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Intersectionality between parenting styles, area of residence and gender on food group consumption among Costa Rican adolescents

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ABSTRACT

Little is known about how parenting styles can influence the adolescent's consumption of sugar-sweetened beverages (SSB), fruits and vegetables (FV) and beans in Latin America. This study uses hierarchical moderated regression models to examine such association by area of residence, sex of the parent and of the adolescent in Costa Rica. Results showed that fathers' authoritarian style was significantly associated with lower intake of sugar-sweetened beverages (SSB) among boys (b = -0.163, p = 0.050), but not girls (b = 0.097, p = 0.114) while mother's authoritarian style was associated with lower SSB intake among girls (b = -0.138, p = 0.031), but not boys (b = 0.159, p = 0.059). Fathers' authoritative style was associated with higher consumption of fruits and vegetables (FV) among boys in rural areas (b=0.440, p= 0.017), but this association was not significant for girls (b=-0.033, p= 0.800) in rural areas or for either gender in urban areas. Parenting styles of the mothers' and fathers' were not significantly associated with Costa Rican adolescent bean consumption, in general or for any of the subgroups. Findings suggest an intersectionality in the effects of parentchild interactions by child and parent sex, cultural and geographic context, and the eating behaviors examined.

1. Introduction

The family environment, often measured by dimensions of cohesion, support, or conflict between its members, is considered a critical context for the development of healthy behaviors among adolescents (Carbert, Brussoni, Geller J., & Mâ; Gubbels, 2020; Hebestreit et al., 2017). Within the family environment, parenting styles that define the general emotional climate for parent-adolescent interactions appear to have a significant impact on the development of healthy eating behaviors (Darling & Steinberg, 1993) (Carbert, Brussoni, Geller J., & Mâ; Haines et al., 2016; Kremers, Brug, de Vries, & Engels, 2003; Viner et al., 2012). Parenting is a global concept often categorized into different styles: authoritative (high responsiveness to, and high demandingness of, youth), authoritarian (low responsiveness and high demandingness), and permissive (high responsiveness and low demandingness) (Baumrind, 1991). Authoritative parenting styles have been associated with healthier weights and better diets in youths, whereas authoritarian and permissive parenting styles have been associated with unhealthy eating (Berge, Wall, Neumark-Sztainer, Larson, & Story, 2010; Shloim, Edelson, Martin, & Hetherington, 2015; Zhang, Davey, Larson, & Reicks, 2019). Parenting styles may change according to the emotional climate (assigned norms, attitudes, beliefs, and values) in which parents and adolescents interact (Chan, Bowes, & Wyver, 2009; Darling & Steinberg, 1993; Shahsavari, 2012).

The contextual culture seems to be important for defining family environment and parenting styles. Parenting styles were originally conceptualized according to Euro-American white, middle-class family values, cultural norms, and parental expectations (Baumrind, 1966).

Abbreviation: FV, Fruits and Vegetables; INCAP, Institute of Nutrition for Central America and Panama; PSDQ, Parenting Styles and Dimensions Questionnaire; SSB, Sugar-Sweetened Beverages; USDA, United States Department of Agriculture.

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However, while Euro-American families prefer horizontal organizational structures (Kagitcibasi, 2005), whereas in other cultures, such as Latin America, family relationships are often guided by a hierarchical or vertical organizational structure where elders and parents hold maximum authority roles (Arredondo, Gallardo-Cooper, & Delgado-Romero, 2015) with higher reported levels of family cohesion (Halgunseth, Ispa, & Rudy, 2006). Compared to Euro-American families, Latin American parents generally have more rules and stricter expectations regarding activities outside the home (Halgunseth et al., 2006). Given these diverse social and cultural contexts, parenting styles may differ and have distinct repercussions on eating outcomes among children (Arredondo et al., 2006; Domènech Rodriguez, Donovick, & Crowley, 2009).

Parenting styles may also vary depending on the intersectionality context, or in other words, from the interactions of different factors and social dynamics operating together within a context (Kapilashrami & Hankivsky, 2018). For example, studies in South Asian and Middle East countries suggest that the authoritarian style is more prevalent in urban areas, while the authoritative style is more pervasive in rural areas (Sondhi, 2017; Mayuri, Divya, & Kiran, 2015; Dwairy & Menshar, 2006, Dwairy et al., 2006). Even within the same urban or rural environment, parenting styles may depend on the child's sex, according to the cultural context in which the parent-child dyad socializes. (Dwairy & Menshar, 2006; Dwairy et al., 2006; Mayuri et al., 2015; Sondhi, 2017). Another factor contributing to intersectionality within a context is the sex of the parents and their interaction with the children according to their sex. Mothers and fathers may adopt different parenting styles based on the children's sex, according to role theory, with mothers in general being observed to be authoritative compared to fathers, who tend to assume an authoritarian style (Conrade & Ho, 2001; McKinney & Renk, 2008; Simons & Conger, 2007). Further, the authoritarian style is more likely adopted when parenting sons, while the authoritative style tends to be used with daughters (Conrade & Ho, 2001; McKinney & Renk, 2008; Simons & Conger, 2007). Nonetheless, despite these studies within different cultures, very little is known about how parenting styles may vary depending on the context of intersectionality in Latin America.

In view of the increasing consumption of unhealthy foods at the expense of more healthful options (i.e. fruits, vegetables, legumes) among Costa Rican adolescents in the last 20 years (Monge-Rojas, Vargas-Quesada, Chinnock, & Colón-Ramos, 2020), and the consequences that this may have on risk of adolescent obesity and the subsequent development of cardiometabolic diseases and related complications in adulthood (Lopes, Bressan, Peluzio, & Hermsdorff, 2019), there is a critical need to understand how interactions of different socioedemographic factors may be associated with parenting styles and the consumption of healthful and unhealthful foods. This information is crucial to inform the development of programmatic strategies in public health nutrition to promote healthy eating among adolescents.

The objective of this study is to contribute to public health nutrition efforts in Costa Rica by examining the association between parenting styles, area of residence, parent and child sex on adolescent eating behaviors, specifically, intake of sugar-sweetened beverages, fruits and vegetables, and beans in Latin American adolescents.

2. Methods

2.1. Study population and setting

Data stem from a cross-sectional sample of adolescents (13–18 years old, 7th to 11th graders) enrolled in ten urban and six rural schools (n = 16) in the province of San José, Costa Rica, in 2017. The majority of Costa Rican adolescents (80%) are enrolled in schools in San José (Programa Estado de la Nación, 2019), and the province has the highest adolescent concentration (30%) in the country (UCR, 2013).

School selection and sample size were determined assuming a sampling error for a population proportion with finite population correction (Ryan, 2013). Sample selection took place in three stages: 1) Schools were selected using a proportional-size probability method to represent urban and rural municipalities within the province (Alam, Sumy, & Parh, 2015). 2) Ten classrooms (two from each grade from 7th to 11th) were selected in each school using simple random sampling. All the students in the selected classrooms were invited to participate in the study and provided with informed assent forms for themselves and informed consent forms for their parents. 3) Study participants were randomly selected from those who provided signed informed consent and assent forms. Close to 5% of the initial sample chose not to participate in the study before the start. The final study sample was 818 adolescents aged 13–18 years. Only those who provided complete data on both their fathers' and mothers' parental styles were selected for analysis (n = 695).

Data were collected during school hours in a private classroom. The Bioethics Committee of the Costa Rican Institute for Research and Education in Nutrition and Health (INCIENSA) approved the study protocol under number IC-2007-01.

2.2. Sociodemographic variables

A paper-based questionnaire was used to collect data on sex, age, and area of residence.

2.3. Anthropometric assessment¶

Each participant's height and weight were determined by trained nutritionists following the methodology described by Preedy (2012). Body Mass Index (BMI) values were calculated, and nutritional status was determined using the BMI Z score for age, as recommended by WHO (Onis et al., 2007): < -2: underweight; ≥ -2 and $< +1$: healthy weight (eutrophy); $\geq +1$ and $< +2$: overweight, and $\geq +2$: obese.

2.4. Dietary intake assessment¶

Dietary intake data were collected via 3-day food records completed by the participants in real time and reviewed by nutritionists. Students were asked to complete their 3-day food records on two weekdays (Monday, Tuesday, Thursday, or Friday) and one weekend day (Saturday or Sunday). Half of the participants were randomly selected to record the foods and drinks they consumed on Thursday, Friday, and Saturday while the others were asked to record their intake on Sunday, Monday, and Tuesday. Data were collected during nine months of the school year (February to November), reflecting seasonal variations for Costa Rica: rainy season (May to November) and dry season (December to April). The goal was to ensure that the data captured daily and seasonal variability in food consumption.

At each school, six trained nutritionists provided printed forms to the participants and instructed them on how to complete accurate food records for three consecutive days by having them write down detailed descriptions of everything they ate and drank from the time they woke up in the morning to the time they went to bed at night. Participants had to include food brand names when applicable, and the recipes and methods of preparation of all dishes and drinks whenever possible. The nutritionists taught the participants how to estimate serving sizes using an established manual that was developed for Costa Rica (Chinnock, 2007). This manual includes photographs and diagrams of 3–6 serving sizes and weights for various local foods and preparations. Participants were instructed to report serving sizes using household utensils or volume and mass units.

Given the challenges related to incompleteness and inaccuracy when recording self-reported dietary data in young populations and specific demographic groups (Trevino et al., 2016), the nutritionists thoroughly reviewed the completed 3-day food records, conducting one-on-one interviews with each participant during school hours. At this interview, the nutritionists inquired about commonly missed items or ingredients

(e.g., added sweeteners, added fats, candies, beverages), entered details about the types of consumed food or drinks, verified or added serving sizes, and clarified any illegible items. The nutritionists used food models, fresh foods, and various utensils to verify serving sizes.

2.5. Parenting styles

Participants filled out a 32-item questionnaire to assess their perception of their parents' parenting styles (Parenting Styles and Dimensions Questionnaire (PSDQ), short version) (Robinson, Mandleco, & Olsen, 2001). The PSDQ short version is a modified version of the original 62-item PSDQ, which was developed by Robinson, Mandleco, Olsen, and Hart (1995) for use with parents of children 4–12 years old in various cultures. PSDQ responses follow a 5-point Likert scale ranging from never (1) to always (5).

The 32-item PSDQ was designed to measure parenting styles following Baumrind's well-known typologies: authoritative (high responsiveness and high demandingness), authoritarian (low responsiveness and high demandingness), and permissive (high responsiveness and low demandingness) (Baumrind, 1991). The Authoritative scale includes 15 items and reflects the three dimensions of warmth and support, regulation, and autonomy granting. The Authoritarian scale consists of 12 items and yields the three dimensions of physical coercion, verbal hostility, and nonreasoning/punitive strategies. The Permissive scale has five items and is designed to assess the subfactor of indulgence (Robinson et al., 2001).

By 2017, before the start of data collection for the study, no literature had been reported on the use of the PSDQ short version in native Spanish-speaking Latin American adolescents or other Spanish-speaking countries. Therefore, the questionnaire was translated into Spanish by the authors (native Spanish-speakers from Costa Rica). One hundred adolescents were polled using cognitive interviewing techniques (Smith-Castro & Molina, 2011; Willis, 2005) to evaluate survey item comprehension. Survey questions were later revised to increase comprehension in the study sample.

The translated short PSDQ version was then validated according to its psychometric properties among Costa Rican adolescents, as detailed elsewhere (Reyes-Fernández & Smith-Castro, 2018). Adolescent-perceived authoritative and authoritarian parenting styles showed acceptable internal consistency for both mothers (Cronbach $\alpha = 0.90$ and 0.73, respectively) and fathers (Cronbach $\alpha = 0.91$ and 0.70, respectively) in this sample (Table 1). The permissive parenting style subscale, had an internal consistency for mothers (Cronbach $\alpha = 0.52$) and fathers (Cronbach $\alpha = 0.51$).

Participants completed the PSDQ twice to assess their perception of the warmth and demandingness of their fathers and mothers, respectively. In cases where participants lived only with one biological parent and a stepparent who did not live with them during childhood, they only completed the evaluation for the biological parent. Parents were scored on each of the three parenting styles. The mean scores for mothers' and fathers' parental styles are presented in Table 1.

Table 1
Cronbach α and mean scores for mothers' and fathers' parental styles.

	Fathers		Mothers	
Parenting Style	Mean Score (*SD*)	Cronbach's α	Mean Score (*SD*)	Cronbach's α
Authoritative Style	3.0 ± 1.05	0.915	3.4 ± 0.96	0.902
Authoritarian Style	1.9 ± 0.66	0.735	2.1 ± 0.67	0.699
Permissive Style	2.2 ± 0.77	0.511	2.4 ± 0.79	0.522

3. Data analysis

Data analysis comprised only the participants who had complete data on both their fathers' and mothers' parental styles (n = 695).

3.1. Diet variables

Data from the 3-day food records were extracted and entered into software designed by the School of Nutrition of Universidad de Costa Rica (UCR, 2016) to assess the dietary composition of commonly consumed foods available on the food composition tables of the Institute of Nutrition for Central America and Panama (INCAP) and the United States Department of Agriculture (USDA).

The mean 3-day intake of sugar-sweetened beverages, fruits and vegetables, and beans was analyzed. Outliers (values ≥ 3 standard deviations above or below the mean) were removed before data analysis. Outlier detection was performed in a way that did not entirely eliminate the cases from the study, i.e., cases were pairwise-deleted. The pairwise deletion procedure excludes a case from analysis when it is missing values for a specific pair of variables but reintroduces the case when analyzing other variables with non-missing values. For this reason, degrees of freedom varied across analyses.

A series of hierarchical, moderated regression analyses (Helm & Mark, 2012) were performed to predict each food group outcome: sugar-sweetened beverages (SSB), fruits and vegetables (FV), and beans. In Step 1, we included BMI, age, sex, area of residence, and mothers' and fathers' parenting styles as predictors of food group consumption. In Step 2, we included the two-way interaction terms for each parenting style and adolescent sex, and the two-way interactions for parenting styles and area of residence. In Step 3, we included the three-way interactions for each parenting style, sex, and area of residence. All continuous variables were centered at their means and the binary predictors were dummy coded (0 = Boys, 1 = Girls, 0 = Urban, 1 = Rural). Statistically significant interactions were analyzed via simple slope analysis (Dawson & Richter, 2006). The equality of regression coefficients was tested using the formula suggested by Paternoster, Piquero & Mazerolle (1998). The analytic plan was pre-specified, and any data-driven analyses were clearly identified and discussed appropriately.

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS Inc., version 21.0 for Windows, Chicago, Illinois). A p-value < 0.05 was considered statistically significant.

4. Results

Demographics of the adolescent sample are presented in Table 2. The sample for the analysis (which consisted of 695 adolescents who had complete data on both fathers' and mothers' parenting styles) were 65% girls, and 50.2% urban inhabitants. Mean age was 14.9 (SD 1.7), and mean BMI was 22.3 (SD 4.3). The prevalence of overweight was significantly higher in girls, and the prevalence of obesity was higher in girls and urban adolescents. Boys reported a higher mean daily consumption of SSB (+60.9 g/d); and urban adolescents reported a higher SSB consumption (+76.3 g/d). Mean daily consumption of beans was higher among boys (+13.5 g/d) and rural adolescents (+22.7 g/d). There was no difference in the mean daily consumption of FV by sex, but significant differences were found by area of residence. Rural adolescents consumed more FV (+19.4 g/d) than urban adolescents. Results for the hierarchical, moderated regression models are presented in Table 3.

Sugar-Sweetened Beverages (SSB): The model for predicting SSB was significant for Step 1 $\Delta R^2 = 0.050$, $F\,(10, 656) = 3.453$, $p < 0.001$; and Step 2 $\Delta R^2 = 0.037$, $F\,(12, 644) = 2.185$, $p = 0.011$, but not for Step 3 $\Delta R^2 = 0.011$, $F\,(6, 638) = 1.251$, $p = 0.278$. Results showed a significant main association for sex ($\beta = -0.115$, $p = 0.003$) and area ($\beta = -0.158$, $p < 0.001$) as predictors of SSB. Being male and residing in urban areas

Table 2
General and dietary characteristics of the study population[a,b].

	Overall (n = 695)	Sex		*p* value	Area of residence		*p* value
		Girls n = 451 (65%)	Boys n = 244 (35%)		Urban n = 349 (50.2%)	Rural n = 346 (49.8%)	
Study population							
Age (years)	14.9 ± 1.7	14.9 ± 1.7	14.9 ± 1.6	0.874	14.9 ± 1.6	15.0 ± 1.7	0.314
BMI (kg/m^2)	22.3 ± 4.3	22.4 ± 4.7	21.9 ± 4.0	0.167	22.2 ± 4.3	22.3 ± 4.6	0.929
Underweight (%)	1.6	0.2	4.1	<0.001	1.4	1.7	0.716
Healthy weight (%)	65.7	67.5	62.3	0.436	67.4	63.8	0.659
Overweight (%)	23.2	24.2	21.3	0.032	22.5	23.9	0.079
Obese (%)	9.6	8.1	12.3	<0.001	8.6	10.5	<0.001
Food group intake							
Fruits and vegetables (g/d)[c]	63 ± 43.4	69 ± 47.7	59 ± 38.4	0.062	55 ± 45.9	74 ± 48.5	<0.001
Beans (g/d)	42 ± 22.8	35 ± 19.6	48 ± 26.0	<0.001	28 ± 17.1	51 ± 34.3	<0.001
Sugar-sweetened beverages (g/d)	288 ± 144.3	257 ± 131.2	318 ± 157.4	0.002	316 ± 153.3	240 ± 124.5	<0.001

[a] Values are given as means ± *SD*s.
[b] *p* values were determined using independent sample t-tests for continuous measurements and chi-square for categorical variables.
[c] Does not include potatoes or fruit juice.

was associated with a higher intake of SSB. Results also show main effects for authoritarian styles in fathers and mothers ($\beta = -0.257$, p = 0.003 and $\beta = -0.202$, p = 0.028, respectively), but these associations were qualified by two-way interactions with sex. Interactions are depicted in Figs. 1 and 2. Simple slope analyses revealed that an authoritarian parenting style in fathers significantly predicted lower intakes of SSB among boys (b = −68.258, SE = 34.695, $\beta = -0.163$, $p = 0.050$) but the association was not significant among girls (b = 38.372, SE = 24.205, $\beta = 0.097$, $p = 0.114$). The test for equality of regression coefficients (b) corroborated that the effect of an authoritarian parenting style in fathers on SSB intake varied significantly between boys and girls ($Z = -2.27$, $p = 0.012$).

On the other hand, an authoritarian parenting style in mothers significantly predicted lower SSB intakes among girls (b = −49.79, SE = 22.97, $\beta = -0.138$, $p = 0.031$) and higher SSB intakes among boys (b = 64.45, SE = 33.94, $\beta = 0.159$, $p = 0.059$) but this association was not statistically significant. However, the test for equality of regression coefficients showed that the effect of an authoritarian style in mothers on SSB intake varied significantly between girls and boys ($Z = 2.79$, $p = 0.003$).

Fruits and Vegetables (FV): The model for predicting FV intake was significant for Step 1 $\Delta R^2 = 0.046$, $F(10, 655) = 3.128$, $p < 0.001$; Step 2 $\Delta R^2 = 0.037$, $F(12, 643) = 2.149$, $p = 0.013$, and Step 3 $\Delta R^2 = 0.019$, $F(6, 637) = 2.301$, $p = 0.033$.

In Step 1, age and area of residence were significant positive predictors ($\beta = 0.092$, $p = 0.020$ and $\beta = 0.161$, $p < 0.001$, respectively) of FV intake. As age increased, FV intake also increased. Living in rural areas was also associated with a higher FV intake. In Step 2, a significant interaction was found between authoritarian fathers and sex, while in Step 3 a significant interaction between authoritative fathers, sex, and area of residence was also found ($p = 0.012$).

To untangle the three-way interactions, another set of regression analyses were run for each area separately. The results show that in rural areas, the fathers' authoritative parenting style was associated with higher FV consumption among boys (b = 27.488, SE = 22.354, $\beta = 0.440$, $p = 0.017$) but this effect was not significant among girls (b = −1.771, SE = 6.996, $\beta = -0.033$, $p = 0.800$). Nevertheless, the test for equality of regression slopes showed that the effect of the fathers' authoritative parenting style on FV intake did not vary significantly between girls and boys ($Z = 1.25$, $p = 0.106$).

Interactions are depicted in Fig. 3. In urban areas, neither mother's nor fathers' authoritarian patenting styles were associated with FV consumption.

Beans: The model for predicting bean consumption was significant only in Step 1 $\Delta R^2 = 0.104$, $F(10, 655) = 7.636$, $p < 0.001$, with sex ($\beta = -14.766$, $p < 0.01$) and area of residence ($\beta = 22.564$, $p < 0.01$) as the significant predictors. Being a boy and residing in rural areas were associated with a higher consumption of beans.

5. Discussion

Our findings contribute importantly to the current body of work by describing how the parenting styles of fathers and mothers may associate differently with adolescent food consumption depending on the area of residence (urban or rural) and sex of the adolescent child in the Costa Rican context.

Previous studies had related authoritarian parenting to unhealthy behaviors such as alcohol consumption, sedentary leisure time activities, poor nutrition, and high risk of obesity among adolescents (Garcia, Serra, Zacares, Calafat, & Garcia, 2020; Hayes, Smart, Toumbourou, & Sanson, 2004; Johnson, Welk, Saint-Maurice, & Ihmels, 2012; Kremers et al., 2003; Lohaus, Vierhaus, & Ball, 2009; Vollmer & Mobley, 2013). Our results evidence a positive association between authoritarian fathers and mothers and lower adolescent SSB consumption. This is consistent with what some researchers have already pointed out: greater strictness in the adolescent years to restrict unhealthy food consumption, particularly when such foods are likely to be highly available in the home or the surrounding community, may benefit adolescents (De Bourdeaudhuij, 1997; Fleary & Ettienne, 2019; Pearson, Atkin, Biddle, Gorely, & Edwardson, 2010; Van der Horst et al., 2007).

Various American studies have found significant associations between parenting styles and adolescent outcomes (e.g., FV intake, family meals, overweight/obesity) that are specific to opposite-sex parent/adolescent dyads (mother/son; father/daughter) (Berge, Wall, Loth, & Neumark-Sztainer, 2010; Berge, Wall, Neumark-Sztainer, et al., 2010; Temple, Wrotniak, Paluch, Roemmich, & Epstein, 2006) and suggest the opposite sex parent plays a unique role in influencing adolescent health behavior. However, our results found an association between authoritarian parenting and adolescent SSB consumption in same-sex parent/-child dyads (mother/daughter, father/son) from a Costa Rican sample. Traditional Latino cultures emphasize rights and responsibilities among family members based on age and sex (Driscoll, Russell, & Crockett, 2008). When adolescent boys perceive that rules are set by the father, in line with their values, goals, and personal benefits, they may be more committed to following those rules. Costa Rican adolescents have better communication with the parent of the same sex (Li, Delvecchio, Miconi, Salcuni, & Di Riso, 2014). It is possible that in father/son and mother/daughter dyads the same-sex parent constitutes a model and authority figure with which adolescents establish a strong and lasting hierarchical relationship, and to which they respond according to the interrelational dynamics of their social context (McKinney & Renk, 2008). Role theory predicts that mothers and fathers adopt parenting styles based on their usual roles as parents and their expected roles as women and men (Biddle, 1986). This suggests differences between

Table 3
Summary of hierarchical regression analyses predicting influence of fathers' and mothers' parenting styles on selected food group consumption in Costa Rican adolescents (n = 695)[a].

	Sugar-sweetened beverages			Fruits and vegetables			Beans		
Predictors	*b*[b]	*SE b*[c]	*β*[d]	*B*	*SE b*	*B*	*b*	*SE b*	*β*
Step 1									
Age	−1.025	5.623	−0.007	3.174	1.360	0.092*	1.266	0.981	0.050
BMI	0.058	2.207	0.001	−0.415	0.533	−0.030	−0.183	0.377	−0.018
Sex (0 = Boys)	−58.281	19.438	−0.115**	6.731	4.685	0.056	−14.766	3.362	−0.165***
Area (0 = Urban)	−76.027	18.700	−0.158***	18.619	4.515	0.161***	22.564	3.226	0.265***
Father authoritative style	1.709	16.087	0.007	3.672	3.825	0.067	0.229	2.695	0.006
Father authoritarian style	−1.874	19.741	−0.005	1.852	4.760	0.019	1.989	3.401	0.028
Father permissive style	−31.245	19.340	−0.100	−6.629	4.692	−0.088	1.425	3.331	0.026
Mother authoritative style	−6.989	17.263	−0.028	−6.775	4.111	−0.112	−0.954	2.902	−0.021
Mother authoritarian style	3.865	19.124	0.010	−2.323	4.622	−0.025	1.964	3.306	0.029
Mother permissive style	1.039	18.540	0.003	7.501	4.474	0.100	−2.251	3.198	−0.041
Model summary	$R^2 = 0.050$			$R^2 = 0.046$			$R^2 = 0.104$		
	F (10,656) = 3.453***			F (10,655) = 3.128***			F (10,655) = 7.636***		
Step 2									
Age	−1.747	5.614	−0.012	3.222	1.357	0.094*	1.182	0.989	0.046
BMI	0.048	2.207	0.001	−0.405	0.534	−0.030	−0.0232	0.381	−0.023
Sex (0 = Boys)	−57.894	19.354	−0.115*	7.197	4.666	0.059	−15.252	3.387	−0.170
Area (0 = Urban)	−76.416	18.631	−0.159***	19.246	4.502	0.166***	22.851	3.252	0.268
Father authoritative style	−10.436	33.012	−0.046	6.847	7.305	0.125	4.412	5.262	0.110
Father authoritarian style	−104.443	35.028	−0.257*	−14.736	8.448	−0.150	3.682	6.101	0.051
Father permissive style	−15.581	36.634	−0.050	−7.756	8.921	−0.103	1.614	6.357	0.029
Mother authoritative style	28.611	36.098	0.114	−18.416	8.050	−0.304*	1.095	5.803	0.025
Mother authoritarian style	76.244	34.662	−0.202*	14.912	8.329	0.163	13.866	6.034	0.207
Mother permissive style	17.734	35.678	0.057	17.886	8.516	0.239*	−5.747	6.169	−0.104
Father authoritative style x Sex	54.103	35.773	0.197	−4.865	8.229	−0.073	−5.348	5.910	−0.110
Father authoritarian style x Sex	109.700	40.438	0.212*	32.016	9.766	0.257**	−0.0289	7.048	−0.003
Father permissive style x Sex	−32.097	41.215	−0.083	−3.038	10.005	−0.032	3.863	7.172	0.056
Mother authoritative style x Sex	−72.996	38.422	−0.242	13.773	8.870	0.189	−2.839	6.388	−0.053
Mother authoritarian style x Sex	−113.120	39.047	−0.241*	−18.246	9.423	−0.161	−13.296	6.832	−0.160
Mother permissive style x Sex	18.867	38.672	0.048	−10.048	9.301	−0.106	1.529	6.741	0.022
Father authoritative style x Area	−53.280	32.040	−0.164	0.837	7.718	0.011	−1.377	5.477	−0.024
Father authoritarian style x Area	100.434	41.979	0.168	−5.394	10.149	−0.037	−2.027	7.338	−0.019
Father permissive style x Area	13.070	38.908	0.029	7.216	9.428	0.066	−6.229	6.777	−0.078
Mother authoritative style x Area	28.286	34.568	0.079	3.499	8.333	0.040	0.361	5.925	0.006
Mother authoritarian style x Area	−32.184	40.562	−0.058	−14.065	9.823	−0.105	−7.449	7.102	−0.076
Mother permissive style x Area	−54.764	37.341	−0.127	−6.945	9.003	−0.067	4.700	6.514	0.061
Model Summary	$\Delta R^2 = 0.037$			$\Delta R^2 = 0.037$			$\Delta R^2 = 0.092$		
	F (12, 644) = 2.185**			*F* (12, 643) = 2.149*			*F* (12, 643) = 1.047		
Step 3									
Age	−1.259	5.617	−0.009	1.352	−0.023	0.099*	1.146	0.993	0.045
BMI	0.443	2.222	0.008	0.535	0.032	−0.023	−0.300	0.385	−0.030
Sex (0 = Boys)	−59.527	19.773	−0.118	4.756	0.167	0.032	−14.986	3.481	−0.167
Area (0 = Urban)	−80.537	18.804	−0.168	4.518	−0.087	0.167***	23.339	3.295	0.274
Father authoritative style	1.554	39.561	0.007	8.442	−0.152	−0.087	4.883	6.148	0.121
Father authoritarian style	−120.384	39.943	−0.296	9.586	0.204	−0.056	2.710	6.980	0.038
Father permissive style	−28.069	43.022	−0.090	10.443	0.138	0.006	5.773	7.460	0.104
Mother authoritative style	42.340	44.838	0.168	9.682	−0.056	−0.152	−1.251	7.047	−0.028
Mother authoritarian style	120.458	40.110	0.318	9.572	0.006	0.204	12.285	6.979	0.184
Mother permissive style	29.054	44.030	0.093	10.351	0.180	0.138	−9.719	7.560	−0.176
Father authoritative style x Sex	36.540	47.676	0.133	10.518	0.013	0.180	−6.249	7.654	−0.129
Father authoritarian style x Sex	131.581	50.897	0.255	12.210	−0.216	0.146	1.203	8.889	0.013
Father permissive style x Sex	−9.786	54.858	−0.025	13.273	0.019	−0.174	−3.719	9.534	−0.054
Mother authoritative style x Sex	−96.601	53.019	−0.320	11.783	0.146	0.013	1.327	8.574	0.025
Mother authoritarian style x Sex	−180.937	50.038	−0.386	11.973	−0.174	−0.216	−10.694	8.722	−0.129
Mother permissive style x Sex	−4.119	55.403	−0.011	13.127	0.415	0.019	9.028	9.567	0.130
Father authoritative style x Area	−77.062	62.101	−0.238	14.275	−0.225	0.415*	−4.512	10.380	−0.078
Father authoritarian style x Area	154.853	66.557	0.260	15.958	−0.163	−0.176	0.569	11.727	0.005
Father permissive style x Area	41.345	68.789	0.092	16.572	0.100	−0.139	−18.069	12.014	−0.227
Mother authoritative style x Area	−3.801	66.611	−0.011	15.307	−0.176	−0.225	8.352	11.164	0.131
Mother authoritarian style x Area	−136.717	64.805	−0.247	15.569	−0.139	-.0163	−4.944	11.515	−0.050
Mother permissive style x Area	−79.687	62.980	−0.185	14.975	−0.463	0.100	15.395	11.019	0.200
Father authoritative style x Sex x Area	36.032	72.650	0.095	16.971	0.300	−0.463*	4.016	12.262	0.060
Father authoritarian style x Sex x Area	−93.105	85.660	−0.127	20.587	0.057	0.180	−3.420	15.046	−0.026
Father permissive style x Sex x Area	−43.937	83.419	−0.008	20.107	−0.190	0.238	18.031	14.569	0.185
Mother authoritative style x Sex x Area	48.742	78.064	0.114	18.246	0.180	0.300	−11.336	13.218	−0.150
Mother authoritarian style x Sex x Area	173.993	82.947	0.257	20.003	0.238	0.057	−4.554	14.662	−0.038
Mother permissive style x Sex x Area	43.823	78.338	0.080	18.715	0.099	−0.190	−17.033	13.697	−0.174
Model Summary	$\Delta R^2 = 0.011$			$\Delta R^2 = 0.019$			$\Delta R^2 = 0.088$		
	F (6, 638) = 1.251			*F* (6, 637) = 2.301*			*F* (6, 637) = 0.569		

[a] Parenting styles were centered at their means. Sex and area variables were dummy coded as appropriate. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.
[b] *b* = unstandardized beta.
[c] *SE B* = standard error for the unstandardized beta.

[d] β = standardized beta.

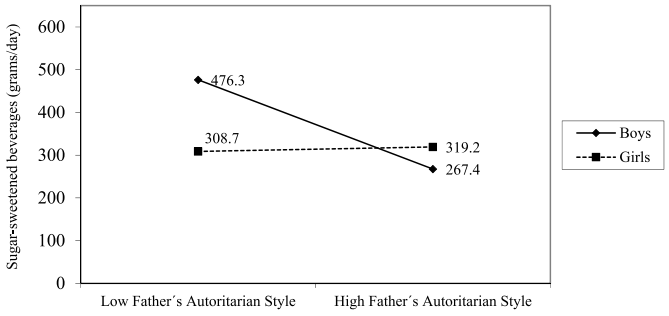

Fig. 1. Interaction of father's authoritarian parenting style with adolescent sugar-sweetened beverages consumption, by sex.

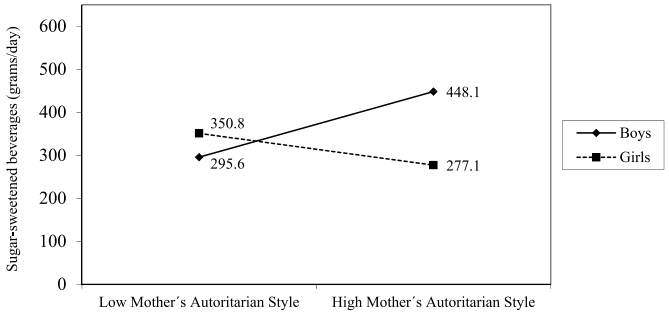

Fig. 2. Interaction of mother's authoritarian parenting style with adolescent sugar-sweetened beverages consumption, by sex.

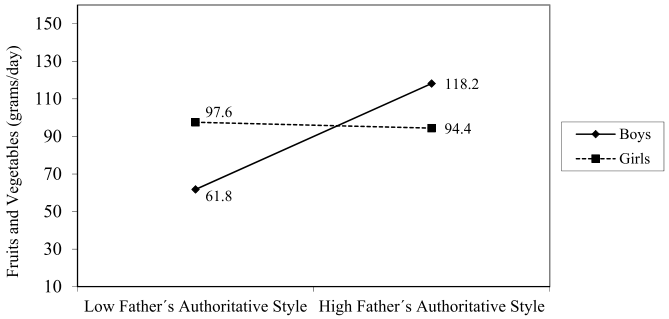

Fig. 3. Interaction of father's authoritative parenting style with rural adolescent fruits and vegetables consumption, by sex.

interrelationships and communication between parents and children according to the sociocultural context in which they socialize (Arredondo et al., 2015).

According to Buamrind's conceptualization, the authoritarian parenting style is associated with parents who emphasize obedience and conformity and expect that rules be obeyed without explanation in a less warm environment (Baumrind, Larzelere, & Owens, 2010). However, in the Latin American family context, authoritarian parenting may reflect another reality because people raised in different cultures are likely to differ in how they relate and communicate. This suggests that parents do not have a single, consistent parenting style. In general, the United States, Europe, and other "Northern" and "Western" cultures emphasize autonomy: individual achievement, self-reliance, and self-assertiveness. In contrast, other cultures, particularly in Asian, African, and Latin American countries, tend to value interdependence: collective achievement, sharing, and collaboration (Johnson, Radesky, & Zuckerman, 2013).

Latin Americans have specific attitudinal orientations towards the importance of family (i.e., *familismo*), as well as strong feelings of loyalty, respect, and solidarity between children and parents fostered by frequent contact and reciprocity (Arredondo et al., 2015). Since Latino parents expect their children to respect and follow orders, they tend to be perceived as stricter and more authoritarian than non-Latino and African American parents (Fontes, 2002; Méndez & SJ, 2006). However, Latino parents tend to exhibit both greater intimacy and more protective behaviors than non-Latino Anglo parents (Fontes, 2002; Méndez & SJ, 2006). As such, the conceptualization of an authoritarian parenting style among Latin Americans may differ; it's not just about expecting rules to be obeyed without explanation in a slightly warm environment (Baumrind, 2010), but about respecting the decisions made by the adolescent's authority figures (e.g., parents) within an affectionate environment, as suggested by Domènech Rodriguez et al. (2009). Nevertheless, Latin American parents are less likely to accept the autonomy of the adolescent child, which tends to generate conflict. Latino parents generally have more rules than Euro-American families and stricter expectations regarding activities outside the home (Halgunseth et al., 2006). However, Latin American adolescents show more respect for parental authority and are less likely than other adolescents to contradict their parents (Persike & Seiffe-Krenke, 2016).

Future research should continue to look at the effect of parenting styles on adolescent food consumption to provide new insights into the complex dynamics of the interaction between parents and adolescents. Particular attention should go to the influence of the same- or opposite-sex parent/adolescent dyads and the socio-cultural environment where parents and adolescents socialize. Inconsistent results on parenting styles and their relationship with child outcomes might be better understood by considering the distinct cultural meanings of obedience and respect towards parents in both individualistic and collectivistic societies (Keller et al., 2006).

Parenting styles may have different influences on adolescent behaviors that warrant encouragement (e.g., FV intake) and those that need to be extinguished or discouraged (e.g., SSB consumption). Our findings support previous research suggesting that the influence of parenting styles varies by food type (Pearson et al., 2010) and possibly responds to the context of the developing adolescent and the culture and home environment in which s/he is growing.

For bean consumption, there was no significant association with parenting style, or with parenting style by sex or residence area. Therefore, other family environment factors that can explain why adolescent consumption of beans has drastically decreased in the last 20 years may be playing a role (Monge-Rojas et al., 2020). Further research is required to elucidate what factors are negatively influencing adolescent bean consumption, such as home availability of beans and parental modeling (both of which have been identified as key elements for the establishment of healthy eating habits during adolescence) (Fleary & Ettienne, 2019; Hanson, Neumark-Sztainer, Eisenberg, Story, & Wall, 2005; Loth, MacLehose, Larson, Berge, & Neumark-Sztainer, 2016; Ma & Hample, 2018; Pearson, Biddle, & Gorely, 2009; Yee, Lwin, & Ho, 2017).

In conclusion, this study offers evidence that parenting styles may have different influences on adolescent food consumption, and that these influences are conditioned by adolescent and parent sex, and by the cultural and geographic context in which the adolescent is living. The effects of parent/child interactions may differ by cultural context and whether the health behavior in question should be encouraged (e.g., eat more FV) or discouraged (e.g., drink less SSB).

This study should be interpreted in light of its strengths and limitations. First, the cross-sectional nature of this study meant that no causal relationship between parenting styles and adolescent food consumption is suggested. Secondly, the study only involved adolescents, and the

results only reflect their perception of their parents' parenting styles. Involving at least two members of the family in the study would provide a more global perception of parenting styles (Bourdeaudhuij & Oost, 2000). Still, this study analyzed the adolescent perception of both fathers' and mothers' parenting styles, unlike other studies that only consider the mothers' parenting styles. Thirdly, the study sample was not nationally representative: it was limited to urban and rural areas within the province of San José. However, the highest proportion of Costa Rican adolescents (30%) is clustered in that province (UCR, 2013). Also, the sample included adolescents enrolled in school, which represents ~80% of adolescents in Costa Rica (Programa Estado de la Nación, 2019).

Author contributions

R. M-R: Conceived and designed the study, collected and interpreted data, and wrote the manuscript. V. SC: Contributed importantly to the analysis and interpretation of data and assisted in writing the manuscript. TM. O, U. C-R and B. RF: Made central contributions to the interpretation of data and assisted in writing the manuscript. All authors read and approved the final manuscript.

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Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Data and code availability

All data used in the study are availability and the lead author has full access to the data reported in the manuscript.

Ethical statement

The Bioethics Committee of the Costa Rican Institute for Research and Education in Nutrition and Health (INCIENSA) approved the study protocol. The study protocol was approved under number IC-2007-01.

All adolescents who participated in the study gave their informed assent verbally and wrote on the informed assent form: name, ID and date of acceptance to participate in the study. Likewise, the adolescents required to have the informed consent form signed by their parents to participate in the study.

All guidelines for human subject research were strictly followed, in accordance with the international regulations, and specifically with Law 9234 "Regulatory Law of Biomedical Research", which regulates biomedical research in Costa Rica.

Declaration of competing interest

The authors declare that they have no conflict of interest.

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