

Soft drink consumption in adolescence: associations with food-related lifestyles and family rules in Belgium Flanders and the Veneto Region of Italy

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Background: The number of studies among adolescents that focus on several lifestyle behaviours and family rules as determinant of soft drink consumption are limited. The aim of this study is to investigate the associations between daily soft drink consumption, food-related lifestyles and family rules in adolescence. **Methods:** The data are part of the Health Behavior in School-aged Children (HBSC) cross-sectional survey. Adolescents between 11 and 16 years of age were included, resulting in a final sample of 14 407 adolescents representative of Belgium Flanders ($N=7904$) and the Veneto Region of Italy ($N=6503$). Binary logistic regression was used to test the association between soft drink consumption and food-related lifestyle (breakfast habits, family meals, snacking, meals in fast food restaurants and television viewing) and family rules (restriction and obligation rules) by region and gender. **Results:** Each independent variable is significantly associated with daily soft drink consumption, despite some sub-groups exceptions. When we entered all the variables into the same statistical model, the positive association with daily soft drink consumption remained significant for frequent meals in fast food restaurants, television variables and low restriction rules. Breakfast during weekdays, evening meal with parents and obligation rules remained significant only in specific sub-groups and not the entire sample. Finally, the association with breakfast with parents and during the weekend disappeared. **Conclusion:** These findings suggest that considering gender and cultural differences, involving parents and limiting adolescents' exposure to television would increase the effectiveness of interventions aimed to reduce soft drink consumption in adolescence.

Keywords: soft drinks, adolescence, food-related lifestyles, family rules.

Introduction

Rates of overweight and obesity have increased all over the world during the last decade and have become a major public health concern.¹ At the same time soft drink consumption has increased^{2,3} and several studies⁴ have speculated that there is a causal link between soft drink consumption and weight status. Although the conclusions of different reviews^{4–6} underline that this association is complex and not entirely clear, sufficient evidence exists to discourage the consumption of soft drinks⁵ especially in children and adolescents. Soft drink consumption is associated with a high risk of chronic diseases^{7–8} (e.g., type 2 diabetes) and it is also related to a higher intake of carbohydrates and a lower intake of fruit and dietary fiber.⁵

Predictors of soft drink consumption in adolescence have been studied before, but not extensively⁹ and often the studies assess only the relation between adolescents' soft drink consumption and specific food lifestyle behaviours (e.g. television viewing), or singular individual or environmental factors (e.g. availability). Boys tend to drink more soft drinks than girls¹⁰ and adolescents of lower parental occupation status have a higher intake of soft drinks than adolescents of higher parental occupation status.¹¹ In addition, family habits,¹² availability of soft drinks at home,¹³ television viewing,¹⁴

taste preference,¹³ fast food consumption,¹⁵ skipping breakfast¹⁶ and family meals¹⁷ have been shown to be associated with adolescents' soft drink consumption. A recent study has linked soft drink consumption to general parenting style¹⁸ finding the lowest soft drink consumption in those families with a highly involved and moderately strict parenting style, while in a study by Vereecken *et al.*¹⁹ no significant association with parenting style was found. Moreover, the literature on specific parenting practices indicates a positive^{18,20,21} effect of family restriction rules on the consumption of soft drinks.

Understanding food-related lifestyle factors that influence adolescents' soft drink consumption may help in the development of relevant interventions and policies for adolescents and families. The purpose of the present study is to investigate the association between daily soft drink consumption, food-related lifestyles variables and family rules in Belgian Flemish and Italian Veneto Region adolescents. We hypothesized that skipping breakfast, not have a daily evening meal with parents, eating regularly in fast food restaurants, frequent television viewing behavior, snacking while watching television and using the computer are positively associated with daily soft drink consumption; in addition we hypothesized that having few family food rules is positively associated with daily soft drink consumption.

Methods

The present data are part of the 2005–2006 Health Behavior in School-aged Children (HBSC) survey, an international study carried out in collaboration with the World Health Organization. The questionnaire consisted of a number of mandatory questions and optional questions. The optional questions on family food rules and food related lifestyle were only included in Belgium (Flemish speaking) and in the

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Veneto Region (a region in the Northeast of Italy). In each country the sample was based on a cluster design²² with the school class as a basic cluster randomly selected, taking into account gender, grade and educational level (general, technical and vocational). Further methodological issues related to the HBSC survey are discussed in a recent paper by Roberts and colleagues.²³

Data in Flanders were collected in a sample of primary (fifth and sixth grade; ± 11 –12 years old) and secondary schools (grades 1 to 6; ± 13 –18 years old), randomly selected from the school list provided by the Ministry of Education. Of the 434 schools approached for participation, 218 schools (50% response) agreed to participate. In each participating school, 2–3 classes (about 50 pupils) were randomly selected. Of all pupils approached, 1% did not obtain consent from their parents; 4.3% of the pupils were absent on the day of testing. In total 11 154 pupils completed the questionnaire.

Data for Italian Veneto Region were obtained from a sample of middle (first grade, ± 11 –12 years old and third grade, ± 13 –14 years old) and high schools (second grade ± 15 –16 years old) randomly selected from the school list provided by the Regional School Office's database. Of the 244 schools selected for participation, 240 schools (98% response) agreed to participate. In each participating school, 2 classes (about 40 pupils) were randomly selected. Of all pupils approached, 3% did not get consent from their parents; 6.6% of the pupils were absent on the day of testing. In total, 6744 pupils completed the questionnaire.

Parents were sent a letter including a short explanation of the study and a request for consent. Student participation was voluntary and the students were assured of the confidentiality of their answers. The questionnaires were completed during school hours in the classroom in the presence of a teacher. The Belgian Flemish HBSC was approved by the ethical board of Ghent University, while the Italian Veneto Region HBSC survey was approved by the ethics board of the University of Padua.

Participants

For the current study only adolescents between 11 and 16 years of age were included, resulting in a final sample of 14 407 adolescents: 7904 adolescents (49.51% male) for Belgium Flanders and 6503 (49.98% male) for Italian-Veneto Region. Characteristics of the adolescents are shown in table 1.

Measures

Soft drink consumption was assessed using the question: 'How many times a week do you usually drink Coke or other soft drinks that contain sugar?' with seven response options

recoded into: (i) Not daily soft drink consumption; (ii) Daily soft drink consumption.

The Family Affluence Scale (FAS) is a four-item measure of socio-economic status developed in the HBSC Study.^{24,25} The items addressed different family conditions of wealth (e.g. having own bedroom). Responses were scored on a 0–9 scale and then divided into groups using the cut-off points recommended by previous FAS studies^{24,25}: (i) low FAS; (ii) medium FAS; (iii) high FAS.

Dieting status was assessed asking: 'At present are you on a diet or doing something else to lose weight?'. There were four response categories from 'No, my weight is fine' to 'Yes', grouped into: (i) currently dieting; (ii) not currently dieting.

Breakfast consumption was measured using the questions: 'How often do you usually have breakfast during weekdays?' and 'How often do you usually have breakfast at the weekend?' recoded into: (i) skip breakfast weekdays/weekend (not daily breakfast); (ii) not skip breakfast weekdays/weekend (daily breakfast).

Family meals were investigated with two items: 'How often do you have breakfast/evening meal together with your mother or father?' with six response options recoded into: (i) not daily breakfast/evening meal with parents; (ii) daily breakfast/evening meal with parents.

The frequency of meal *consumption in a fast food restaurant* was assessed by asking: 'How often do you eat in a fast-food restaurant?' followed by examples of country specific fast food restaurants with nine response options recoded into: (i) eat often in fast food (one time per week or more); (ii) not eat often in fast food (2–3 times per month or less).

The *snack consumption* was measured using the following questions²⁶: 'How often do you eat a snack while you watch TV (including videos and DVDs)/work or play on a computer or games console?' with six response options recoded into: (i) daily snack while watching TV/using PC; (ii) not daily snack while watching TV/using PC.

Television during meal was assessed by asking: 'How often do you watch TV while having a meal?' with six response options recoded into: (i) daily TV during meal; (ii) not daily TV during meal. The time spent watching the television during the day was measured by asking: 'About how many hours a day do you usually watch television (including DVDs and videos) in your free time?' with nine response options ranging from 'None at all' to '7 or more hours a day'. Based on mean hours for television viewing the responses were categorized into: (i) high television viewing behavior (≥ 4 h); (ii) low television viewing behavior (< 4 h).

Family rules included family restriction and obligation rules. The family restriction rules were assessed by asking: 'Do you get the following items from your parents if you ask for them?' Coke or other soft drinks that contain sugar/sweets or

Table 1 Demographic characteristics (age and FAS) of the study participants by county and gender

Variables	Belgium Flanders		p ^a	Italy Veneto		p ^a	Belgium Flanders		p ^a	Italy Veneto		p ^a
	Total N=7904	Total N=6503		Boy N=3913	Girl N=3991		Boy N=3250	Girl N=3253				
	%	%	%	%	%	%	%	%	%	%	%	
Age												
11–12	29.4	31.4		29.7	29.2		33.0	29.9		31.7	31.0	
13–14	34.3	31.3		34.4	34.2		31.7	31.0		31.7	31.0	
15–16	36.3	37.2	<0.001	35.9	36.6	0.764	35.3	39.1	0.003	35.3	39.1	
FAS												
High	38.5	43.5		40.9	36.2		47.2	39.9		47.2	39.9	
Medium	54.4	50.7		52.7	56.1		47.6	53.7		47.6	53.7	
Low	7.1	5.8	<0.001	6.4	7.7	<0.001	5.2	6.4	<0.001	5.2	6.4	

p^a = χ^2 test

chocolates/biscuits or pastries/crisps with four response options from 'No, I never get that' to 'I can take it when I want it'. The internal consistency of the items was good for both samples ($\alpha=0.89$ and 0.88 for respectively Belgian and Italian adolescents). The family obligation rules were measured with a five-item scale measuring structure/rules at family meals²⁷ (e.g. in my family there are rules at meal times that we are expected to follow) with five response categories from 'Strongly agree' to 'Strongly disagree'. The reliability of the scale, ($\alpha=0.55$ and 0.51 for respectively Belgian and Italian adolescents) is somewhat lower than what has previously been found (i.e. $\alpha=0.60$).²⁸ For both scales the average of the items was computed and the scales were dichotomized with a cut-off the midpoint of the scale ($=2.5$).

Statistical analyses

SPSS version 14.0 for Windows was used for analyses. Chi-square tests were performed to determine country and gender differences. Binary logistic regression with the backward method was used to test the association between soft drink consumption and food-related lifestyle variables and family rules. Taking into account country and gender differences (table 2), analyses were done separately by country and gender. This was done in two steps: first, by regressing soft drink consumption separately for each independent variable (Singular Models) and secondly, including significant variables from the first step in one final model to see if these variables remained significant in the full model. All the models were adjusted for age, FAS and dieting status. Adjusted odd ratios and 95% confidence intervals are reported; *P*-values are two-tailed; the significance was defined as $P < 0.05$.

Results

Comparison by country and gender (table 2) shows significant differences for most variables. In Belgium-Flanders more adolescents drink daily soft drinks, skip breakfast on weekdays, miss daily dinner with parents, eat regularly in fast food restaurants, have extreme television viewing behavior and have few obligation rules, whereas Italian adolescents skip breakfast more during the weekend and have less breakfast with parents, watch more television during meals and have less restriction rules. No significant differences were found between countries for snacking while watching television or using the computer.

Comparison by gender revealed a similar pattern for most variables in both countries. Boys drink more soft drinks, skip less breakfast during the week, have breakfast more often with their parents, eat in a fast food restaurant more often and snack more while using the computer. No significant gender difference was found for breakfast skipping during the weekend, miss daily dinner with parents and restriction rules. Belgian boys watch more television and have snacks and meals more frequently while watching television, while no significant gender difference was found for Italian adolescents. In Italy-Veneto there are less obligation rules for girls than boys, while no difference was found in Belgium-Flanders.

Significant positive associations with daily soft drink consumption were found for both genders and countries for frequent meals in a fast food restaurant, high television viewing behavior, snacking and meal consumption while watching television, and low restriction and obligation rules in the singular models (table 3). All these associations remained significant in the full model except the obligation rules in boys (both countries). A significant positive association with daily soft drink consumption was found for snacking using computer in both gender and countries with the exception of Italian girls.

Associations with daily breakfast consumption differed by country: a significant association was found in Belgium for boys and girls, with a higher likelihood of daily soft drink consumption in those who regularly skip breakfast on weekend and weekdays, while in the Veneto Region a significant association was only found for girls' breakfast consumption during the weekends. After controlling for all other variables the significant associations with the breakfast variables disappeared except for Belgian girls' breakfast consumption during the weekdays.

No significant association was found for breakfast and dinner with parents except for Belgian boys (higher likelihood of daily consumption in those who rarely have breakfast with parents and regularly have dinner with parents). However, in the full model the significant association disappeared for breakfast, but not for dinner.

Discussion

The present study investigated the association between soft drink consumption, food-related lifestyles and family rules in Belgian Flemish and Italian Veneto Region adolescents. This work showed, consistent with previous studies, a higher

Table 2 Descriptive analyses (%) of diet, soft drink consumption, food related lifestyle and family rules by country and gender and significance of the difference

Variables	Belgium Flanders	Italy Veneto	<i>P</i> ^a	Belgium Flanders		<i>P</i> ^a	Italy Veneto		<i>P</i> ^a
	Total %	Total %		Boy %	Girl %		Boy %	Girl %	
Currently dieting	12.2	16.2	<0.001	7.5	16.7	<0.001	11.4	20.9	<0.001
Daily soft drink consumption	41.7	21.1	<0.001	47.9	35.7	<0.001	25.7	16.6	<0.001
Skip breakfast weekdays	30.1	28.2	<0.01	26.3	33.8	<0.001	23.5	32.9	<0.001
Skip breakfast weekend	6.6	11.3	<0.001	6.8	6.3	0.332	11.1	11.4	0.751
Not daily breakfast with parents	70.5	74.5	<0.001	68.9	72.1	0.002	72.9	76.2	0.002
Not daily evening meal with parents	36.8	22.5	<0.001	37.6	36.0	0.123	23.1	21.9	0.239
Eat often in fast food (≥ 1 time/week)	20.3	4.4	<0.001	22.1	18.5	<0.001	5.4	3.5	<0.001
Daily snack while watching TV	18.9	18.7	0.737	21.0	16.9	<0.001	19.4	18.0	0.166
Daily snack while using PC	12.7	11.9	0.198	15.9	9.5	<0.001	15.0	8.9	<0.001
Daily TV during meal	11.9	54.2	<0.001	13.2	10.7	<0.001	53.7	54.8	0.386
High TV viewing behavior (≥ 4 h)	23.0	17.6	<0.001	24.1	20.9	0.030	17.8	17.4	0.652
Low restriction rules	60.8	66.8	<0.001	61.4	60.2	0.276	67.7	65.9	0.127
Low obligation rules	32.0	21.4	<0.001	31.5	32.5	0.368	19.9	22.9	0.003

^a $P^a = \chi^2$ test

Table 3 Logistic regression analyses for Belgian Flanders and Italian Veneto Region boys and girl: odds ratios and their confidence interval for daily soft drink consumption controlling for age, FAS and diet

Variables	Belgium Flanders						Italy Veneto Region					
	Boys			Girls			Boys			Girls		
	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P
Singular models												
Skip breakfast weekdays	1.47	1.26–1.72	<0.001	1.89	1.63–2.18	<0.001	1.10	0.91–1.33	–	1.19	0.97–1.46	–
Skip breakfast weekend	1.70	1.29–2.24	<0.001	1.72	1.31–2.25	<0.001	1.17	0.90–1.50	–	1.72	1.32–2.27	<0.001
Not daily breakfast with parents	1.18	1.02–1.37	0.026	1.13	0.95–1.34	–	1.06	0.88–1.28	–	1.03	0.81–1.30	–
Not daily evening meal with parents	0.79	0.69–0.91	<0.001	0.94	0.81–1.08	–	0.87	0.71–1.05	–	1.04	0.83–1.32	–
Eat often in fast food (≥ 1 time/week)	2.52	2.13–2.98	<0.001	2.45	2.06–2.91	<0.001	4.79	3.46–6.64	<0.001	3.04	2.03–4.56	<0.001
Daily snack while watching TV	3.16	2.64–3.77	<0.001	2.24	1.87–2.67	<0.001	2.75	2.28–3.32	<0.001	2.76	2.23–3.42	<0.001
Daily snack while using PC	3.00	2.45–3.67	<0.001	2.75	2.15–3.40	<0.001	3.39	2.75–4.17	<0.001	1.99	1.50–2.65	–
Daily TV during meal	2.77	2.23–3.43	<0.001	2.50	2.01–3.13	<0.001	2.32	1.96–2.76	<0.001	2.93	2.36–3.63	<0.001
High TV viewing behavior (≥ 4 h)	2.17	1.86–2.53	<0.001	2.17	1.85–2.53	<0.001	2.16	1.78–2.63	<0.001	2.49	1.98–3.12	<0.001
Low restriction rules	3.83	3.28–4.46	<0.001	4.16	3.53–4.91	<0.001	4.84	3.82–6.14	<0.001	5.22	3.92–6.94	<0.001
Low obligation rules	1.60	1.38–1.85	<0.001	2.10	1.81–2.43	<0.001	1.73	1.43–2.09	<0.001	2.14	1.74–2.63	<0.001
Full model												
Skip breakfast weekdays				1.45	1.23–1.70	<0.001						
Skip breakfast weekend												
Not daily breakfast with parents												
Not daily evening meal with parents	0.80	0.68–0.94	0.008									
Eat often in fast food (≥ 1 time/week)	1.97	1.62–2.34	<0.001	1.77	1.46–2.14	<0.001	3.05	2.14–4.36	<0.001	1.84	1.19–2.86	0.006
Daily snack while watching TV	1.80	1.45–2.25	<0.001	1.45	1.17–1.79	<0.001	1.57	1.25–1.97	<0.001	1.93	1.53–2.44	<0.001
Daily snack while using PC	1.62	1.26–2.08	<0.001	1.46	1.12–1.91	0.006	2.06	1.61–2.64	<0.001			
Daily TV during meal	1.62	1.25–2.09	<0.001	1.47	1.14–1.89	0.003	1.64	1.36–1.98	<0.001	2.01	1.56–2.53	<0.001
High TV viewing behavior (≥ 4 h)	1.41	1.18–1.68	<0.001	1.54	1.29–1.83	<0.001	1.41	1.14–1.77	0.002	1.68	1.32–2.15	<0.001
Low restriction rules	3.38	2.87–3.97	<0.001	3.11	2.61–3.72	<0.001	3.38	2.67–4.29	<0.001	3.88	2.88–5.23	<0.001
Low obligation rules				1.37	1.16–1.61	<0.001				1.50	1.20–1.87	<0.001

prevalence of daily soft drink consumption in Belgian adolescents (41.7% vs. 21.1% in Italian adolescents)²⁹ and a higher intake in boys than in girls in both countries.^{9,11,13} We found differences between countries in all food-related lifestyles and family rules with the exception of snacking variables. In particular, the larger differences concern the high frequency of meals in fast food restaurants (20.3% in Belgian adolescents vs. 4.4% in Italian adolescents) and watching television during meals (11.9% in Belgian adolescents vs. 54.2% in Italian adolescents). Moreover, several, but not all, lifestyle variables are associated with the outcome variable. As hypothesized, significant positive associations with daily soft drink consumption were found for frequent meals in fast food restaurants, high television viewing behaviours, snacking and meal consumption while watching television and low restriction rules in both genders and countries. When we entered all the variables into the same statistical model the role of breakfast habits and obligation rules disappeared in different sample sub-groups.

In line with other studies,^{30,31} our data show an association between high frequency of eating in fast food restaurants and daily soft drink intake. Fast food restaurants are a potential source of these drinks. However, given that in Italy only 4.4% of participants visit fast food restaurants once or more times a week, it is probably not the case that consumption at fast food restaurants alone is responsible for the association, but that both behaviours are part of a less healthy lifestyle.

Television viewing has been associated with high soft drink consumption^{13,14,32,33} and calorie intake as a result of increased consumption either during viewing or as a result of food advertisement.^{14,34} Also in our study we found a strong relationship between daily soft drink consumption and television viewing. In addition, consistent with Coon and colleagues,³⁵ a significant positive association was found between daily television viewing during meals and daily soft

drink intake. Computer use is accompanied by fewer food advertisements, which are designed to invoke feelings of hunger than television,¹⁴ nevertheless, in the present study snacking while using the computer was associated with daily soft drink consumption, with the exception of Italian girls. It is possible that the association between snacking while using the computer and soft drink intake is part of a complex lifestyle, in which sedentary behaviours, snacking and soft drink intake are all associated.

An important finding of this study is that the family restriction rules represent the strongest variable associated with soft drink consumption in both countries. In line with previous studies,^{18,20,21} our results confirm that restriction of unhealthy foods can discourage the consumption of soft drinks. The obligation rules, on the other hand, are only significantly associated with soft drink consumption in girls in both countries: clearly some food-related parenting practices are more effective than others. These results are not unexpected because family restriction rules are directly targeted to restrict soft drink consumption and unhealthy food intake, while family obligation rules are more general rules concerning structure during mealtimes and it seems that specific rules are more effective than general rules at reducing soft drink intake.

The importance of good breakfast habits has been observed in many studies.^{12,16} A recent Belgian study among adolescents found that those who had good breakfast habits (in terms of good quality, large quantity and high frequency) had lower soft drinks intake than those with bad breakfast habits.¹⁶ In addition, Vagstrand and colleagues¹² found a relation between low breakfast consumption frequency and high soft drink intake. In our study, the associations between soft drink intake and daily breakfast consumption differed by country. However, after controlling for all other variables, the association remained significant only for breakfast consumption during the weekdays in Belgian girls, suggesting that

breakfast habits are a less important variable related with soft drinks consumption than the other food-related lifestyle variables.

An unexpected finding was that evening meals with the family were not associated with soft drink consumption with the exception of Belgian boys, for whom there is a negative association between daily soft drink consumption and frequent evening meals with the family. Previous studies documented a relationship between high frequency of family meals and high intake of fruits, vegetables and low soft drink intake.^{17,36} In contrast, a recent study³⁷ found no significant relationship between family meal frequency and the availability or consumption of high-sugar/high-fat snack foods and soft drinks. Probably, availability, acceptability at home and communication during meals play a more important role than eating together. Further research is necessary to investigate the potential mechanisms underlying this association.

Several limitations of this study should be considered. First, because of the cross-sectional design of the survey, inferences regarding cause and effect are not possible. Longitudinal data are needed to study causal relationships and long-term consequences. Second, the data was based on self-report measurements. Self-report measures, which assess the dietary intake of adolescents tend to result in reporting errors.³⁸ For example, there might be a difference in what is considered as fast food. Moreover, there might be cultural differences in these interpretations because of, e.g. differences in nutritional traditions. Self-report measures may also be influenced by social desirability. Third, we only used adolescents' reports; obtaining data from multiple sources (i.e. parents) would probably be more informative. Fourth, we only assessed breakfast frequency, we have no further indication of the quality of the breakfast consumed. Lastly, there are other factors that are important indicators of family food environment (i.e. modelling) that have not been addressed in this study.

In conclusion, our results underline that daily soft drink consumption in adolescence seems to be part of a complex configuration of unhealthy lifestyle behaviours, in which the family plays an important role. These findings suggest that considering gender and cultural differences, involving parents and limiting adolescents' exposure to television would increase the effectiveness of interventions aimed at reducing soft drink consumption in adolescence.

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Conflicts of interest: None declared.

Key points

- To investigate the associations between daily soft drink consumption, food-related lifestyle and family rules.
- Daily soft drink consumption is positively associated with frequent meal consumption in a fast food restaurants, high television viewing behaviour, snacking and meal consumption while watching television. However, the strongest association was found with family restriction rules (more restrictions rules are associated with less soft drink consumption).
- Breakfast habits and evening meals with parents are less important predictors of soft drink consumption than the other food-related lifestyle behaviours.
- The findings highlight the need to consider simultaneously several lifestyle behaviours and involve parents in nutrition programs aimed to reduce soft drink consumption.

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