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Early school-age family meal characteristics matter for the later development of boys and girls

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ABSTRACT

Objective: Sharing a meal together offers an innovative approach to study the family environment. How often families eat together may not capture the distinct experience for sons and daughters. Instead, studying family meal characteristics might be more enlightening. This study aims to examine the prospective associations between family meal environment quality at age 6 years and later well-being at age 12 years in 734 boys and 758 girls.

Method: Participants are from the Quebec Longitudinal Study of Child Development birth cohort. When children were aged 6 years, parents reported on their family meal environment experience. At age 12 years, child outcomes included parent-reported healthy lifestyle habits, teacher-reported academic achievement, and self-reported social adjustment. The relationship between early family meal environment quality and later child outcomes were analyzed using multivariate linear regressions.

Results: For girls, better family meal environment quality at age 6 years predicted an earlier bedtime, a lower consumption of soft drinks and sweet snacks, more classroom engagement, and fewer behavior problems at age 12 years. For boys, better family meal environment quality at age 6 years predicted an earlier bedtime and less anxiety and more prosocial behaviour at age 12 years. These significant relationships were adjusted for a multitude of child/family characteristics.

Conclusion: From a population-health perspective, our findings suggest that family meals represent a cost-efficient, effective protective factor that likely has long-term influences on bio-psycho-social development. Information campaigns that promote family meals as a health intervention could optimize the well-being of boys and girls.

1. Introduction

Since the beginning of time, people have broken bread for initiating and building relationships. Meal sharing is also part of the family life environment. In fact, going back historically, the family meal was the main collective objective of hunting and gathering societies [1]. Sharing a meal provides an occasion for communication as the family environment is the most significant vehicle of socialization in childhood [2]. Today, family meals are declining in frequency given the tightening ratio between limited downtime and basic activities of daily living. Moreover, they are often plagued by distracting media, like television [3].

Because it represents a recurrent daily event in parenting, family meals are an innovative component of home environment research [2]. Family meals often refer to the frequency with which all or most relatives living under the same roof dine together. A recent review of mostly cross-sectional research reported that higher family meal frequency is linked with a healthier diet and body weight in children of all ages and cultures [4]. This is likely explained by the fact that in childhood, adults are the nutritional gatekeepers. Interestingly, those adults also shape the meal environment. However, how often family members eat together may not capture the psycho-social experience of meal sharing in the family context of a household, especially with children [5].

Optimal environments offer an opportunity for the habitual transmission of relational, culinary, and cultural rituals and family interaction routines [6]. Common sense dictates that these likely confluent characteristics can be beneficial to child growth and development. Habitual interparental or parent-child conflict routines may pose risks as might eating practices that favor sequential solitary eating or screen distractions during mealtime by family members [6–8].

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The literature suggests that the relation between eating behavior and social and health indicators matters [6]. Prospective associations were found between family environment quality in kindergarten and subsequent child lifestyle and social adjustment by the end of fourth grade [2]. The parent-reported measure of family meal environment quality used in this study extracted mealtime enjoyment, communication, emotional sharing, and feelings of acceptance and harmonious relations. Lower quality meal sharing contexts predicted more soft drink consumption and less physical fitness relative to other children at age 10 years. Early family meal environment quality was also inversely associated with physical aggression, oppositional behavior, non-aggressive delinquency, and reactive aggression, according to child self-reports. Unlike past research that is mostly cross-sectional, such findings suggest that the association is one that is powerful enough to endure past middle childhood. Lifestyle habits that are acquired early and sustained throughout childhood are more likely to endure [9].

Past research addressing this simple child rearing strategy is not without limitations. Foremost would be the regular use of cross-sectional designs, which limit control over pre-existing conditions like difficult child temperament, maternal depression, and other sources of bias [4,6]. As such, a multitude of 'chicken and egg' debates come into play. Second, studying frequency may not capture the complexity of the family meal experience [2]. The psycho-social experience of breaking bread might matter, given that it is what families do more often than with relatives and friends. Third, previous studies have mainly focused on older children, thus unable to underscore the importance of the early childhood years in relation to long-term well-being [10]. Younger children are more likely to eat at home than adolescents and young adults [8]. Fourth, past research did not include some important indicators measuring the family meal experience [2]. Having arguments at the table and having to eat quickly takes away from the positive experience family meals can offer. These must be additionally considered. Finally, past research has not considered that human development is multifaceted and that raising sons and daughters is a qualitatively different experience given a confluence of biological and social influences. Although our twenty-first century attitudes toward gender equality are prevalent, parents continue to show significant differences in how they socialize their sons and daughters through the types of opportunities they offer through experiences within and outside the family [11,12]. For example, daughters are more likely to experience discussions on cooking and meal characteristics whereas sons are more likely to be taught how to build things [13]. Mothers and fathers are generally more responsive to negative emotions and behavior and parenting style with daughters compared to sons, especially mothers [14]. Parental approaches to socialization of emotion and engagement in flexible-democratic instead of authoritarian styles are more likely with daughters than sons. Parents also have harsher, controlling, and affectively negative interactions with daughters, than with sons [15]. These patterns suggest that from early childhood onward, daughters are more strongly influenced by specific aspects of child-rearing and its concomitant family environment than sons [16]. An evolutionary combination of biology and socialization processes might render daughters more sensitive to meal sharing and domestic influences [1,12]. Thus, a population-based, longitudinal birth cohort of typically developing boys and girls offers a naturalistic setting to study the influence of family meal environment quality on bio-psycho-social outcomes while simultaneously adjusting for underlying confounders.

This study examines the prospective influence of family meal environment quality at age 6 years on later child well-being at age 12 years, using the Quebec Longitudinal Study of Child Development birth cohort. Data are provided by parents, teachers, children, and independent measures. All parent-collected data was provided by the most knowledgeable parent, oftentimes being the mother. This study is particularly unique in its assessment of the early school-age family meal environment and the breath of subsequent outcomes of boys and girls. That is, we assume distinct responses to risk and protective factors in the environment. It is expected that better family meal environment quality will be associated with more optimal healthy lifestyle, school, and social habits. Due to different biological influences and contextual expectations, we expect that boys and girls will experience distinct responses to low and high family meal environment quality, as risk and protective factors respectively. Nevertheless, we offer no directional hypothesis on these responses in our sex-stratified approach to our main objective.

2. Material and methods

2.1. Participants

The Quebec Longitudinal Study of Child Development originates from a randomly selected, stratified sample of 2837 infants born between spring 1997 and spring 1998 in Quebec, Canada (http://www.iamillbe.stat.gouv.qc.ca/default_an.htm). Using the provincial birth register, at the inception of the longitudinal component, 93 children were deemed ineligible and 172 were untraceable owing to incorrect coordinates at the first postpartum wave of data collection (5 months). Of the 2572 remaining children, 349 parents were unreachable or refused participation. Thus, 2223 infants (and their families) with parental consent were deemed eligible for annual follow-up from age 5 months onward, representing 82% of the eligible target population. Of these, 39% were firstborn. Annual and biennial follow-ups occurred during the school-age years. The study received IRB approval from the University of Montreal and the *Institut de la Statistique du Québec*.

In this study, we used the subsample of 1492 children (49% boys) with complete family meal data at age 6 years. Follow-up occurred six years later, at age 12 years.

2.2. Measures

2.2.1. Predictor variable: family meal environment quality using parent report (Age 6 years)

We created a scale measuring family meal environment quality, as reported by parents (8 items: meal time is enjoyable for all; meal time is an opportunity to talk; meals must be taken quickly (reverse coded [RC]); during meal time, there are arguments between parents and/or children (RC); we express our feelings to each other; we feel accepted for what we are; there are lots of bad feelings in the family (RC); we confide in each other; $\alpha_{boys} = 0.66$, $\alpha_{girls} = 0.63$). To create this scale, we used statements validated in other studies to assess meal enjoyment or atmosphere at family meals, as well as some statements from the McMaster Model of Family Functioning [2,17,18]. All the parent-reported items in our family meal environment scale were rated on a Likert scale with response options including 1 (never or fully disagree), 2 (occasionally or disagree), 3 (often enough or agree), and 4 (always or fully agree). Higher scores indicate environmental quality during mealtime.

2.2.2. Outcome variables: bio-psycho-social well-being using multiple sources (age 12 years)

2.2.2.1. Healthy lifestyle habits. Parents reported on the average bedtime (during the week and the weekend) and on the dietary consumption frequency of soft drinks and sweet snacks, with responses ranging from 1 (never) to 7 (4 times or more per day).

2.2.2.2. Academic achievement. Sixth-grade teachers reported on classroom engagement, which represents classroom task orientation, compliance, and persistence (10 items: child follows directions; follows rules; follows instructions; completes work on time; works independently; listens attentively; works neatly and carefully; puts a lot of effort into work; participates in class; and asks questions when he or she does not understand; $\alpha_{boys} = 0.92$, $\alpha_{girls} = 0.91$). All of the teacher-reported factors were rated on a Likert scale with response options ranging from 1 (never) to 5 (always). Higher values indicate a higher degree of the factor [19].

2.2.2.3. Social adjustment. Children self-reported their anxious behaviour (4 items: I am too fearful or nervous; I am very worried; I cry a lot; I am

nervous or very tense; $\alpha_{boys} = 0.70$, $\alpha_{girls} = 0.72$). Teachers reported on hyperactive behaviour (6 items: child could not stay put, was agitated or hyperactive; stirred constantly; was unable to wait when something was promised; was impulsive, acted without thinking; had difficulty waiting for his/her turn in a game; had trouble staying still to do something for more than a few moments; $\alpha_{boys} = 0.88$, $\alpha_{girls} = 0.83$), oppositional behaviour (4 items: child was rebellious or refused to obey; did not appear to have remorse after misbehaving; has not changed his/her behaviour after being punished; has had tantrums or got angry quickly; $\alpha_{boys} = 0.80$, $\alpha_{girls} = 0.79$), physical aggression (3 items: child got into a fight; physically attacked others; hit, bitten, kicked other children; $\alpha_{boys} = 0.85$, $\alpha_{girls} = 0.64$), and prosocial behaviour (3 items: child tried to help someone who was injured; comforted a child (friend, brother or sister) who was crying or upset; helped other children who were not feeling well; $\alpha_{boys} = 0.83$, $\alpha_{girls} = 0.77$). All the child- and teacher-reported factors were rated on a Likert scale with response options including 1 (never or not true), 2 (sometimes or somewhat true), and 3 (often or very true). Higher values indicate a higher degree of the measured factor. These items are taken from the Social Behavior Questionnaire, a good predictor of future social adjustment and school success [19].

2.2.3. Pre-existing control variables using multiple sources

In an attempt to establish a causal inference framework, a number of potentially confounding pre-existing child and family characteristics were implemented as controls, using parental and direct assessment: temperament problems at age 1.5 years (6 items; $\alpha_{boys} = 0.81$, $\alpha_{girls} = 0.78$; 0 = below or in the median, 1 = above the median); early cognitive skills measured at age 2 years by research assistants using an abridged version of the Imitation Sorting Task, which is specifically designed for assessing working memory and attention during the transitional period from infancy to preschool [20,21]; maternal depression at age 5 months, using a short version of the Center for Epidemiological Studies Depression Scale (12 items; $\alpha_{boys} = 0.81$, $\alpha_{girls} = 0.78$; 0 = below or in the median, 1 = above the median) [22,23]; maternal education at age 5 months (finished high school = 0 and not = 1); family dysfunction at age 1.5 years, using a scale that measures family communication, problem solving, control of disruptive behavior, and demonstrations of affection (7 items; $\alpha_{boys} = 0.82$, $\alpha_{girls} = 0.84$; 0 = below or in the median, 1 = above the median) [17,21], with higher levels of this variable indicating higher levels of family dysfunction; family configuration (intact family = 0 and not = 1) and income (0 = sufficient and 1 = insufficient, as defined by the Canadian low-income cut-off of that year provided by Statistics Canada at age 5 years); and directly measured maternal and child body mass index (BMI) at ages 1.5 and 2 years, respectively. Maternal BMI was treated as a continuous variable. Child BMI were converted into z-scores and were classified according to CDC growth charts [24]. Children were classified as 0 = underweight or normal weight if they were below the 85th percentile, as 1 = overweight if they were at or above the 85th percentile, as 2 = obese if they were at or above the 95th percentile, and as 3 = severely obese if they were at or above the 97th percentile.

2.3. Data analytic procedure

Our analyses treat boys and girls as separate populations with distinct experiences related to risk and protective factors. We estimated a series of ordinary least-square regressions in which a number of indicators of well-being at age 12 years were linearly regressed on family meal environment quality at age 6 years for boys and girls separately (SPSS v.25). This postulated relation can be interpreted as the prospective influence of increasing family meal environment quality by 1 unit on an array of later well-being measures. We then adjusted for baseline child and family characteristics from 5 months to age 5 years to best ensure an unbiased estimation of these presumed prospective associations, accounting for possible omitted variable bias.

This study required follow-up data from several sources and waves. These correspond to the predictor, outcomes, and potential confounders in early childhood. As with any longitudinal study, incomplete data required an attrition analysis to compare the participants with varying incomplete data on control variables to participants with complete data on control variables from our sample. Using independent sample *t*-tests, several significant bivariate differences were found. Compared with the nonretained cases, our retained sample at age 12 years had higher temperament problems at age 1.5 years ($\bar{x} = 0.57$ vs 0.48; $t_{308.875} = 2.49$; $p \leq 0.05$), had lower cognitive skills at age 2 years ($\bar{x} = 4.76$ vs 4.91; $t_{298.334} = -2.31$; $p \leq 0.05$), and had mothers who were more educated ($\bar{x} = 0.12$ vs 0.18; $t_{349.263} = -2.59$; $p \leq 0.01$). There were no between-group differences in the other potential confounders in early childhood.

We used SPSS v.25 for multiple imputation to correct for response and attrition bias. Using a stochastic algorithm, missing observations are imputed based on available complete data on auxiliary variables, creating multiple datasets that are copies of the original complete data. The algorithm generates slightly different values for each imputed measure across the multiple datasets. The additional variance caused by differences in imputed values between the various copies reflects the uncertainty of the imputation and is added as a correction to the analyses. Our analyses were conducted with 20 imputed data sets.

3. Theory

Family meals are viewed as an activity of daily living that relates to the positive youth development model as our framework [25]. By experiencing mutually beneficial relations with the significant others and institutions in their social world, youth are more likely to project themselves on a path toward positive contributions to themselves, their families, and their communities. This approach considers the potential and capacity of each individual. For young children, the main vehicle of socialization and institution which provides warmth and structure is the family. Mealtime then encourages psychological, emotional, and social ties between parents and children. Rather than grounding its developmental approach in the presence of adversity, risk or challenge, a positive youth development approach views children's characteristics as resources to develop toward flourishment [26].

As for our outcomes, a healthy and connected lifestyle represents flourishment, the gold standard for defining well-being across development. According to flourishing theory, an optimal life is pleasant, engaged, meaningful, achieving, and connected with others [27]. This state is cultivated by valuing one's strengths and talents as resources. Thus, to flourish represents a state of positive emotions, engagement, relationships, finding meaning, and a sense of accomplishment. In such, mealtime is an opportunity for parents to contribute to the child's flourishment.

4. Results

4.1. Descriptive statistics

Table 1 reports sex-specific descriptive statistics for all study variables. Both boys and girls have a mean score of 3.42 (on a total of 4) for family meal environment quality at age 6 years. At age 12 years, boys and girls go to bed around 21:08 and 21:12, respectively. They consume soft drinks and sweet snacks on average 1 to 3 times per week. Boys and girls have a relatively high score on classroom engagement compared to the range of scores. In terms of social adjustment, the highest scores for boys are with respect to hyperactivity and prosocial behaviour. The highest scores for girls are for anxiety and prosocial behaviour.

4.2. Relationship between baseline control variables and subsequent family meal environment quality

We next examined associations between baseline child and family characteristics from 5 months to age 5 years and family meal environment quality at age 6 years.

Table 1
Descriptive statistics for study variables.

		Boys			Girls	
	M (SD)	Categorical variables (%)	Range	M (SD)	Categorical variables (%)	Range
Predictor (age 6)						
Family meal environment quality	3.42 (0.33)	–	2.13–4	3.42 (0.32)	–	2.13–4
Outcomes (age 12)						
Bedtime (week/week-end)	21.08 (0.44)	–	19.57–22.57	21.12 (0.5)	–	19.57–23.43
Soft drinks and sweet snacks	2.0 (0.7)	–	1–6.50	1.98 (0.68)	–	1–5
Classroom engagement	3.58 (0.66)	–	1.80–5	3.97 (0.64)	–	1.40–5
Anxious behavior	1.46 (0.38)	–	1–3	1.63 (0.42)	–	1–3
Hyperactive behavior	1.71 (0.51)	–	1–3	1.48 (0.5)	–	1–2.67
Oppositional behavior	1.55 (0.33)	–	1–3	1.47 (0.33)	–	1–2.75
Physical aggression	1.46 (0.43)	–	1–3	1.3 (0.37)	–	1–2.16
Prosocial behavior	1.94 (0.41)	–	1–3	2.11 (0.46)	–	1–3
Control variables						
Temperament problems (age 1.5)	–	–	0–1	–	–	0–1
0 = below or in the median	–	47.7	–	–	46.7	–
1 = above the median	–	52.3	–	–	53.3	–
Child BMI (age 2)	–	–	0–3	–	–	0–3
0 = underweight or normal	–	79.2	–	–	83.2	–
1 = overweight	–	15.4	–	–	12.4	–
2 = obese	–	2.9	–	–	1.5	–
3 = severly obese	–	2.6	–	–	2.9	–
Cognitive ability (age 2)	–	–	3–6	–	–	3–6
3 = score of 3	–	2.6	–	–	5	–
4 = score of 4	–	20.4	–	–	22.3	–
5 = score of 5	–	59.1	–	–	57.1	–
6 = score of 6	–	17.8	–	–	15.6	–
Maternal depression (5 mo)	1.43 (1.23)	–	0–8.21	1.36 (1.21)	–	0–6.41
Maternal education (5 mo)	–	–	0–1	–	–	0–1
0 = finished high school	–	85.8	–	–	83.2	–
1 = did not finish high school	–	14.2	–	–	16.8	–
Maternal BMI (age 1.5)	23.83 (4.98)	–	15.24–47.34	23.58 (4.32)	–	14.17–43.52
Family dysfunction (age 1.5)	–	–	0–1	–	–	0–1
0 = below or in the median	–	56	–	–	57.5	–
1 = above the median	–	44	–	–	42.5	–
Family configuration (age 5)	–	–	0–1	–	–	0–1
0 = intact	–	72.8	–	–	73.4	–
1 = non-intact	–	27.2	–	–	26.6	–
Family income (age 5)	–	–	0–1	–	–	0–1
0 = sufficient	–	83.5	–	–	83.9	–
1 = insufficient	–	16.5	–	–	16.1	–

Notes. M = mean; SD = standard deviation; BMI = body mass index. Analyses corrected for attrition bias.

4.2.1. Boys

As reported in Table 2, boys with higher temperament problems at age 1.5 years had lower scores on family meal environment quality at age 6 years (unstandardized $\beta = -0.05$, $p \leq 0.05$, 95% confidence interval [CI], -0.07 to -0.03). Specifically, every standard deviation (SD) unit increase (= 0.02) in temperament problem scores contributed to a 7% SD unit decrease in family meal scores. Boys with higher cognitive abilities at age 2 years had higher scores on family meal environment quality at age 6 years (unstandardized $\beta = 0.03$, p ≤ 0.05, 95% CI, 0.02 to 0.05). Every SD unit increase (= 0.02) in cognitive abilities scores contributed to a 7% SD unit increase in family meal scores. Boys with mothers who had higher scores on maternal depression at 5 months (unstandardized $\beta = -0.03, p \leq 0.001$, 95% CI, -0.04 to -0.02) and who were from families with higher levels of family dysfunction at age 1.5 years (unstandardized $\beta = -0.24$, p ≤ 0.001, 95% CI, -0.26 to -0.21) had lower scores on family meal environment quality at age 6 years. Every SD unit increase in maternal depression scores (= 0.01) and in family dysfunction scores (= 0.02) contributed to a 11% SD unit and a 35% SD unit decrease in family meal scores, respectively. Boys from non-intact families at age 5 years had higher scores on family meal environment quality at age 6 years (unstandardized $\beta = 0.06, p \leq 0.05$, 95% CI, 0.03 to 0.09). Every SD unit increase (= 0.03) in family configuration scores contributed to an 8% SD unit increase in family meal scores. Finally, boys from families who had an insufficient income at age 5 years had lower scores on family meal environment quality at age 6 years (unstandardized $\beta = -0.09, p \leq 0.01$, 95% CI, -0.13 to -0.06). Every SD unit increase (= 0.03) in family income scores contributed to a 10% SD unit decrease in family meal scores.

Table 2
Unstandardized regression coefficients (standard error) reflecting the adjusted relationship between baseline child and family characteristics between 5 months and age 5 years and family meal environment quality at age 6 years.

	β (SE)	
	Family meal environment quality	
Sex	0.002 (0.02)	
	Boys	Girls
Temperament problems (age 1.5)	−0.05 (0.02)*	−0.02 (0.02)
Child BMI (age 2)	0.02 (0.02)	0.02 (0.02)
Cognitive ability (age 2)	0.03 (0.02)*	0.02 (0.02)
Maternal depression (5 mo)	−0.03 (0.01)***	−0.02 (0.009)
Maternal education (5 mo)	−0.001 (0.03)	0.02 (0.03)
Maternal BMI (age 1.5)	0.00 (0.002)	−0.003 (0.003)
Family dysfunction (age 1.5)	−0.24 (0.02)***	−0.23 (0.02)***
Family configuration (age 5)	0.06 (0.03)*	−0.02 (0.03)
Family income (age 5)	−0.09 (0.03)**	−0.06 (0.03)
Adjusted R^2	0.18	0.16

Notes. *p ≤ 0.05, **p ≤ 0.01, ***$p \leq 0.001$. BMI = body mass index. Analyses corrected for attrition bias.

4.2.2. Girls

As documented in Table 2, girls from families with higher levels of family dysfunction at age 1.5 years had lower scores on family meal

environment quality at age 6 years (unstandardized $\beta = -0.23, p \leq 0.001$, 95% CI, −0.25 to −0.21). Every SD unit increase (= 0.02) in family dysfunction scores contributed to a 36% SD unit decrease in family meal scores.

4.3. Relationship between family meal environment quality and subsequent Well-being

We then proceeded to examine associations between family meal environment quality at age 6 years and subsequent well-being at age 12 years, as reported by parents, children, and teachers.

4.3.1. Healthy lifestyle habits outcomes

4.3.1.1. Boys. As documented in Table 3, the unstandardized coefficients indicate that higher family meal environment quality at age 6 years predicted earlier average bedtime (unstandardized $\beta = -0.15, p \leq 0.01$, 95% CI, −0.21 to −0.10), as reported by parents. Every SD unit increase (= 0.33) in family meal scores contributed to a 11% SD unit decrease in average bedtime scores. Dietary consumption frequency of soft drinks and sweet snacks was not significantly related to family meal environment quality.

4.3.1.2. Girls. As documented in Table 3, the unstandardized coefficients indicate that higher family meal environment quality at age 6 years predicted earlier average bedtime (unstandardized $\beta = -0.29, p \leq 0.001$, 95% CI, −0.35 to −0.23) and lower dietary consumption frequency of soft drinks and sweet snacks (unstandardized $\beta = -0.33$, p ≤ 0.001, 95% CI, −0.41 to −0.25), as reported by parents. Every SD unit increase (= 0.32) in family meal scores contributed to a 19% SD unit decrease in average bedtime scores and a 16% SD unit decrease in soft drinks and sweet snacks scores.

4.3.2. School achievement outcome

4.3.2.1. Boys. As described in Table 3, family meal environment quality did not significantly predict classroom engagement.

4.3.2.2. Girls. As described in Table 3, higher family meal environment quality at age 6 years predicted higher classroom engagement at age 12 years (unstandardized $\beta = 0.24$, p ≤ 0.001, 95% CI, 0.17 to 0.32), as reported by teachers. Every SD unit increase (= 0.32) in family meal scores contributed to a 12% SD unit increase in classroom engagement scores.

4.3.3. Social adjustment outcomes

4.3.3.1. Boys. As reported in Table 4, higher family meal environment quality at age 6 years predicted lower anxious behaviour (unstandardized $\beta = -0.11, p \leq 0.05$, 95% CI, −0.16 to −0.07) and higher prosocial behaviour (unstandardized $\beta = 0.14, p \leq 0.01$, 95% CI, −0.35 to 0.63) at age 12 years, as reported by children and teachers, respectively. Every SD unit increase (= 0.33) in family meal scores contributed to a 10% SD unit decrease in anxious behavior scores and a 12% SD unit increase in prosocial behavior scores. Hyperactive behaviour, oppositional behaviour, and physical aggression were not significantly related to family meal environment quality.

4.3.3.2. Girls. As reported in Table 4, higher family meal environment quality at age 6 years predicted lower anxious behaviour (unstandardized $\beta = -0.12, p \leq 0.05$, 95% CI, −0.17 to −0.07) at age 12 years, as reported by children themselves. Greater family meal environment quality also predicted lower hyperactive behaviour (unstandardized $\beta = -0.18$, p ≤ 0.01, 95% CI, −0.24 to −0.12), oppositional behaviour (unstandardized $\beta = -0.15, p \leq 0.001$, 95% CI, −0.19 to −0.11), and physical aggression (unstandardized $\beta = -0.11$, p ≤ 0.05, 95% CI, −0.06 to −0.16), as reported by teachers. Every SD unit increase in family meal scores (= 0.32) contributed to a 9% SD unit decrease in anxious behavior scores, a 11% SD unit decrease in hyperactive behavior scores, a 15% SD unit decrease in oppositional behavior scores, and a 9% SD unit decrease in physical aggression scores. Prosocial behaviour was not significantly related to family meal environment quality.

5. Discussion

The value of a prospective-longitudinal design is its stronger foundation for causal inference when experiments are not possible or practical. Our predictor, the quality of the experiences of sharing a meal in the family

Table 3
Unstandardized regression coefficients (standard error) reflecting the adjusted relationship between family meal environment quality at age 6 years and bedtime, soft drinks and sweet snacks, and classroom engagement at age 12 years.

		β (SE)		
		Bedtime (week/weekend)	Soft drinks and sweet snacks	Classroom engagement
Boys	Family meal environment quality	−0.15 (0.06)**	−0.01 (0.08)	0.12 (0.08)
	Temperament problems (age 1.5)	0.01 (0.03)	−0.02 (0.05)	0.17 (0.05)***
	Child BMI (age 2)	−0.01 (0.03)	−0.08 (0.04)*	–
	Cognitive ability (age 2)	0.02 (0.02)	−0.01 (0.04)	−0.09 (0.03)**
	Maternal depression (5 mo)	0.03 (0.01)*	0.03 (0.02)	−0.08 (0.02)***
	Maternal education (5 mo)	0.01 (0.05)	0.16 (0.08)*	−0.24 (0.07)***
	Maternal BMI (age 1.5)	−0.001 (0.003)	0.004 (0.005)	–
	Family dysfunction (age 1.5)	−0.01 (0.04)	−0.06 (0.06)	0.06 (0.05)
	Family configuration (age 5)	0.08 (0.04)*	−0.09 (0.06)	−0.02 (0.06)
	Family income (age 5)	−0.05 (0.05)	0.36 (0.08)***	−0.2 (0.07)**
	Adjusted R^2	0.02	0.04	0.09
Girls	Family meal environment quality	−0.29 (0.06)***	−0.33 (0.08)***	0.24 (0.08)***
	Temperament problems (age 1.5)	−0.01 (0.04)	−0.01 (0.05)	0.08 (0.05)
	Child BMI (age 2)	0.02 (0.03)	0.004 (0.04)	–
	Cognitive ability (age 2)	−0.02 (0.02)	0.02 (0.03)	−0.13 (0.03)***
	Maternal depression (5 mo)	−0.03 (0.02)*	0.05 (0.02)*	−0.04 (0.02)***
	Maternal education (5 mo)	0.03 (0.05)	0.07 (0.07)	−0.27 (0.06)
	Maternal BMI (age 1.5)	0.004 (0.004)	−0.02 (0.006)**	–
	Family dysfunction (age 1.5)	0.03 (0.04)	0.01 (0.05)	0.04 (0.05)
	Family configuration (age 5)	0.06 (0.04)	0.00 (0.06)	−0.07 (0.05)
	Family income (age 5)	0.004 (0.06)	0.18 (0.07)**	−0.17 (0.07)**
	Adjusted R^2	0.04	0.06	0.10

Notes. *p ≤ 0.05, **p ≤ 0.01, ***p ≤ 0.001. BMI = body mass index. Analyses corrected for attrition bias.

Table 4
Unstandardized regression coefficients (standard error) reflecting the adjusted relationship between family meal environment quality at age 6 years and psycho-social behavior outcomes at age 12 years.

		β (SE)				
		Anxious behavior	Hyperactive behavior	Oppositional behavior	Physical aggression	Prosocial behavior
Boys	Family meal environment quality	−0.11 (0.05)**	−0.1 (0.06)	−0.05 (0.04)	−0.02 (0.05)	0.14 (0.05)**
	Temperament problems (age 1.5)	0.07 (0.03)	−0.02 (0.04)	−0.05 (0.02)*	−0.03 (0.03)	0.09 (0.03)**
	Cognitive ability (age 2)	0.02 (0.02)	0.05 (0.03)	0.03 (0.02)	0.05 (0.02)*	−0.02 (0.02)
	Maternal depression (5 mo)	0.02 (0.01)	0.06 (0.02)***	0.02 (0.10)	0.04 (0.01)**	−0.04 (0.01)**
	Maternal education (5 mo)	0.02 (0.04)	−0.03 (0.06)	0.04 (0.04)	0.5 (0.05)	0.06 (0.04)
	Family dysfunction (age 1.5)	−0.04 (0.03)	−0.04 (0.04)	−0.004 (0.03)	−0.02 (0.03)	0.11 (0.03)**
	Family configuration (age 5)	0.03 (0.03)	0.03 (0.05)	0.05 (0.03)	−0.02 (0.04)	−0.04 (0.04)
	Family income (age 5)	0.03 (0.04)	0.16 (0.06)**	0.13 (0.04)***	0.17 (0.05)***	−0.01 (0.04)
	Adjusted R^2	0.01	0.04	0.05	0.04	0.04
Girls	Family meal environment quality	−0.12 (0.05)*	−0.18 (0.06)**	−0.15 (0.04)***	−0.11 (0.05)*	0.09 (0.06)
	Temperament problems (age 1.5)	−0.03 (0.03)	−0.01 (0.04)	−0.004 (0.02)	0.02 (0.03)	0.03 (0.03)
	Cognitive ability (age 2)	0.03 (0.02)	0.07 (0.02)**	0.04 (0.02)**	0.04 (0.02)*	0.01 (0.02)
	Maternal depression (5 mo)	−0.004 (0.01)	0.03 (0.02)	0.001 (0.01)	0.02 (0.01)*	−0.03 (0.02)*
	Maternal education (5 mo)	0.09 (0.04)*	0.03 (0.05)*	0.07 (0.03)*	−0.01 (0.04)	−0.02 (0.05)
	Family dysfunction (age 1.5)	−0.004 (0.03)	−0.03 (0.04)	−0.02 (0.03)	−0.05 (0.03)	0.10 (0.04)**
	Family configuration (age 5)	0.02 (0.04)	0.04 (0.04)	0.09 (0.03)***	−0.01 (0.03)	−0.08 (0.04)*
	Family income (age 5)	−0.06 (0.05)	0.11 (0.06)	0.05 (0.04)	0.07 (0.04)	0.04 (0.05)
	Adjusted R^2	0.01	0.04	0.06	0.02	0.01

Notes. *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$. Analyses corrected for attrition bias.

environment in early school-aged children, seemed to matter six years later for several indicators of child well-being in girls as well as for some indicators in boys. This suggests that family meals may be worthy of being an intervention target. Many parents would benefit from knowing the importance of meal sharing as a stimulating, functional, and value-based family environment. Such knowledge would better favor child growth and development.

We assessed the degree to which mealtime is enjoyable and an opportunity to communicate and feel accepted by family members. Our measure also considered negative experiences such as rushed eating environments, family discord, and bad feelings among members partaking in meals. Using an associational approach with observational data, girls with better family meal environment quality at the end of kindergarten were compared with girls with lesser family meal environment quality. The same comparisons were done for boys.

For girls, we found associations which suggest that more optimal environments during mealtime beget healthier bio-psycho-social outcomes by the end of sixth grade. More enjoyable mealtime, more opportunities to talk and less arguments during mealtime predicted an earlier bedtime, and lower consumption of soft drinks and sweet snacks. It also predicted more optimal classroom engagement, according to teachers. More early school-age importance to family meal quality forecasted less behavior problems in girls. Specifically, they were less at risk of anxious, oppositional, hyperactive, and physically aggressive behavior with classmates, according to self- and teacher-reported measures.

The prospective associations for boys were different in that we only observed sleeping habits and psycho-social benefits in relation to family meals. Greater aspects of this family environment characteristic predicted an earlier bedtime and less anxious behaviour by the end of sixth grade, according to self-reported measures, compared to boys with family situations that accorded less importance to the family meal sharing experience. More optimal family meal environment quality also predicted more teacher-reported prosocial behavior with classmates.

Although we found distinct prospective associations for sons and daughters in response to their early school-age meal environment, less optimal quality of the meal sharing experience forecasted subsequent anxious behavior for both boys and girls. This does not augur well given that the presence of anxiety during youth significantly increases the probability of having anxiety in emerging adulthood [28].

Evolutionary origins related to hunting and gathering have remained dominant human biological predispositions [1]. The family is the primary unit in such societies, where women play a key role in food production and men play a role in food security. Then and now, mothers and fathers decide how food is to be shared, and how children are to be socialized and protected, respectively. Although our twenty-first century attitudes toward gender equality are prevalent, parents continue to show significant differences in how they socialize their sons and daughters through the types of opportunities they offer through experiences within and outside the family [11]. Daughters are more likely to experience discussions on cooking and meal characteristics, engage in domestic work [29], and experience behavioral control by mothers [30]; whereas sons are more likely to be taught how to build things [13] and have a more gender-typical contribution toward household maintenance [29]. Family environments thus shape children's impressions of gender roles through modeling of expected gender-normed behavior.

Six years later, greater family meal environment quality seemed to matter differently for sons and daughters. Girls were more responsive on all three lifestyle levels. Although boys had better sleep habits and were less fearful and more apt toward helping others altruistically, no associations were observed for empty calorie consumption, classroom engagement, and turbulent behaviors. In low- and middle-income countries, parents tend to be more controlling with sons than with daughters [11]. Parents play an important role in the development of children's behavioral self-regulation by virtue of disciplining, supporting, and guiding children's behavior, especially for boys [31]. Parents tend to be more authoritarian with sons and more flexible-democratic with daughters [32,33]. These more common child-rearing characteristics, though unmeasured in this study, might explain why family meal environment might seem more crucial for girls. Thus, the association between family meal environment quality and boys' outcomes might have been limited because sons tend to experience more rigorous overall parenting [11].

From the positive youth development perspective, mealtime is an opportunity for both boys and girls to develop their psycho-social skills and to strengthen their relationships through positive interactions with their family [25]. In this way, by nurturing certain gender-specific characteristics during meal sharing, these events at age 6 years contribute to later flourishing.

This study is not without limitations. First, regardless of how many pre-existing controls were used to isolate the predictor at baseline, the findings cannot imply causality. Second, because the findings are based on secondary analysis of an existing data set that was designed to study child development, it only comprises information of the environment quality. Third, we are also missing information about who attended family meals. Finally, while this data may be older, the effect size today should remain similar as people have always eaten together. Furthermore, at the time of data

collection, family meals were not yet contaminated with the presence of smartphones and tablets at the table, which may take away from the quality of the meal sharing experience.

Public health is meant to preserve and promote health and prevent disease. Emotional and behavioral disorders like anxiety are more prevalent in childhood and adolescence [34]. From a population-health perspective, our findings suggest that family meals represent a simple, cost-efficient, and effective protective factor that likely has long-term influences on bio-psycho-social development. Promoting family meals as a target of home-based interventions could optimize the well-being of boys and girls in our rapidly changing society.

Authors' contributions

LP made substantial contributions to the study, including conceptualization/design, methodology, and participated in the writing and the revision of the manuscript. MJH made substantial contributions to the study, including conceptualization/design, methodology, and participated in the writing and the revision of the manuscript. GF made substantial contributions to the study, including conceptualization/design, methodology, formal analysis, and participated in the revision of the manuscript. KH and TAB made substantial contributions to the study, including conceptualization/design, methodology, and participated in the revision of the manuscript. All authors have had full access to all data in the study and take responsibility for its integrity and the accuracy of its analysis.

Declaration of Competing Interest

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