	1.15 (1.08–1.23)***
Turkey ^b	1.13 (1.03–1.24)**
West Europe	
Austria	1.21 (1.13–1.31)***
Belgium	1.13 (1.04–1.22)**
France	1.10 (1.05–1.16)***
Germany	1.15 (1.09–1.22)***
Luxembourg	1.05 (0.98–1.12)
Netherlands	1.13 (1.03–1.23)**
Total	1.12 (1.10–1.13)***

^a Data include 13- and 15-year olds

^b Data include 15-year olds

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

frequent headache, while in other countries the prevalence is about 20%. Although with some variations, headache was a quite common symptom in early adolescents coming from different geographical areas. As a matter of fact, even in the countries with the lowest prevalence, about one-fifth of the students experienced weekly headache.

These large variations between countries in headache prevalence could be related to the different health care and welfare systems. Health care systems may be relatively less effective in the early diagnosis and treatment of headache in post-communist Eastern European countries in transition. This can at least partially explain the high prevalence

of headache in Romania, Ukraine and Turkey. If we consider the welfare typology (Eikemo et al. 2008), our findings show a lower prevalence of headache in most of the Bismarckian (Belgium, Netherlands, Austria, Germany) and Anglo-Saxon (Scotland) countries included in the study. With regards to the Scandinavian states, whose welfare is considered more effective in promoting population health, we can observe the following: a high prevalence in some of the countries (Finland, Sweden), and a lower prevalence in others (Denmark, Norway). The difficult interpretation of the large variation between countries in headache prevalence based on different welfare systems may indicate that welfare seems to play an only marginal role in headache prevalence in children and adolescents, and there are other numerous factors of greater importance (Eikemo et al. 2008).

In line with previous studies (Ghandour et al. 2004), and with studies conducted in Asian and African adolescents (Chong et al. 2010; Ofovwe and Ofili 2010), our results show that frequent headache increases with age and is more common in females. These results are consistent across countries, making them attributable to biological and psychological processes of maturation (Rasmussen 1993). In males, puberty involves physical and maturational changes, which are generally regarded as positive (Kraemer 2000). In girls, however, these changes, such as onset of menstruation, are often associated with both physical and psychological symptoms (Eme 1979).

The association between family affluence and headache prevalence is less consistent across countries: although students with a higher family affluence are significantly less likely to experience frequent headache compared to their peers from a lower affluent background in 15 countries, there are several countries where there are no differences in frequent headache between students with different levels of family affluence (Denmark, Finland, Norway, Slovenia, Austria and Luxembourg). It is possible that this result is related to the different levels of income inequality that characterize these countries. In line with Holstein et al. (2009), a relatively equal distribution of income at the national level can have a protective effect on health, attenuating the association between family affluence and health complaints. Moreover, the lack of association between FAS and headache in these specific countries may be due to their smaller size, which contributes to a less broad income and lifestyle variety compared to the other countries included in the study.

Regarding the central aim of the present study, our results show that perceived teacher unfairness is associated with frequent headache in a representative sample of adolescents coming from 21 European and North-American countries: the more students perceive to be treated unfairly, the more they experience frequent headache. Even if this

association is moderate (with OR varying from OR = 1.08, CI = 1.01–1.16 to OR = 1.23, CI = 1.14–1.33), it has been found in all but two of the participating countries, after controlling for several confounding factors. This supports the general sensitization hypothesis (Ursin 1997), which posits that the stress associated with perceived unfairness, through continuous psychological activation, can influence somatic complaints (Nicholson et al. 2007). These cross-national results are in line with Santinello et al. (2009), who found the same association in a representative sample of Italian students, further supporting the hypothesis that the mechanisms between stress and somatic symptoms are general and unspecific.

During the period of adolescence, the school context can be regarded as the workplace of young people, and hence the perception of being treated unfairly can be a risk factor in both contexts. Our results highlight the importance of what organizational psychologists have found in the work setting, showing that these findings can be useful in understanding school-level characteristics and how they are associated with students' well-being (Vieno et al. 2005; Wendorf and Alexander 2005). Looking at our results, the mechanisms linking teacher unfairness and headache seem to be in action in countries with different social and cultural characteristics. Given the consistence of these findings, further research is needed for a better understanding of the specific pathways through which perceived unfairness at school can impact adolescents' health and the protective factors that could moderate this association.

The present study has some limitations. First of all, the cross-sectional nature of the study does not permit any conclusions regarding the direction of the effects. Although we controlled for possible confounding variables (socio-demographic information, academic achievement, being bullied, lifestyles), it is possible that adolescents who perceive frequent somatic complaints have a different perception of school climate, evaluating teachers' behavior in a more negative way. The direction of the relationship between these variables can only be determined with longitudinal studies.

Another limitation of this study is related to the unique use of self-report measures, impeding the identification of the specific type of headache (migraine vs. tension type headache) and a more accurate measure of school characteristics. Moreover, relational unfairness was measured in relation to teachers in general. Thus, we had a measure of the adolescents' general perception of teachers' treatment, but we missed specific information about how single teachers relate to students. Although the scale from which the item was drawn has been adequately validated (Torsheim et al. 2000), the use of a single-item measure might represent a limitation of the study, and a multi-item scale might provide a more valid measure of teacher unfairness.

Respect to the evaluation of our hypotheses, it is important to point out that, although we based them on the general sensitization hypothesis (Ursin 1997), which posits that the stress associated with perceived unfairness, through continuous psychological activation, can influence somatic complaints (Nicholson et al. 2007), we did not test this mediation effect. Finally, a limitation of the study derives from the reduction of the sample due to participants' non-response on some items. This aspect may have impacted our results because the excluded sample differs from the final one in terms of gender and age distribution, although we limited this effect by including gender and age as control variables.

The strength of the study lies in the possibility of evaluating the prevalence of headache, and its association with perceived teacher unfairness, in a large, cross-national sample representative of 21 European and North-American countries. Our results showed that, even if culture, structure, and style of education may be very different, there are some factors related to the school context that can be influential for students' well-being in different parts of the world. In fact, teacher unfairness showed an impact on adolescents' well-being in all but two countries included in the study, highlighting the importance of promotion of teacher fairness in school-based interventions to reduce adolescent health complaints.

Our results underline the importance of the teacher–student relationships in influencing adolescents' health, giving further support to the increasing prevention efforts within the school environment in frequent headache respect. Indeed, many prevention programs recently implemented in the school context were focused on improving teachers' classroom management or their communicative styles (Wendorf and Alexander 2005), with the aim of promoting students' well-being. Consistently, the literature has identified a number of strategies for building an open and fair school climate, by reaching a consensus with students about rules and social accepted norms, and by giving them the opportunity to participate in establishing school norms (Gini 2004; Vieno et al. 2005). Prevention programs aimed at improving the school and classroom climate, in which students' participation in making rules and organizing events is promoted, might be associated with higher levels of perceived teacher fairness, because some of the decisions related to the school life would be taken through a collaborative process involving both students and teachers. Future research should explore this potential association, and examine whether higher levels of perceived teacher fairness reduce the likelihood of experiencing health complaints.

Considering the results of the present study, school interventions which are able to increase teacher fairness, for example through the promotion of a democratic school–

climate, could be beneficial for students' well-being in different European and North-American countries.

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Conflict of interest The authors declare that they have no conflict of interest.

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