

Moderation of associations between maternal parenting styles and Australian pre-school children's dietary intake by family structure and mother's employment status

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Abstract

Objective: To examine associations between maternal parenting style and pre-school children's dietary intake and to test whether perceived maternal time pressures, parenting arrangements and employment status influence these relationships.

Design: This cross-sectional study examined mothers' reports of their child's frequency of consumption of eight food and drink groups, including sugar-sweetened beverages (SSB), unhealthy snacks, takeaway foods, fruit and vegetables. Parenting styles were classified as authoritative, authoritarian, permissive or disengaged using two parenting dimensions (warmth and control). The moderating roles of parenting arrangements, indexed by number of parents in the home and maternal employment status, were assessed. Associations were examined using multinomial regression.

Setting: Data were from the infant and child cohorts in the Longitudinal Study of Australian Children.

Participants: Children aged 4–5 years from both cohorts (infant: n 3607; child: n 4661) were included.

Results: Compared with children of disengaged mothers, children of authoritative mothers consumed most unhealthy foods less frequently, and fruit and vegetables more frequently. Results suggested parenting arrangements and mothers' working status may moderate associations between parenting styles and SSB, takeaway foods, takeaway snacks and fruit consumption.

Conclusions: These findings suggest that authoritative parenting style is associated with a higher consumption of fruit and vegetables and a lower consumption of unhealthy foods among children. However, parenting arrangements and the mothers' working status may influence these relationships. Further research is required to examine the influence of other potential moderators of parenting style/food consumption relationships such as household time and resource limitations.

Keywords

Diet
Parenting styles
Pre-school children
Longitudinal Study of Australian Children

The prevalence of childhood overweight and obesity has been increasing globally; worldwide, 41 million children under 5 years of age are estimated to be overweight or obese⁽¹⁾. Among this age group in Australia, one child in four is reported to be overweight or obese⁽²⁾. This is particularly concerning because overweight children often become overweight or obese adults, as early childhood is a time when children learn about foods and form their dietary patterns and preferences^(3–5). Obesity in children and adults is associated with a number of chronic diseases including CVD, cancer and diabetes mellitus^(6–9). Tackling the increasing rates of overweight and obesity in early

childhood could help reduce rates in adolescence and adulthood, in addition to the burden of chronic disease. Therefore, understanding the reasons for the increase in childhood overweight and obesity is of paramount importance for the prevention of obesity and overweight in children⁽¹⁰⁾.

While the causes of childhood overweight and obesity are complex, one of the main contributing factors is poor diet, especially excess consumption of energy-dense foods and sugar-sweetened beverages (SSB), and low consumption of fruit and vegetables⁽¹¹⁾. Australian pre-school children consume more than one-third of their daily

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kilojoules from energy-dense, nutrient-poor foods and beverages such as snack foods, confectionery and SSB⁽¹²⁾. Greater understanding of the factors influencing the consumption of both energy-dense foods and fruit and vegetables among pre-school children will aid in the development of interventions to improve diet in this age group^(2,11). Parents, as the main food providers, play an influential role in the dietary intake of children⁽¹³⁾. Mothers are of particular importance as many of them spend significantly more time with their children than fathers across several situations including mealtimes⁽¹⁴⁾. Mothers also tend to be the main providers of household food⁽¹⁵⁾. Maternal influence over a child's dietary intake is thought to be strongest in early childhood as early childhood is likely to be where the influences on children's behaviours are greatest^(16,17). This is particularly important as dietary habits formed in early childhood can influence eating habits throughout the child's lifespan⁽¹⁸⁾.

Parenting styles are one potential influence on young children's diets. Parenting styles have been defined as parenting behaviours and practices which influence the development of a child^(19,20). The four commonly defined parenting styles were conceptualised by Maccoby and Martin in 1983 based on parental demandingness and responsiveness. These are authoritative (high demandingness/high responsiveness), authoritarian (high demandingness/low responsiveness), permissive (low demandingness/high responsiveness) and disengaged (low demandingness/low responsiveness)⁽²¹⁾. More recently, demandingness and responsiveness have been re-labelled as control and warmth⁽²²⁾.

Parenting styles have been found to influence the dietary intake of pre-school children (age 1.5–5 years); previous studies in Australia and South Korea have found evidence to suggest that children with authoritative parents have a higher intake of fruit and vegetables compared with children of parents who employ other styles^(13,23). These studies examined the primary carers which were primarily mothers^(13,23). Similar associations have been found among children over 5 years of age in other Western countries, including a lower intake of unhealthy foods^(24–28). However, one Australian study did not find evidence of an association between parenting styles and the dietary intake of pre-school children⁽²⁹⁾.

Although associations between parenting styles and child dietary intake have been reported previously, to our knowledge no studies have examined factors that may moderate these associations. Lack of time is a common reason that people give for not eating healthy foods, as preparing nutritious foods takes time⁽³⁰⁾. Since the 1980s there has been a rise in women entering the workforce with a shift away from 'stay at home mothers'^(31,32). With more hours being worked and fewer hours spent at home, poor work–life balance may result in poorer health outcomes for dependants and other household members⁽³²⁾. Previous studies have reported that maternal employment

is associated with feelings of time strain and poorer health status^(33,34). The family structure, such as the presence of a second parent in the home, shapes the parents' ability to provide support and control their children's health-related behaviours⁽³⁵⁾. Previous research has found evidence that children from single-parent families are at a higher risk of overweight and obesity and are more likely to consume unhealthy snacks than children from dual-parent families^(35–39). These associations may be due to greater time constraints experienced by single parents⁽³⁷⁾.

While studies have demonstrated that time constraints, such as single parenting or the number of hours a mother works, can have negative impacts on the health of dependants, their potential influence on the relationships between parenting styles and children's food consumption has not been investigated or considered in parenting theory^(30,40–43). Therefore, the present study focuses on the moderating effects of the presence of a second parent in the home (parenting arrangements) and the mother's employment status (full-time, part-time or not employed) regarding parenting styles and the dietary intake of pre-school children. Understanding such moderating effects will help to inform the development of intervention strategies focused on reducing the prevalence of obesity among pre-school children⁽³⁷⁾.

The present study aims to examine associations between maternal parenting styles and both healthy and unhealthy dietary intake (four discretionary food groups, three healthy food groups and one SSB item) in two nationally representative samples of Australian pre-school children (the infant and child cohorts, see below). In addition, time-related pressures such as the presence of a second parent in the home and the mother's employment status are considered as moderators of this relationship.

Methods

Study design and sample

The present study involved secondary analysis of the data from the Longitudinal Study of Australian Children (LSAC), which is a nationally representative data set involving children from across Australia. The LSAC data were collected to provide information to develop policies in the areas of parenting, family relationships and functioning, early childhood education and schooling, child care and health. Full details of the study design and sampling protocols are provided elsewhere⁽⁴⁴⁾. The LSAC consists of two cohorts: the infant cohort (aged 0–1 years at recruitment) and the child cohort (aged 4–5 years). Both cohorts commenced data collection in 2004 with follow-up assessments collected every two years. The most recent assessment was in 2016⁽⁴⁴⁾.

The cohorts were randomly selected using the Health Insurance Commission Medicare database in which most Australians are represented⁽⁴⁴⁾. An invitation to participate

was sent to parents of children of the appropriate ages, parents then had four weeks to withdraw from the study if they did not wish to include their child⁽⁴⁴⁾.

The data for the LSAC were collected using both face-to-face interviews and telephone interviews with the parent who identified as the child's primary caregiver (usually the mother, known as 'parent 1') and face-to-face interviews with the child (beginning only when children were 10 years of age). Where applicable, the child's pre-school teacher and other resident parent (usually the father, known as 'parent 2') were asked to complete paper questionnaires. Written consent forms were obtained for each child participating in the study and the study was approved by the Australian Institute of Family Studies Ethics Committee.

Of the 18800 families that were invited to participate in the study, 54% agreed to take part. This resulted in 5107 children in the infant cohort and 4983 children in the child cohort at wave 1 (2004)⁽⁴⁴⁾. The present cross-sectional study used data from wave 3 of the infant cohort (2008) and wave 1 of the child cohort as the focus was on examining dietary intake of pre-school children aged 4–5 years.

Outcome measures

The LSAC data include the reported frequency of consumption of twelve food and drink groups during face-to-face interviews. These questions were from the Amherst Health and Activity Study⁽⁴⁵⁾. The validity and reliability of this questionnaire are unknown. The primary parent or caregiver was asked to report their child's food and drink consumption in the 24 h prior to the interview. The question asked of the parents was 'In the last 24 hours has your child had the following foods and drinks once, more than once, or not at all?'

Eight of the twelve food and drink questions for children aged 4–5 years (i.e. wave 3 and wave 1 of the infant and child cohorts, respectively) were considered in the present study. There were four discretionary food groups (hot takeaway foods/snacks, savoury/sweet snacks), one SSB item and three healthy food groups (raw/cooked vegetables, fruit). Hot takeaway foods included meat pies, hamburgers, hot dogs, sausages or sausage rolls, while takeaway snacks included hot chips or French fries. Cold savoury snacks were foods such as potato chips while cold sweet snacks included biscuits (cookies), doughnuts, cake or chocolate. SSB included soft drink and cordial. Raw vegetables included salad and raw vegetables, while cooked vegetables and fruit included all cooked vegetables and fresh fruit, respectively.

Exposure measures

In the LSAC, parenting styles for parents of children aged 4–5 years were assessed based on parenting dimensions of warmth and control⁽⁴⁶⁾. During face-to-face interviews

with the primary caregiver (a written questionnaire was completed by the secondary caregiver), parents were asked to rate their parenting behaviours on these two dimensions. The warmth parenting dimension was assessed by averaging the scores of six items from the Child Rearing Questionnaire, for example: 'How often do you have warm, close times together with this child?'⁽⁴⁷⁾. The control parenting dimension was assessed by averaging the scores of five items from the National Longitudinal Survey of Children and Youth, for example: 'When you discipline this child, how often does he/she ignore the punishment?' (reverse scored)⁽⁴⁸⁾. The responses were recorded on five-point Likert scales, ranging from 1 (never/almost never) to 5 (all the time). Each parenting dimension has demonstrated good reliability and internal consistency ($r=0.73$ – 0.83), as well as good validity when modelled against a variety of co-existing family and parental characteristics in previous studies^(22,49).

The warmth and control parenting dimension scores were divided and combined into the four categorical parenting styles as per Wake *et al.*⁽²²⁾. Following this approach, as data for both parental warmth and control have been shown to be positively skewed and there are no standard cut-off points for these scales, the scores were dichotomised at the least positive tertile. Therefore, parental warmth and control scores that fell above the 66th percentile were considered high warmth and high control, while the rest were classified as low warmth and low control. The combination of high warmth and high control was classified as authoritative; low warmth and high control as authoritarian; high warmth and low control as permissive; and low warmth and low control as disengaged. The present study focused on the parenting styles of mothers only as 98% of the primary caregivers were mothers and mothers are shown to be the main providers of household food⁽¹⁵⁾. Hereafter, for the sake of brevity, these styles are indicated by the terms 'authoritative mothers', 'authoritarian mothers', 'permissive mothers' and 'disengaged mothers'.

Potential confounders

The potential confounders of the associations between parenting styles and child dietary intake included maternal age, number of children in the household (0, 1, 2 or ≥ 3), maternal country of birth (Australia/not Australia), maternal education level (less than Year 12, Year 12, trade/certificate or tertiary) and parenting arrangements (single- or two-parent home). All confounders were measured at the same time point as the parenting and diet measures, apart from the number of children in the household and level of maternal education for the infant cohort which were measured at wave 1 only. These wave 1 variables were thus considered for the infant cohort.

Moderators

Maternal employment status (full-time, part-time or not employed) and parenting arrangements (single- or two-parent home) when the children were aged 4–5 years were considered as moderators of the relationship between parenting style and child dietary intake. Information regarding the mother's working status and the presence of a second parent in the home was collected during the face-to-face interviews with the primary caregiver and by written questionnaires with the secondary caregiver.

Statistical analysis

The statistical analyses were conducted using the statistical software package Stata version 14 (2015).

As the response categories for each of the dietary intake outcomes were ordinal, Brant tests were used to test the proportional odds assumption to determine if ordinal regression models could be fitted. The Brant tests were significant at the 5% significance level. Therefore, separate multinomial regression models were fitted to examine associations between the parenting styles and each of the outcomes. As per previous studies, disengaged parenting style was considered as the comparator category in all analyses^(13,50). As the consumption of takeaway snacks

and takeaway foods more than once per day was low in the infant cohort (0.5 and 1.5%, respectively), logistic regression models were fitted to consider the odds of consuming these food groups once *v.* not at all for this cohort. Both unadjusted and adjusted regression models were fitted to obtain crude and adjusted relative risk ratios (RRR) and 95% CI of the associations between independent variables (parenting styles) and each of the outcomes. Adjusted analyses accounted for the number of children in the household, maternal country of birth, maternal education level, maternal age and parenting arrangements. As children were sampled from within postcodes in the LSAC, this clustered sampling was accounted for by using clustered standard errors in the analysis.

To determine if the associations between parenting styles and dietary intake differed depending on the time pressure variables (parenting arrangements and mother's employment status), interactions between parenting style and each of the characteristics were included in separate models for each of the food and beverage intake outcomes. Where there was evidence of an interaction at the 5% significance level, stratified models were fitted for each category of the moderator.

A complete case analysis was conducted assuming missing data were missing completely at random. Of the

Table 1 Demographic and parenting style characteristics of the Longitudinal Study of Australian Children cohorts†

Variable	Infant cohort (wave 3; <i>n</i> 3607)		Child cohort (wave 1; <i>n</i> 4661)	
	<i>n</i> or mean	% or SD	<i>n</i> or mean	% or SD
Child's sex, <i>n</i> and %				
Male	1857	51.5	2306	50.6
Female	1750	48.5	2301	49.4
Child's age (years), mean and SD	4.24	0.43	4.17	0.38
Household type, <i>n</i> and %				
Two-parent household	3256	90.3	4054	87.0
Single-parent household	351	9.7	607	13.0
Mother's employment status, <i>n</i> and %				
Part-time employment	1544	42.8	1722	36.9
Full-time employment	754	20.9	920	19.7
Not in paid employment outside the home	1309	36.3	2019	43.3
Number of children in the home, <i>n</i> and %				
1 child	1436	39.8	520	11.2
2 children	1358	37.7	2283	49.0
3 or more children	813	22.5	1858	39.9
Mother's country of birth, <i>n</i> and %				
Born in Australia	2439	67.6	3600	77.2
Born overseas	1168	32.4	1061	22.8
Mother's education level, <i>n</i> and %				
Less than Year 12	485	13.5	1023	22.0
Year 12	571	15.8	731	15.7
Trade/certificate	1238	34.3	1582	34.0
Tertiary	1313	36.4	1325	28.4
Mother's age (years), mean and SD	35.58	5.17	34.63	5.33
Parenting style, <i>n</i> and %				
Authoritative	1420	39.4	1672	35.9
Authoritarian	732	20.3	1257	27.0
Permissive	804	22.3	852	18.3
Disengaged	651	18.1	880	18.9

†Number of children in the home and maternal education were measured at wave 1 for the infant cohort.

4386 participants at wave 3 of the infant cohort, 3607 (82%) had complete data for all study variables and were included in analysis, while of the 4983 participants at wave 1 of the child cohort, 4661 (94%) had complete data. Descriptive characteristics of the included participants were compared with those of the full sample and the excluded participants. The descriptive characteristics of the complete case sample were similar to those of the full samples for both cohorts.

Results

Demographic and parenting characteristics

Descriptive characteristics of the two cohorts are shown in Table 1. Just over half of the children were male in both cohorts, with a mean age of 4.24 (SD 0.43) years (infant cohort) and 4.17 (SD 0.38) years (child cohort). Most lived with two parents (90 and 87% in the infant and child cohorts, respectively). In both cohorts, a large proportion of the mothers reported being the primary carer of the child (99 and 97%, respectively). The mean age of the mothers was fairly similar in both cohorts; 35.58 (SD 5.17) years in the infant cohort compared with 34.63 (SD 5.33) years in the child cohort. The proportion of mothers born in Australia was lower in the infant cohort (68%) than the child cohort (77%). Both cohorts had similar proportions of women in full-time employment (21% in infant cohort; 20% in child cohort).

Parenting styles were similar in both cohorts; 39% of mothers from the infant cohort and 36% from the child cohort were classified as having an authoritative parenting style, while the others were classified as authoritarian (20% infant cohort; 27% child cohort), permissive (22% infant; 18% child) and disengaged (18% infant; 19% child).

Reported food and beverage consumption

Table 2 shows that, prior to the day of data collection, while under a third of the children from the infant cohort consumed SSB once or more per day, almost half of the child cohort consumed SSB at least once per day. In contrast, consumption of cold savoury snacks (e.g. potato crisps) once or more per day was similar in both cohorts (~30%), as was the consumption of cold sweets snacks (cakes, biscuits, etc.; ~75%) and takeaway snacks and/or hot takeaway foods (~25%) once or more each day. The consumption of cooked vegetables (~75%) and raw vegetables (~40%) once or more each day was similar in both cohorts, as was fruit intake, although 77% ate fruit more than once per day in the infant cohort while 62% ate fruit more than once per day in the child cohort.

Associations of food and beverage consumption with maternal parenting styles and other variables

Overall, there was evidence of an association between maternal parenting styles and the intake of some foods and SSB by pre-school children (Tables 3 and 4). In general, associations were similar in both cohorts. After adjusting for confounders, authoritative mothers reported that their children had higher intakes of healthy foods including cooked and raw vegetables, compared with the children of disengaged mothers in both cohorts (Tables 3 and 4). Similarly, in the child cohort, authoritarian mothers reported higher consumption of fruit and cooked vegetables (but not raw vegetables; Tables 3 and 4) compared with disengaged mothers. However, these associations were not shown in the infant cohort (Table 3).

Compared with disengaged mothers, authoritative mothers reported that their children had lower consumption of unhealthy foods including cold savoury snacks (like potato crisps), hot takeaway foods (like meat pies, hamburgers) and SSB (soft drink, cordial) in both cohorts. In general, the findings also suggested that the authoritarian mothers reported their children had lower intakes of these foods in both cohorts (Tables 3 and 4). However, there was no difference for takeaway snacks and hot takeaway foods in the infant cohort, among whom very few children consumed these more than once per day (Table 3).

The food and beverage intakes of children of permissive mothers did not differ significantly from those of the children of disengaged mothers in either cohort (Tables 3 and 4), except for a lower reported consumption of SSB and a higher consumption of takeaway snacks among children of permissive mothers in the child cohort and a higher consumption of raw vegetables in the infant cohort.

In general, there was little evidence to suggest that the associations between maternal parenting styles and child dietary intake were moderated by either parenting arrangements or maternal employment status. However, there were statistically significant interactions in four of the models suggesting that mothers' working status may moderate the association between parenting styles and takeaway snacks in the infant cohort ($P=0.027$) and parenting arrangements may moderate the association between parenting styles and SSB ($P<0.001$), fruit ($P=0.019$) and hot takeaway foods ($P=0.048$) intake in the child cohort. The stratified associations between parenting styles and takeaway snacks stratified by mothers' working status for the infant cohort are shown in Table 5. The stratified associations between parenting styles and fruit intake, SSB intake and hot takeaway food intake stratified by parenting arrangements for the child cohort are shown in Table 6.

The findings in the child cohort suggest that, in single-parent homes, children with permissive mothers had lower consumption of SSB (more than once compared with not at all) than those with disengaged mothers.

Table 2 Maternal reports of child's food and beverage intakes in the last 24 h in the Longitudinal Study of Australian Children cohorts

Food/beverage	Infant cohort (wave 3; <i>n</i> 3607)		Child cohort (wave 1; <i>n</i> 4661)	
	<i>n</i>	%	<i>n</i>	%
Child's SSB intake†				
Not at all	2614	72.5	2539	54.5
Once	673	18.7	1194	25.6
More than once	320	8.9	928	19.9
Child's cold savoury snacks intake‡				
Not at all	2548	70.6	2985	64.0
Once	953	26.4	1427	30.6
More than once	106	2.9	249	5.3
Child's cold sweet snacks intake§				
Not at all	987	27.4	1247	26.8
Once	1905	52.8	2416	51.8
More than once	715	19.8	998	21.4
Child's takeaway snacks intake				
Not at all	2862	79.4	3472	74.5
Once	745	20.7	1114	23.9
More than once	0	0.0	75	1.6
Child's hot takeaway foods intake¶				
Not at all	2954	81.9	3441	73.8
Once	653	18.1	1074	23.0
More than once	0	0.0	146	3.1
Child's cooked vegetables intake				
Not at all	738	20.5	1218	26.1
Once	2118	58.7	2387	51.2
More than once	751	20.8	1056	22.7
Child's raw vegetables intake††				
Not at all	2002	55.5	2829	60.7
Once	1169	32.4	1321	28.3
More than once	436	12.1	511	11.0
Child's fruit intake				
Not at all	231	6.4	545	11.7
Once	589	16.3	1232	26.4
More than once	2787	77.3	2884	61.9

SSB, sugar-sweetened beverages.

†SSB include soft drink and cordial.

‡Cold savoury snacks include foods such as potato chips.

§Cold sweet snacks include biscuits, doughnuts, cake or chocolate.

|| Takeaway snacks include hot chips or French fries.

¶Hot takeaway foods include meat pies, hamburgers, hot dogs, sausages or sausage rolls.

††Raw vegetables include raw vegetables or salad.

However, this was not the case for children in two-parent homes. The findings also suggest that in single-parent homes, children with authoritarian mothers had lower consumption of SSB (more than once compared with not at all) than those with disengaged mothers. On the other hand, in two-parent homes, children with authoritarian mothers had lower consumption of SSB (once compared with not at all) than those with disengaged mothers. Differences between single-parent homes and two-parent homes were also found for consumption of SSB in children of authoritarian mothers.

Furthermore, it appears that children in two-parent homes with authoritarian mothers consumed more fruit than those who had disengaged mothers (Table 6). This difference was not found among children from single-parent homes. There was also evidence of a difference in hot takeaway food consumption between children of authoritative mothers and disengaged mothers that was not apparent for children in two-parent homes. In contrast,

children in single-parent homes with permissive mothers consumed fewer hot takeaway foods (at once per day) than those with disengaged mothers. This was not the case among children from two-parent homes.

In addition, in the infant cohort, the findings suggest that among mothers who are in part-time employment, children with permissive mothers and authoritarian mothers had lower consumption of takeaway snacks (once compared with not at all) than those with disengaged mothers. This was not the case among children whose mothers were unemployed or in full-time employment.

Discussion

The present study found that in general, across two nationally representative cohorts of Australian pre-school children, maternal authoritative parenting style is mostly

Table 3 Adjusted† multinomial‡ regression models of the association between parenting style and child dietary outcomes in the last 24 h in the Longitudinal Study of Australian Children infant cohort (n 3607)

	SSB§				Cold savoury snacks				Cold sweet snacks¶				Takeaway snacks (hot chips)††			
	Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all	
	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	OR	95 % CI	RRR	95 % CI
Disengaged	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Authoritative	0.69**	0.53, 0.91	0.47***	0.34, 0.64	0.79*	0.64, 0.98	0.37**	0.21, 0.67	0.87	0.71, 1.10	0.60***	0.46, 0.79	0.85	0.68, 1.04	–	–
Authoritarian	0.78	0.58, 1.04	0.45***	0.29, 0.71	0.86	0.68, 1.10	0.27**	0.12, 0.57	0.99	0.76, 1.29	0.84	0.62, 1.15	0.80	0.62, 1.04	–	–
Permissive	0.86	0.65, 1.13	0.93	0.67, 1.30	1.08	0.86, 1.36	1.07	0.64, 1.77	1.01	0.81, 1.27	0.82	0.61, 1.09	0.88	0.68, 1.13	–	–
	Hot takeaway foods‡‡				Cooked vegetables				Raw vegetables§§				Fruit			
	Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all	
	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI
Disengaged	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Authoritative	0.76*	0.60, 0.96	–	–	1.38**	1.09, 1.75	1.45*	1.06, 1.97	1.30*	1.04, 1.63	1.66**	1.21, 2.28	0.85	0.58, 1.25	1.16	0.82, 1.66
Authoritarian	0.76	0.57, 1.01	–	–	1.24	0.94, 1.65	1.04	0.72, 1.51	1.21	0.95, 1.53	1.19	0.84, 1.67	0.92	0.56, 1.51	1.21	0.77, 1.91
Permissive	1.00	0.78, 1.27	–	–	1.15	0.90, 1.46	1.33	0.96, 1.83	1.14	0.90, 1.44	1.60**	1.16, 2.20	0.98	0.61, 1.58	1.00	0.64, 1.56

SSB, sugar-sweetened beverages; RRR, relative risk ratio.

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

†Adjusted for number of children in the household, mother's country of birth, mother's education level, mother's age and the presence of a second parent in the home. Results were similar in the unadjusted model (see online supplementary material; Supplemental Table 1).

‡Logistic regression models were used for takeaway snacks and hot takeaway foods due to the low numbers who consumed these items more than once.

§SSB include soft drink and cordial.

||Cold savoury snacks include foods such as potato chips.

¶Cold sweet snacks include biscuits, doughnuts, cake or chocolate.

††Takeaway snacks include hot chips or French fries.

‡‡Hot takeaway foods include meat pies, hamburgers, hot dogs, sausages or sausage rolls.

§§Raw vegetables include raw vegetables or salad.

Table 4 Adjusted† multinomial regression models of the association between parenting style and child dietary outcomes in the last 24 h in the Longitudinal Study of Australian Children child cohort (n 4661)

	SSB‡				Cold savoury snacks§				Cold sweet snacks				Takeaway snacks (hot chips)¶			
	Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all	
	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI
Disengaged	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Authoritative	0.62***	0.51, 0.76	0.55***	0.44, 0.69	0.72***	0.61, 0.86	0.68*	0.48, 0.97	1.15	0.95, 1.39	0.82	0.65, 1.03	0.93	0.77, 1.12	0.47*	0.26, 0.86
Authoritarian	0.70**	0.57, 0.87	0.75*	0.59, 0.95	0.64***	0.54, 0.76	0.62*	0.42, 0.93	1.30*	1.06, 1.60	0.98	0.76, 1.28	0.75**	0.62, 0.90	0.33***	0.14, 0.75
Permissive	0.67**	0.53, 0.85	0.87	0.68, 1.12	1.00	0.82, 1.23	1.11	0.76, 1.64	1.13	0.90, 1.41	0.93	0.71, 1.21	1.24*	1.01, 1.53	0.82	0.47, 1.43
	Hot takeaway foods††				Cooked vegetables				Raw vegetables‡‡				Fruit			
	Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all	
	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI
Disengaged	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Authoritative	0.76**	0.62, 0.93	0.88	0.56, 1.37	1.28*	1.06, 1.55	1.56***	1.21, 2.00	1.19	1.00, 1.42	1.47**	1.11, 1.95	1.25	0.95, 1.64	1.69***	1.32, 2.17
Authoritarian	0.72**	0.59, 0.89	0.66	0.38, 1.16	1.21	0.99, 1.49	1.34*	1.04, 1.71	1.07	0.88, 1.30	1.28	0.95, 1.73	1.27	0.93, 1.72	1.71***	1.29, 2.27
Permissive	0.91	0.73, 1.12	0.94	0.56, 1.57	1.09	0.87, 1.37	1.32	1.00, 1.74	1.03	0.84, 1.26	1.21	0.89, 1.64	1.00	0.74, 1.34	1.04	0.78, 1.40

SSB, sugar-sweetened beverages; RRR, relative risk ratio.

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

†Adjusted for number of children in the household, mother's country of birth, mother's education level, mother's age and the presence of a second parent in the home. Results were similar in the unadjusted model (see online supplementary material; Supplemental Table 2).

‡SSB include soft drink and cordial.

§Cold savoury snacks include foods such as potato chips.

||Cold sweet snacks include biscuits, doughnuts, cake or chocolate.

¶Takeaway snacks include hot chips or French fries.

††Hot takeaway foods include meat pies, hamburgers, hot dogs, sausages or sausage rolls.

‡‡Raw vegetables include raw vegetables or salad.

Table 5 Adjusted† logistic regression models of the associations between parenting style and child's intake of takeaway snacks in the last 24 h in the Longitudinal Study of Australian Children infant cohort, stratified by mothers' working status

	Takeaway snacks‡					
	Unemployed (<i>n</i> 1309)		Part-time (<i>n</i> 1544)		Full-time (<i>n</i> 754)	
	Once v. Not at all		Once v. Not at all		Once v. Not at all	
	RRR	95% CI	RRR	95% CI	RRR	95% CI
Disengaged	–	–	–	–	–	–
Authoritative	0.86	0.60, 1.23	0.78	0.54, 1.12	0.97	0.58, 1.61
Authoritarian	1.21	0.82, 1.81	0.54**	0.36, 0.81	0.83	0.45, 1.52
Permissive	0.99	0.68, 1.44	0.54**	0.34, 0.85	1.43	0.83, 2.46

RRR, relative risk ratio.

***P* < 0.01.

†Adjusted for number of children in the household, mother's country of birth, mother's education level, mother's age and the presence of a second parent in the home.

‡Takeaway snacks include hot chips and fries.

positively associated with children's intake of healthy foods. Additionally, maternal authoritative and/or authoritarian parenting styles are generally negatively associated with children's intake of unhealthy foods. It also found that some of these associations were moderated by parenting arrangements and mothers' employment status. However, importantly, these findings were not consistent across both cohorts.

Our findings are consistent with previous studies of pre-school children that found the authoritative parenting style is associated with higher intakes of fruit (with the exception of the infant cohort) and vegetables^(13,23,50). However, children of authoritarian mothers had greater intakes of cooked vegetables and fruit in only the child cohort and there were no associations between authoritarian parenting style and healthy food consumption in the infant cohort, which is consistent with a study of adolescents' fruit and vegetable intakes⁽²⁷⁾ but not with previous studies of the relationships between authoritarian parenting and pre-school children's food consumption^(13,23,29). This may be due to the higher number of participants in the present study and the study conducted among adolescents⁽²⁷⁾. Furthermore, the present study examined fruit and vegetables separately, whereas previous studies have grouped them together^(13,23,29).

Our study suggests that authoritative mothers and authoritarian mothers tend to foster similar food consumption patterns in their children regarding unhealthy foods, as both parenting styles tended to be associated with lower consumption of unhealthy foods compared with intakes among children of disengaged mothers. One interesting difference between the dietary intakes of children of authoritative mothers and those of children of authoritarian mothers was the higher consumption of cold sweet snacks (biscuits, doughnuts, cake, chocolate) among children of authoritarian mothers compared with children of disengaged mothers in the child cohort. This

association was not found among children of authoritative mothers.

Previous studies of the relationships between parenting styles and the dietary intakes of pre-school children have not found any associations between parenting styles and unhealthy dietary intake^(23,29). Discrepancies between the present study and previous studies may be due to the broader groups of foods examined within our study, as previous studies examined the associations of parenting styles in relation to only four groups of foods, including fat from dairy, sweetened beverages and non-core foods^(23,29,51), as well as the different measures of parenting styles used^(23,29,52). While children of both authoritative mothers and authoritarian mothers had healthier dietary intakes in the child cohort when compared with those of disengaged mothers, children of authoritative mothers had a higher intake of raw vegetables while children of authoritarian mothers had a higher intake of cold sweet snacks, compared with children of disengaged mothers. This may be due to the higher levels of warmth given by authoritative mothers, as previous research has shown lower levels of parental warmth are associated with higher intakes of unhealthy foods^(11,53).

To our knowledge, the present study is the first to examine moderators of parenting styles and pre-school children's dietary intake. Importantly, our findings were not consistent across both the infant and the child cohorts. Our results indicate, in the child cohort, that children who live in two-parent homes with authoritarian mothers have higher intakes of fruit compared with children of disengaged mothers. Previous research has suggested that children who live in two-parent homes have healthier dietary intakes compared with children who live in single-parent homes; however, the current study has shown that this may also be dependent on maternal parenting style^(37,39,54). Considering single-parent homes, the current study found, in the child cohort, that children of

Table 6 Adjusted† multinomial regression models of the associations between parenting style and child intake of sugar-sweetened beverages, fruit and hot takeaway foods in the last 24 h in the Longitudinal Study of Australian Children child cohort, stratified by parenting arrangements

	SSB‡								Fruit							
	Single-parent home (n 607)				Two-parent home (n 4054)				Single-parent home (n 607)				Two-parent home (n 4054)			
	Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all	
	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI
Disengaged	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Authoritative	0.54*	0.31, 0.95	0.29***	0.16, 0.50	0.63***	0.51, 0.79	0.63***	0.49, 0.80	1.67	0.85, 3.28	1.53	0.87, 2.68	1.20	0.89, 1.62	1.74***	1.32, 2.28
Authoritarian	0.76	0.40, 1.45	0.38**	0.20, 0.72	0.71**	0.56, 0.88	0.85	0.66, 1.09	0.57	0.25, 1.29	0.75	0.38, 1.47	1.43*	1.04, 1.98	1.97***	1.44, 2.69
Permissive	0.33***	0.18, 0.59	0.46**	0.27, 0.78	0.77*	0.60, 0.99	1.01	0.76, 1.33	1.01	0.48, 2.10	0.98	0.52, 1.86	0.99	0.73, 1.34	1.05	0.77, 1.42
	Hot takeaway foods§															
	Single-parent home (n 607)				Two-parent home (n 4054)											
	Once v. Not at all		More than once v. Not at all		Once v. Not at all		More than once v. Not at all									
	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI	RRR	95 % CI								
Disengaged	–	–	–	–	–	–	–	–								
Authoritative	0.48**	0.28, 0.81	2.03	0.61, 6.67	0.83	0.67, 1.03	0.74	0.46, 1.19								
Authoritarian	0.37**	0.19, 0.70	1.51	0.36, 6.26	0.80*	0.65, 0.99	0.57	0.32, 1.02								
Permissive	0.48**	0.28, 0.82	1.69	0.51, 5.61	1.04	0.83, 1.30	0.84	0.48, 1.47								

SSB, sugar-sweetened beverages; RRR, relative risk ratio.

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

†Adjusted for number of children in the household, mother's country of birth, mother's education level, mother's age and the presence of a second parent in the home.

‡SSB include soft drink and cordial.

§Hot takeaway foods include meat pies, hamburgers, hot dogs, sausages or sausage rolls.

authoritative mothers who lived in single-parent homes had a lower intake of hot takeaway foods compared with children of disengaged mothers who lived in single-parent homes. The current study also found that children of permissive mothers who lived in single-parent homes had lower intakes of SSB than children of disengaged mothers who lived in single-parent homes. Additionally, children who lived in single-parent homes with permissive mothers had lower intakes of hot takeaway foods compared with children of disengaged mothers. These results may be due to children of disengaged mothers being more exposed to unhealthy diets, which could be compounded by being in a single-parent home.

The present study found, in the infant cohort, that children of permissive mothers and authoritarian mothers who were in part-time employment had lower intakes of takeaway snacks compared with children of disengaged mothers whose mothers were unemployed or in full-time employment. This may be due to the measures of maternal employment status used, as previous research has shown that other factors such as the nature of employment and psychological effects of employment may be more important than simply examining employment status. Other factors of maternal employment could be included in future research⁽⁵⁵⁾. Further research focusing on the influence of other potential moderators relating to time pressures and resource limitations may provide further insights into the impact of these moderators on associations between parenting styles and children's food consumption. As the results are not consistent across both cohorts, future research is important to determine the effects of these moderators.

The results presented in the current study have important implications for health promotion. In particular, these results could be important in providing advice to parents regarding their parenting style and approach to feeding their child and reducing unhealthy food consumption. Training parents in the skills and behaviours associated with a positive parenting style, such as an authoritative parenting style, could be the focus of future intervention programmes.

The limited number of response categories in the dietary questions, as well as only one day of dietary intake, may have limited the estimates of the child's dietary intake, therefore not capturing the child's usual dietary intake. They may also have limited the validity of the questions in detecting significant differences between sub-populations. Future research should focus on a more comprehensive assessment of the children's dietary intake, such as a diet quality index score. Additionally, future research should investigate these associations longitudinally to track the influence of early parenting styles on dietary intake in later childhood, as well as explore the moderators of these associations further.

A major strength of the present study was the use of a nationally representative data set, which makes the findings generalisable to the wider population. A limitation

was the study's cross-sectional design, which did not allow for investigation of causal relationships. Additionally, two variables in the infant cohort (maternal education and the number of children in the home) were measured at wave 1 only, which may not be representative of the cohort at wave 3. Furthermore, as parenting dimensions and styles and health-related behaviours, such as dietary intake, may be considered to have different degrees of social desirability, it is possible that mothers may have over- or under-reported both their parenting dimensions and their children's dietary behaviours. The study findings need to be confirmed in future studies.

Conclusion

The present study found that children of mothers who reported an authoritative parenting style were more likely to have healthier dietary intakes compared with children whose mothers reported a disengaged style of parenting. The study also found that parenting arrangements and mothers' working status may moderate the associations between mothers' parenting style and children's consumption of SSB, hot takeaway foods, takeaway snacks and fruit intake. Promoting a positive parenting style, such as an authoritative parenting style, as well as supporting parents to overcome limitations in time and resources to prevent unhealthy dietary intake in children could be the focus of future interventions.

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Supplementary material

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