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Exploring parental secretive eating of sugary foods and drinks, and its associations with food consumption in families

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ABSTRACT

As a way of modeling healthier eating habits for their children, parents may intentionally avoid consuming sugary foods and drinks (SFDs) in their presence but consume these on other occasions (later referred to as parental secretive eating). This study aimed to 1) explore the prevalence of parental secretive eating, 2) investigate the associations between parental secretive eating and SFD consumption in parents and children, and 3) qualitatively explore the reasons for parental secretive eating. Participants were Finnish mothers ($n = 362$), fathers ($n = 123$), and their 3–6-year-old children ($n = 403$); this data was collected in 2017 as part of the baseline assessment of the DAGIS intervention. Parents reported how often they avoided eating SFDs in the presence of their child, completed food frequency questionnaires for themselves and their child, and responded to an open-ended question of explaining reasons for secretive eating. The overall prevalence of parental secretive eating was 68%. It was more common among mothers than fathers ($p < 0.001$) and most prevalent in chocolate (61%) and sweets (59%). Parental secretive eating was positively associated with SFD consumption both among mothers ($\beta = 0.274$, $p < 0.001$) and fathers ($\beta = 0.210$, $p = 0.028$) in linear regression models adjusted for parents' and child's age, child's gender, parental education level, and number of household members. Mothers' or fathers' secretive eating and child's SFD consumption were not associated ($\beta = 0.031$, $p = 0.562$; $\beta = -0.143$; $p = 0.167$). Three themes describing reasons for parental secretive eating were found: family food rules, avoiding child's requests, and aspiration for healthy modeling. In conclusion, parental secretive eating may play an important role in determining SFD consumption in families with preschoolers. Additional research is needed to determine whether parents can prevent their own eating habits from influencing their child through secretive eating.

1. Introduction

Parents have an important role in the development of their child's eating habits (Cooke, 2007; Haines et al., 2019; Scaglioni et al., 2018). When it comes to sugary foods and drinks (SFDs), the parental role may be even more crucial, as preschool children in Finland consume most of their SFDs outside of preschool hours (Korkalo et al., 2019a). Thus, understanding children's consumption of SFDs requires insight into the home food environment and parental behavior.

Parents are responsible for the physical home food environment including the availability and accessibility of foods (Bekelman et al., 2017; Rosenkranz & Dzewaltowski, 2008). Unsurprisingly, the

availability of unhealthy foods (e.g., SFDs) is positively associated with children's consumption of these foods (Bassul et al., 2020; Blaine et al., 2017; Boles et al., 2019; Paasio et al., 2022; Vepsäläinen et al., 2018a; Yee et al., 2017). Moreover, parents affect the social home food environment with their food perceptions, eating habits, parenting style, and specific food parenting practices (e.g., rules, and modeling) (Rosenkranz & Dzewaltowski, 2008).

Parental modeling has a clear role in shaping children's eating habits as there is an association between healthy modeling and children's healthier eating habits (Mazarello Paes et al., 2015; Yee et al., 2017) and unhealthy modeling and children's less healthy eating habits (Brown & Ogden, 2004; Dickens & Ogden, 2014; Yee et al., 2017). Parents are

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aware of their role as models (Cook et al., 2021; Ray et al., 2016; Versele et al., 2021) and try to avoid unhealthy modeling of SFD consumption for their child (Cook et al., 2021; Lindsay et al., 2018; Versele et al., 2021). Intentional avoidance of unhealthy modeling, indicated by statements “If I would like to eat/drink sweets/soft drinks, I would restrain myself because of the presence of my child”, was negatively associated with child’s soft drink consumption in a Belgian cross-sectional study (Vereecken et al., 2004). However, in a longitudinal study, intentional avoidance of unhealthy modeling was not associated with children’s consumption of sweets, soft drinks and crisps in multivariate regression models (Vereecken et al., 2010), although the results may have been different if this study focused on SFDs rather than combining salty foods and SFDs.

Studies with preschool children found that mothers may unintentionally model intake of less healthy foods even if they try to be healthy models (Palfreyman et al., 2013, 2014). Unintentional modeling referred to instances where the mother had not used verbal or direct behavioral modeling. Even if parents intentionally avoid modeling SFD consumption, they remain continuous models for their child (Rhee, 2008). A qualitative study found that Danish parents consumed SFDs as a reward for themselves after a stressful day when their child was asleep (Moura & Aschemann Witzel, 2020). The perception of SFDs as a reward may be transmitted from parents to children through unintentional modeling, fostering a temptation toward these foods in children. Though it may be common that there is a contradiction between parents’ eating habits and their aim to be healthy models, little research has studied the intentional avoidance of modeling SFD consumption for children and the reasons behind it. Hence, it remains unclear whether intentional avoidance of unhealthy modeling is beneficial for children’s eating habits or not.

In the present study, we refer to the behavior in which parents intentionally avoid SFD consumption in the presence of their child but consume these foods on other occasions, as parental secretive eating. Parental secretive eating differs from intentional avoidance of unhealthy modeling in that parental secretive eating requires parental SFD consumption, whereas intentional avoidance of unhealthy modeling does not.

This study had three aims. First, we explored the prevalence of parental secretive eating among parents of 3–6-year-olds in Finland. Mothers and fathers were considered separately to gain knowledge about possible differences in parental secretive eating, as differences between mothers’ and fathers’ food parenting practices (Khandpur et al., 2014) and Finnish women’s and men’s SFD consumption have been detected (Valsta et al., 2018). We were also interested in examining if secretive eating in mothers and fathers have different impacts on children’s food consumption. Research on fathers’ food parenting is still relatively limited (Jansen et al., 2018), even though father’s caretaking responsibilities (Jones & Mosher, 2013) and involvement in child feeding have raised (Rahil et al., 2020). Next, we investigated the associations between parental secretive eating and SFD consumption frequency in parents and children to understand if parent’s or child’s SFD related eating habits differed by parental secretive eating. Finally, we performed a qualitative exploration of underlying reasons for parental secretive eating to gain insight into the motivations driving this behavior. Understanding the motivations involved enables more accurate explanations of the behavior and supports theory development in future studies. As this was an explorative study there was no hypothesis for any of these three aims.

To the best of our knowledge, no previous studies have specifically examined parental secretive eating; however, avoiding unhealthy modeling has been investigated as a component of food parenting practices in a limited number of studies (Gevers et al., 2015; Vereecken et al., 2004, 2010). Increasing our understanding of parental secretive eating enables the broadening of knowledge about SFD-related eating habits in families with preschool-aged children.

2. Methods

2.1. Study design and participants

This study reports secondary analyses from the baseline data of the DAGIS (Increased Health and Wellbeing in Preschools) intervention, a randomized controlled trial conducted in 2017–2018 (Ray et al., 2020). The intervention studied children’s energy balance-related behaviors and was reviewed by the Research Ethics Committee in the Humanities and Social and Behavioral Sciences of the University of Helsinki (22/2017; May 16, 2017) and found ethically acceptable. The prospective trial registration number is ISRCTN57165350 (January 2015).

The recruitment process has been described in detail elsewhere (Ray et al., 2020). To summarize, participants were recruited through preschools ($n = 32$) from two municipalities in Southern Finland: Salo ($n = 29$) and Riihimäki ($n = 3$). Consent to participate was received from 714 parents of 802 (47% of invitees) children from 3–6-year age groups (87 families had two or three participating children and 82 families had both the mother and father participating in the study). Baseline data was collected in autumn of 2017. The analytic sample of this study includes parents and children who fulfilled the following criteria: parent had data from at least one SFD item in secretive eating questions (mothers, $n = 362$; fathers, $n = 123$) and a child that could be connected to at least one of the parents ($n = 403$).

2.2. Measures

Parents filled in a 55-item parental food frequency questionnaire (FFQ), a 51-item FFQ for their children, and answered questions about secretive eating and background information of the family. If available, both parents were requested to complete the parental FFQ and answer secretive eating questions. Questionnaires were sent to research participants by email; in cases where participants could not fill the electronic questionnaire, hardcopies were subsequently sent by post.

2.2.1. Consumption frequency of SFDs

Table 1 presents the formation of all variables. In the parental FFQ, parents were asked to report foods and drinks consumed during the past week. When answering for children, parents were asked to report only those foods consumed outside preschool hours because parents would not have been able to report the foods eaten in preschool. In Finland, preschool meals are provided by municipalities, so most of the variation in diets of children is from outside preschool.

The parental and child FFQs were identical, except that the parental FFQ included additional questions about coffee and alcohol, totaling four extra items. FFQs were based on a 47-item FFQ designed for the DAGIS survey, which has shown acceptable reproducibility (Määttä et al., 2018) and validity compared to 3-day food records in children (Korkalo et al., 2019b). Both FFQs included three options for each food item: not at all, times per week, and times per day. Parents were instructed to either tick the “not at all” box or to write a number in one of the other columns. The consumption frequency variables for all seven SFD items for mothers, fathers, and children were formed by summing up the consumption frequencies (times/week) of all SFDs (Table 1). To ensure normally distributed residuals in regression analyses, outliers ($>3SD$, mothers $n = 3$, fathers $n = 1$) were winsorized with new values ($= \text{mean} + 3SD$).

2.2.2. Parental secretive eating

In the questionnaire, parents were asked if they avoided consuming certain foods (13 items) in the presence of their children. As the aim of this study was to examine SFDs, other foods were excluded from analyses (6 items: chips, popcorns, and other salty snacks, pizza, hamburgers, and other fast foods, restaurant meals, 100 % juices, mild alcohol drinks, and strong alcohol drinks). All seven SFDs were included in the analysis (Table 1). Answer options were: never, rarely, sometimes,

Table 1
Variables used in the analyses.

Variable name	Survey question	Original answer options	Variable used in analyses	Type of the variable
Dependent variables				
Parental consumption frequency of all SFDs	How many times have you eaten the following foods during the past week?	Numeric answer separately for each food item: times/day or times/week. Food items: 1) chocolate, 2) sweets, 3) ice cream, 4) cookies, snack bars and cereal bars, 5) cakes, cupcakes, buns, and other sweet pastries, 6) sugary juices, 7) soft drinks with added sugar.	Sum variable: mothers, range 0–27; fathers, range 0–30 times/week.	Continuous
Children's consumption frequency of all SFDs	How many times has your child eaten the following foods during the past week? Only foods eaten outside preschool hours were considered	As above.	Sum variable: range 0–29 times/week	Continuous
Independent variables				
Parental secretive eating	Do you avoid eating the following foods in the presence of your child/children?	Never; rarely; sometimes; usually; I don't eat this food at all. Food items: 1) chocolate, 2) sweets, 3) ice cream, 4) cookies, snack bars and cereal bars, 5) cakes, cupcakes, buns, and other sweet pastries, 6) sugary juices, 7) soft drinks and energy drinks with added sugar.	For each food item separately and all combined: Snacks in secret (sometimes; usually); Doesn't snack in secret (never; rarely; I don't eat this food at all);	Categorical
Secretive eating frequency		As above.	Each food item recategorized: 0 = never; I don't eat this food at all; 1 = rarely; 2 = sometimes; 3 = usually. Then summed up. Range 0–21.	Continuous
Confounders				
Parent's age	Your/your partner's age as years?	Numeric answer	Unmodified Categorized in thirds. Mothers: 24–33; 34–38; 39–49. Fathers: 23–35; 36–40; 41–59.	Continuous Categorical
Number of adults in the household	How many people are part of your household currently including yourself	Numeric answer	Number of adults in two classes: one adult; two adults or more	Categorical
Maternal/paternal educational level	What is the highest degree of education you have achieved?	Comprehensive school; vocational school; secondary school; bachelor's degree or equivalent; master's degree; licentiate/doctoral degree; other	Low (high school or vocational school graduate or lower); middle (bachelor's degree or equivalent); high (master's degree or higher)	Categorical
Child's age	What is your child's date of birth?	Date of birth.	Age, in years and months, calculated from the date of birth. Categorized 3–4; 5–6	Continuous Categorical
Child's gender	Gender of your child:	Girl; boy; I don't want to answer	Gender of child in two classes: girl; boy	Categorical
Number of children in the household	How many people are part of your household currently including yourself	Numeric answer in age groups: 0–2; 3–6; 7–17 living at home	Age groups summed up. Number of children in three classes: one child; two children; three or more	Categorical

SFD=Sugary foods and drinks.

usually, or I don't eat this food at all. The categorical variable "Parental secretive eating" (eats in secret, does not eat in secret) and continuous variable "Secretive eating frequency" were formed, both separately for mothers and fathers (Table 1).

2.2.3. Confounding variables

Analyses were adjusted with parent's and child's age, child's gender, maternal/paternal educational level, and the number of adults and children in the household (Table 1), as these factors are found to be associated with family's food consumption (Elfhag & Rasmussen, 2008; Fismen et al., 2020; Skaffari et al., 2023), food parenting practices, healthy modeling (Paasio et al., 2022), and the similarity between parent's and child's food consumption (Vepsäläinen et al., 2018b). Parent's age was categorized in thirds for cross-tabulations due to different age distribution in mothers and fathers. Child's age was categorized for cross-tabulations in two groups (3–4; 5–6 years old). Continuous age variables were used in further analyses. Participants originally categorized with the parental status of "other" (stepdad, $n = 1$, foster mother, $n = 1$, alternative caregiver, $n = 1$) were subsequently categorized as either mothers or fathers based on their gender. Maternal/paternal educational level was categorized into three categories: low (= high school or vocational school graduate or lower), middle (=bachelor's degree or equivalent), and high (=master's degree or

higher). Maternal/paternal educational level was used as a proxy for family's socioeconomic status. Families with more than two parents ($n = 3$) were combined to the category with two parents because of their small prevalence.

2.2.4. Reasons for parental secretive eating

After the question about parental secretive eating in the questionnaire, parents had the possibility to further explain their responses in an open-ended format. The question was "If you avoid eating the following foods in the presence of your child, please provide more details here (e.g., why or when?)". Altogether 167 parents (mothers $n = 150$, fathers $n = 17$) provided answers to the open-ended question inquiring about parental secretive eating. Answers where an SFD and a reason for secretive eating were mentioned ($n = 63$, 38% of all answers, mothers $n = 59$, fathers $n = 4$) were included in the analysis. Parents answered in Finnish. The citations presented in the present study were translated to English by a native English speaker to retain the original tone of the answer.

2.3. Explorative procedures

2.3.1. Statistical analyses

Statistical analyses were carried out with the IBM SPSS Statistics 28.0 software package. A significance level of $p < 0.05$ was applied for all

statistical tests. Descriptive statistical analyses were used to assess the prevalence of parental secretive eating. Differences in parental secretive eating between mothers and fathers, as well as between background variables among mothers and fathers separately, were explored with cross-tabulations using a Chi-square test. Results are presented as χ^2 (chi-square statistic value), degrees of freedom, and exact p-values. As the sample included 82 mother-father pairs from the same families, the differences between mothers and fathers in the prevalence of secretive eating was also explored within a sub-sample of non-dependent observations (n = 403). In this sensitivity analysis, to keep the number of included fathers as high as possible, we excluded all mothers from the families from which a father was also a participant (n = 82).

A Mann Whitney U test was performed to evaluate whether consumption frequency of all SFD items (dependent variable) differed by parental secretive eating of any SFDs. This was further examined with food item specific consumption frequency (dependent variable) and food item specific parental secretive eating. Analyses were carried out separately for mothers, fathers, and children. For children, the analyses had two stages: the first grouping variable was the mother's secretive eating and the second was the father's secretive eating. Results are reported as z-values, mean ranks, means, Mann Whitney U test value and p-value (Monte Carlo p-values were used in analyses with consumption frequency of all SFDs, since the dataset was too large for the exact algorithms; exact p-values were used in food item specific analyses). Means were used instead of medians due to their better ability to describe small variations between these groups.

Associations between secretive eating frequency (independent variable) and consumption frequency of all SFDs (dependent variable) were explored with linear regression separately in mothers, fathers, and children. In model 1, we included all independent variables one at a time. Independent variables were mother's/father's secretive eating frequency, mother's/father's age, and child's age (continuous), and mother's/father's highest education, number of adults and children in the household, and child's gender (categorical). Model 2 was a full model with all independent variables included at the same time. For children, analyses had two stages: in the first stage, the independent variables were mother's secretive eating frequency, mother's and child's age, mother's highest education, number of adults and children in the household, and child's gender. In the second stage, the independent variables were father's secretive eating frequency, father's and child's age, father's highest education, number of adults and children in the household, and child's gender.

2.3.2. Content analysis of the open-ended question

Reasons for parental secretive eating were explored with content analysis by the first author. Analysis included four stages: 1) identifying responses that answered the research question, 2) coding relevant phrases, 3) classifying into groups, and 4) formation of themes. All answers were read thoroughly several times and process cycled interactively back and forth between data, codes, groups, and themes.

Relevant data was identified with the following criteria: an answer had a mention of SFDs (e.g., "chocolate", "sweets day", "sugar"), and provided any kind of reason for parental secretive eating. Answers where parent did not specify if word like "treats" meant sugary treats or other treats (e.g., salty treats like chips) were excluded from the analysis. Units for coding were words and phrases that were used to describe reasons for parental secretive eating. There were no previously defined categories for coding as the research was explorative. Three categories were identified during the process: 1) parent related reasons, 2) child related reasons, and 3) home environment related reasons.

Coded answers were categorized into seven groups that described the reason for parental secretive eating in more detail. Groups for parent related reasons were: 1) avoids modeling of SFD consumption because of own hardships with SFDs, 2) avoids modeling of breaking family's rules for SFDs, 3) avoids always modeling SFD consumption. Groups for child related reasons were: 4) avoiding child's disappointment through

denial, 5) avoiding child's requests, and 6) to support child's healthier eating habits. For home environment related reasons there was only one group: 7) different food rules for adults and children in the family.

Themes were created by identifying common groups and overlapping reasons for parental secretive eating between groups. Reasons related to modeling behavior and aims for child's healthy eating habits (1, 2, 3, and 6) were combined into one theme, groups related to child's behavior and emotions (4 and 5) into second theme and group for family's food rules (7) into third theme.

3. Results

3.1. Participants

Table 2 presents the characteristics of the participants. The statistical sample included more mothers (n = 362) than fathers (n = 123). The average ages of mothers and fathers were 35.8 years (SD 5.03) and 37.9 years (SD 5.96), respectively. Almost half of the mothers and nearly half of the fathers had middle level education (bachelor's degree or equivalent). The number of girls and boys among the children participating in the study was similar; their mean age was 5.2 years (SD 1.02). Families with two children (50%) and at least two adults (87%) were most common. Participants in the content analysis were mostly mothers (94%). Otherwise, the sample was quite similar to the statistical sample.

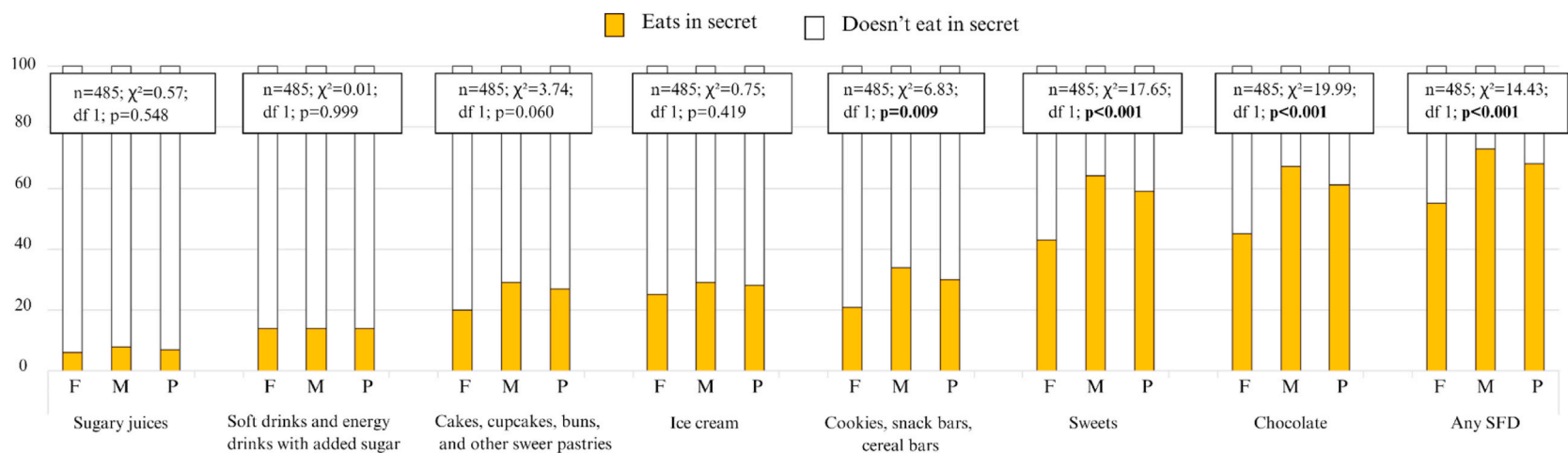
3.2. Prevalence of parental secretive eating

Fig. 1 shows the prevalence of parental secretive eating. Over two thirds of the parents (68%) reported parental secretive eating at least sometimes. The prevalence of parental secretive eating varied by food item and parental status. Chocolate (61%) and sweets (59%) were consumed in secret most commonly. About one third of the parents

Table 2 Characteristics of the participants.

Background variable	Participants in statistical analyses		Participants in content analysis	
	n	%	n	%
Parental status				
Mother	362	75	59	94
Father	123	25	4	6
Total	485	100	63	100
Maternal educational level				
High	64	18	15	25
Middle	175	48	26	44
Low	108	30	16	27
Missing	15	4	2	3
Paternal educational level				
High	24	20	2	50
Middle	50	41	1	25
Low	41	33	1	25
Missing	8	7	0	0
Child's gender				
Girl	193	48	33	52
Boy	210	52	30	48
Total	403	100	63	100
Number of children in the household				
One child	67	17	7	11
Two children	203	50	39	62
Three or more	118	29	14	22
Missing	15	4	3	5
Number of adults in the household				
One adult	38	9	2	3
Two or more	352	87	58	92
Missing	13	3	3	5
Maternal/paternal educational level: low (high school or vocational school graduate or lower), middle (bachelor's degree or equivalent), high (master's degree or higher)				

SFD=sugary foods and drinks



F=Father, M=Mother, P=Parent, SFD=Sugary foods and drinks

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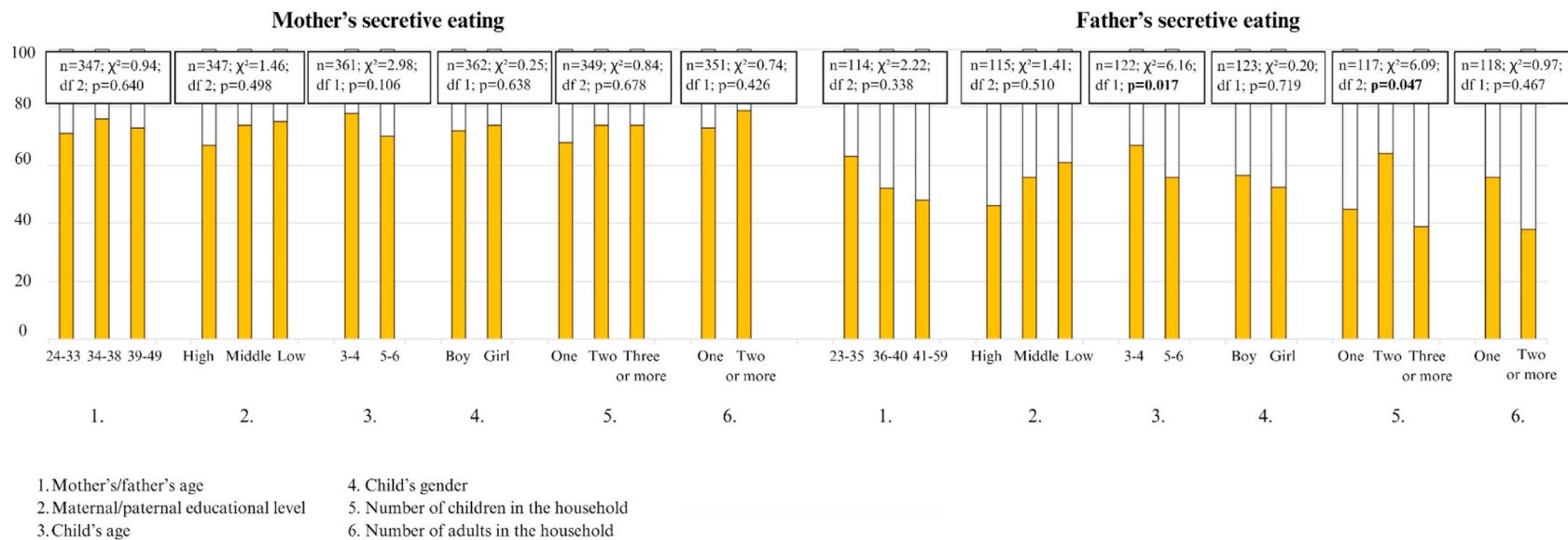


Fig. 1. Prevalence of parental secretive eating.

consumed cookies, snack bars, and cereal bars in secret (30%), and about one fourth consumed ice cream (28%) or cakes, cupcakes, buns, and other sweet pastries (27%). Parental secretive eating of soft drinks and energy drinks with added sugar (14%) and sugary juices (7%) was comparatively uncommon. Almost three quarters of mothers (73%) and over half of fathers (55%) reported parental secretive eating of any SFDs at least sometimes. Parental secretive eating was significantly more common in mothers than fathers (Fig. 1, $\chi^2 = 14.43$; df 1; $p < 0.001$). Similar results were found for chocolate ($\chi^2 = 19.99$; df 1; $p < 0.001$), sweets ($\chi^2 = 17.65$; df 1; $p < 0.001$) and cookies, snack bars, and cereal bars ($\chi^2 = 6.83$; df 1; $p = 0.009$). For all but one food groups, the results of the sensitivity analysis were similar to the results derived from the original sample (data not shown). A statistically significant difference between mothers and fathers was observed in secretive eating of cakes, cupcakes, buns, and other sweet pastries (mothers 31% vs. fathers 20%, $\chi^2 = 4.92$; df 1; $p = 0.027$).

Significant differences in parental secretive eating of any SFDs by

other confounding variables were found only in fathers. Fathers with younger children reported parental secretive eating more often than fathers with older children ($\chi^2 = 6.16$; df 1; $p = 0.017$). Parental secretive eating among fathers also differed depending on the number of children in the household; fathers with two children reported parental secretive eating more often than fathers with one child or three or more children ($\chi^2 = 6.09$; df 2; $p = 0.047$).

3.3. Difference in SFD consumption by parental secretive eating

Table 3 presents the results from the Mann Whitney U tests. The results indicated that both mothers ($z = -3.22$; $p = 0.002$) and fathers ($z = -1.99$; $p = 0.046$) who reported parental secretive eating had a significantly higher SFD consumption frequency than those who did not. Mothers who reported secretive eating of chocolate ($z = -4.27$; $p < 0.001$), sweets ($z = -5.12$; $p < 0.001$), cookies, snack bars, and cereal bars ($z = -4.49$; $p < 0.001$), cakes, cupcakes, buns and other sweet

Table 3
Difference in mother's, father's, and children's SFD consumption by parental secretive eating.

	Parents' SFD consumption frequency						Children's SFD consumption frequency					
	Group	n	Mean	Mean rank	Mann-Whitney U	p-value	Group	n	Mean	Mean rank	Mann-Whitney U	p-value
Mother												
Chocolate	Eats in secret	243	2.26	196.40	10351.500	<0.001	Eats in secret	239	0.93	179.15	13826.00	0.856
	Doesn't eat in secret	117	1.45	147.47			Doesn't eat in secret	117	0.97	177.17		
Sweets	Eats in secret	232	1.77	198.20	9814.50	<0.001	Eats in secret	228	1.37	183.45	13464.50	0.193
	Doesn't eat in secret	124	0.89	141.65			Doesn't eat in secret	128	1.19	169.69		
Ice cream	Eats in secret	104	0.80	192.84	11612.50	0.056	Eats in secret	106	1.03	193.20	11691.50	0.060
	Doesn't eat in secret	252	0.61	172.58			Doesn't eat in secret	250	0.89	172.27		
Cookies, snack bars, cereal bars	Eats in secret	121	2.24	210.00	10285.00	<0.001	Eats in secret	121	1.69	193.71	12255.50	0.032
	Doesn't eat in secret	234	1.14	161.45			Doesn't eat in secret	234	1.34	169.87		
Cakes, cupcakes, buns, and other sweet pastries	Eats in secret	105	2.06	206.94	10611.00	0.001	Eats in secret	106	1.27	188.64	12175.50	0.207
	Doesn't eat in secret	255	1.50	169.61			Doesn't eat in secret	250	1.21	174.20		
Sugary juices	Eats in secret	28	1.32	236.88	3097.50	<0.001	Eats in secret	27	2.37	207.00	3626.00	0.109
	Doesn't eat in secret	333	0.64	176.30			Doesn't eat in secret	328	1.98	175.55		
Soft drinks and energy drinks with added sugar	Eats in secret	51	1.18	237.92	5002.00	<0.001	Eats in secret	50	0.60	203.93	6328.50	0.015
	Doesn't eat in secret	310	0.52	171.64			Doesn't eat in secret	305	0.42	173.75		
Any SFD	Eats in secret	252	9.11	182.90	8971.00	0.002	Eats in secret	256	8.32	178.03	12151.50	0.747
	Doesn't eat in secret	92	6.89	144.01			Doesn't eat in secret	97	8.16	174.27		
Father												
Chocolate	Eats in secret	55	1.84	66.94	1598.50	0.153	Eats in secret	55	0.80	56.96	1593.00	0.272
	Doesn't eat in secret	68	1.31	58.01			Doesn't eat in secret	65	1.03	63.49		
Sweets	Eats in secret	53	1.87	70.16	1422.50	0.022	Eats in secret	53	1.08	54.35	1449.50	0.064
	Doesn't eat in secret	70	1.24	55.82			Doesn't eat in secret	67	1.46	65.37		
Ice Cream	Eats in secret	30	0.83	71.07	1093.00	0.059	Eats in secret	31	0.68	60.82	1369.50	0.949
	Doesn't eat in secret	92	0.65	58.38			Doesn't eat in secret	89	0.87	60.39		
Cookies, snack bars, cereal bars	Eats in secret	26	1.81	70.42	1042.00	0.152	Eats in secret	26	1.19	53.06	1028.50	0.262
	Doesn't eat in secret	97	1.57	59.74			Doesn't eat in secret	92	1.50	61.32		
Cakes, cupcakes, buns, and other sweet pastries	Eats in secret	25	1.96	72.08	973.00	0.102	Eats in secret	25	1.32	59.32	1158.00	0.845
	Doesn't eat in secret	98	1.34	59.43			Doesn't eat in secret	95	1.40	60.81		
Sugary juices	Eats in secret	7	0.86	70.79	337.50	0.432	Eats in secret	6	2.33	58.75	331.50	0.905
	Doesn't eat in secret	115	1.51	60.93			Doesn't eat in secret	114	2.27	60.59		
Soft drinks and energy drinks with added sugar	Eats in secret	16	2.13	81.78	491.50	0.003	Eats in secret	17	0.53	64.18	813.00	0.546
	Doesn't eat in secret	104	0.99	57.23			Doesn't eat in secret	103	0.36	59.89		
Any SFD	Eats in secret	64	10.31	65.24	1360.50	0.046	Eats in secret	66	8.20	56.76	1535.00	0.325
	Doesn't eat in secret	54	8.31	52.69			Doesn't eat in secret	52	8.67	62.98		

SFD = sugary foods and drinks

pastries ($z = -3.18$; $p = 0.001$), sugary juices ($z = -3.79$; $p < 0.001$), or soft drinks and energy drinks with added sugar ($z = -5.21$; $p < 0.001$) consumed these food items significantly more frequently than those who did not report secretive eating of these food items. Fathers who reported secretive eating of sweets ($z = -2.29$; $p = 0.022$) or soft drinks and energy drinks with added sugar ($z = -2.86$; $p = 0.003$) consumed these food items significantly more frequently than those who did not eat these in secret.

Children's consumption frequency of any SFDs did not differ significantly by mothers' or fathers' secretive eating. However, children whose mothers reported secretive eating of cookies, snack bars, and cereal bars ($z = -2.15$; $p = 0.032$) or soft drinks and energy drinks with added sugar ($z = -2.42$; $p = 0.015$) consumed these food items significantly more frequently than children whose mothers did not eat these in secret. No significant differences were observed between children's SFD consumption frequencies and fathers' secretive eating.

3.4. Associations between parental secretive eating and SFD consumption

3.4.1. Mothers

Table 4 presents the results from the linear regressions. In model 1, mothers' ($\beta = 0.277$, $p < 0.001$) secretive eating was positively associated with their SFD consumption frequency. These associations remained statistically significant in the full model (model 2: $\beta = 0.274$; $p < 0.001$). Of the independent variables included in the mother's full model, parental secretive eating was most strongly associated with their SFD consumption frequency. In addition, mothers' age ($\beta = 0.194$; $p = 0.001$) was positively associated with their SFD consumption frequency.

3.4.2. Fathers

In model 1, fathers' ($\beta = 0.230$, $p = 0.012$) secretive eating was positively associated with their SFD consumption frequency. These associations remained statistically significant in the full model (model 2: $\beta = 0.210$; $p = 0.028$). Of the independent variables included in the father's full model, parental secretive eating was only variable associated with their SFD consumption frequency.

3.4.3. Children

No association with parental secretive eating and children's SFD consumption frequency was detected in model 1 (mothers, $\beta = 0.053$, $p = 0.323$; fathers, $\beta = -0.119$, $p = 0.198$) or 2 (mothers, $\beta = 0.031$, $p = 0.562$; fathers, $\beta = -0.143$, $p = 0.167$). There was a significant association between mother's age ($\beta = 0.194$; $p < 0.001$), father's age ($\beta = 0.113$; $p = 0.014$), and the children's SFD consumption frequency in model 1. Mother's age ($\beta = 0.213$; $p < 0.001$) and number of adults in the household ($\beta = -0.118$; $p = 0.037$) were significantly associated with children's consumption of SFDs in the mothers' model. Children with older mothers consumed SFDs more frequently, and children with only one adult in the household consumed SFDs less frequently. In the full model with data from fathers, no significant associations were found.

3.5. Reasons for parental secretive eating

We found three themes describing reasons for parental secretive eating. These themes were: 1) family food rules, 2) avoiding child's requests, 3) aspiration for healthy modeling.

3.5.1. Family food rules

Several parents, including both mothers and fathers, described that they had different SFD rules for the children and adults at home, indicating a common theme within the data. Many of these answers, simply mentioned secretive eating due to differing food rules without delving into further explanation or motivation for this behavior. All these answers included a mention of "sweets day" meaning that children were allowed to eat "sweets day" -treats only once or twice a week, but their

parents ate these more often. However, some parents provided a more detailed answer. Some of them felt that their child should not eat SFDs as frequently as adults. Perceptions of suitable frequency varied between these parents. Most of these parents explained that their child was allowed to eat sweets at weekends, while few mothers explained that their children were only allowed SFDs on festive occasions. There was also one mother, who reported that sweets in particular were completely prohibited for her child, but she did not follow the same rule herself. There were also mothers and a father who explained that they tried to follow same SFD rules that they had for their child, but sometimes failed.

"Children have a "sweets day" once a week, when I also eat sweets. Sometimes I crave chocolate/sweets in the middle of the week, and then I eat them in secret from my child." (Mother, 33 years, 4 years old child)

3.5.2. Avoiding child's requests

Several mothers and a father explained their secretive eating by reporting that they aimed to avoid having their child request or desire SFDs. Some of them explained further that they wanted to prevent their child's disappointment through denial, and few admitted that it just was easier to eat in secret. Some of these mothers described that their child would also want SFDs, if they saw their parent eating them. So, when they ate SFDs and did not want to give them to the child or could not because of allergies, they did it secretly.

"I usually eat sweets in the evenings to prevent my child from feeling upset when they see adults eating treats. At parties, everyone can freely eat without worry and my child can also have sweets there." (Mother, 36 years, 4 years old child)

3.5.3. Aspiration for healthy modeling

Many participants, both mothers and a father, wanted to be healthy models for their child and avoid setting a "bad example" through their SFD consumption. Almost every one of these parents believed that SFD consumption was a "bad example" only in certain situations (e.g., before a meal, during weekdays), while few of the mothers held the perception that modeling consumption of sweets and chocolate in particular was consistently a negative influence on a child. Some mothers hoped that by avoiding eating too much SFDs in the presence of their child, children would learn healthier eating habits. These mothers were worried that their "bad habits" would be passed on to their child and described their sweets and chocolate consumption as a "vice".

"I don't want my child to crave sweets and other sweet foods like I do. Sometimes I go days without and sometimes I buy a chocolate bar every day." (Mother, 36 years, 5 years old child.)

4. Discussion

This study investigated parental secretive eating and SFD consumption in Finnish families with 3–6-year-olds. The findings indicate that parental secretive eating is common among parents of preschool children. Parental secretive eating was more frequent among mothers than fathers. Among the various types of SFDs, sweets and chocolate were the most commonly eaten in secret. We found a positive association between parental secretive eating and SFD consumption frequency, both among mothers and fathers, whereas parental secretive eating was not associated with children's SFD consumption. Three types of reasons for parental secretive eating were identified: family food rules, avoiding child's requests, and aspiration for healthy modeling.

4.1. Prevalence of parental secretive eating

A possible explanation for the finding that parental secretive eating was more common among mothers than fathers may be the fact that

Table 4
The association between parental secretive eating and SFD consumption frequency in mothers, fathers, and children.

	Association with parent's SFD consumption frequency							Association with children's SFD consumption frequency						
	Model 1			Model 2				Model 1			Model 2			
	n	β	CI 95%	n	B	β	CI 95%	n	β	CI 95%	n	B	β	CI 95%
Mother														
Secretive eating frequency	344	0.277	0.227–0.493***	328	0.355	0.274	0.221–0.488***	353	0.053	−0.056–0.171	337	0.033	0.031	−0.080–0.147
Mother's age	330	0.221	0.131–0.372***	328	0.222	0.194	0.090–0.355**	339	0.221	0.107–0.299***	337	0.198	0.213	0.087–0.308***
Maternal educational level														
High	ref.			ref.				ref.			ref.			
Middle	330	0.084	−0.275–2.191	328	−0.169	−0.015	−1.813–1.474	339	0.035	−0.673–1.325	337	0.466	0.050	−0.916–1.849
Low	330	−0.162	−3.319–0.676**	328	−1.216	−0.099	−3.126–0.694	339	−0.083	−1.911–0.238	337	0.498	0.050	−1.104–2.101
Number of adults in the household														
Two or more	ref.			ref.				ref.			ref.			
One adult	334	−0.082	−3.664–0.503	328	−1.782	−0.090	−3.921–0.357	343	−0.102	−3.284–0.069	337	−1.901	−0.118	−3.683–0.120*
Number of children in the household														
One child	ref.			ref.				ref.			ref.			
Two children	332	0.063	−0.510–1.953	328	0.236	0.021	−1.516–1.988	341	0.053	−0.503–1.493	337	0.539	0.058	−0.907–1.986
Three or more	332	−0.039	−1.814–0.850	328	−0.434	−0.035	−2.342–1.474	341	0.006	−1.026–1.154	337	0.102	0.010	−1.482–1.687
Child's gender														
Boy	ref.			ref.				ref.			ref.			
Girl	344	0.046	−0.697–1.750	328	0.002	0.000	−1.188–1.193	353	0.000	−1.003–1.000	337	−0.173	−0.019	−1.169–0.822
Child's age	344	0.006	−0.591–0.659	328	−0.019	−0.003	−0.651–0.612	353	0.104	−0.004–1.016	337	0.422	0.089	−0.108–0.953
Constant							−1.262			−7.025–4.501				−1.803
Father														
Secretive eating frequency	118	0.230	0.068–0.545*	106	0.284	0.210	0.031–0.538*	118	−0.119	−0.285–0.060	107	−0.129	−0.143	−0.314–0.055
Father's age	109	−0.217	−0.440–0.033*	106	−0.076	−0.069	−0.290–0.139	110	0.045	−0.112–0.182	107	0.048	0.065	−0.111–0.206
Paternal educational level														
High	ref.			ref.				ref.			ref.			
Middle	110	−0.068	−3.395–1.608	106	1.032	0.078	−2.130–4.194	111	−0.001	−1.819–1.799	107	0.232	0.026	−2.082–2.545
Low	110	0.222	0.489–5.600*	106	3.001	0.215	−0.361–6.364	111	0.050	−1.385–2.365	107	0.750	0.080	−1.713–3.213
Number of adults in the household														
Two or more	ref.			ref.				ref.			ref.			
One adult	113	−0.196	−9.749–0.296*	106	−2.595	−0.065	−10.151–4.962	113	−0.076	−5.530–2.337	107	−5.252	−0.519	−11.926–1.421
Number of children in the household														
One child	ref.			ref.				ref.			ref.			
Two children	112	0.261	1.043–5.878**	106	2.765	0.207	−0.821–6.352	112	−0.057	−2.229–1.197	107	−0.805	−0.089	−3.429–1.818
Three children	112	−0.146	−4.868–0.593	106	0.631	0.043	−3.321–4.574	112	0.093	−0.955–2.805	107	0.147	0.015	−2.708–3.002
Child's gender														
Boy	ref.			ref.				ref.			ref.			
Girl	118	0.128	−0.737–4.183	106	1.507	0.114	−0.891–3.906	118	−0.028	−2.042–1.500	107	−0.884	−0.099	−2.662–0.894
Child's age	118	−0.173	−2.298–0.055	106	−0.999	−0.159	−2.167–0.169	118	−0.003	−0.865–0.840	107	−0.359	−0.084	−1.231–0.531
Constant							12.015			0.715–23.315				9.765

SFD = sugary foods and drinks.

Maternal/paternal educational level: low (high school or vocational school graduate or lower), middle (bachelor's degree or equivalent), high (master's degree or higher).

Mothers: Model 1: one independent variable at a time; Model 2: full model; Durbin Watson 0.762; $F = 6.06$; $p < 0.001$; $R^2 = 0.122$.

Fathers: Model 1: one independent variable at a time; Model 2: full model; Durbin Watson 0.447; $F = 3.09$; $p = 0.003$; $R^2 = 0.152$.

Children (mother): Model 1: one independent variable at a time; Model 2: full model; Durbin Watson 1.745; $F = 2.30$; $p = 0.002$; $R^2 = 0.051$.

Children (father): Model 1: one independent variable at a time; Model 2: full model; Durbin Watson 1.834; $F = 0.79$; $p = 0.623$; $R^2 = -0.018$.

B = Unstandardized coefficients, β = Standardized coefficients, CI = confidence interval *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

mothers are at home with their child more often (Bianchi, 2000; Parker & Wang, 2013) and use more time for childcare than fathers (Official Statistics of Finland OSF, 2024; Pääkkönen, 2013). Hence, fathers can eat their “bad foods” elsewhere, without having to specifically think about avoiding eating them in front of the child. Mothers also feel more responsibility towards children’s healthy diet than fathers (Reczek et al., 2014). This may be due to normative gendered expectations where “good motherhood” is associated with housework and routine childcare, while “good fatherhood” is not (Doucet & Merla, 2007). On the other hand, the enhanced engagement of mothers in the workforce (Bianchi, 2011; Gauthier et al., 2004; Pääkkönen, 2013) and increased involvement of fathers in childcare (Goldscheider et al., 2015; Milkie & Denny, 2014; Pääkkönen, 2013) may alter these social dynamics. In recent years, the aim to be a healthy model for a child has been recognized by both parents (Lindsay et al., 2018; Versele et al., 2021).

Difference in parental secretive eating between parents may also be explained by overall gendered differences in SFD consumption, as parental secretive eating was positively associated with parents’ SFD consumption frequency. Parental secretive eating was most common for chocolate and sweets, and Finnish women in general consume more of these foods than men (Valsta et al., 2018). Women’s higher SFD consumption could be explained by factors such as more frequent emotional eating (Smith et al., 2020) and chronic stress (Adam & Epel, 2007; Matud, 2004; Torres & Nowson, 2007). Thus, if mothers eat chocolate or sweets more often, they may have a higher “need” for secretive eating than fathers if they want to avoid role modeling. This could explain why secretive eating of chocolate and sweets were more prevalent among mothers than fathers. However, in the present data, only consumption of chocolate was more frequent among mothers, while consumption of sweets was similar in mothers and fathers. It is possible that men increase their SFD consumption when becoming fathers as indicated in a qualitative study (Versele et al., 2021). However, social factors mentioned above might explain differences between mothers and fathers secretive eating better than SFD consumption, which is important to consider in future studies.

4.2. Associations between parental secretive eating and SFD consumption

A positive association between parental secretive eating and SFD consumption in parents may arise because parents who had a higher SFD consumption frequency also had a higher “need” for secretive eating. On the other hand, the associations may be bidirectional, as secretive eating may enable more frequent SFD consumption. Our finding that there was no association between parental secretive eating and child’s SFD consumption was supported by a previous study where mother’s avoidance of unhealthy modeling did not affect the child’s less healthy food consumption (sweets, soft drinks, and chips) four years later (Vereecken et al., 2010). Based on our results and these prior longitudinal results, it can be speculated that there is neither harm nor benefit of parental secretive eating to the child when looking at all SFDs together.

However, when looking at food items separately, avoiding unhealthy modeling was negatively associated with child’s soft drinks consumption frequency in a Belgian study (Vereecken et al., 2004). In contrast to these findings, our results indicated that children whose mothers consumed soft drinks and energy drinks in secrecy consumed these foods more often than others. This was also detected with cookies, snack bars and cereal bars. Hence, associations between parental secretive eating and child’s SFD consumption may differ by SFD item. In line with the approach taken in previous studies (Vereecken et al., 2004, 2010), it is notable to mention that our research focused solely on consumption frequency, without delving into the specific amounts consumed each time.

While our present study didn’t reveal an association between parental secretive eating and children’s SFD consumption, there are potential pathways through which parental secretive eating could impact SFD consumption in children. For instance, the availability of

SFDs at home has been positively associated to increased consumption among preschoolers (Bassul et al., 2020; Blaine et al., 2017; Boles et al., 2019; Paasio et al., 2022; Vepsäläinen et al., 2018a; Yee et al., 2017) and parental secretive eating requires availability of SFDs at home. Additionally, our findings suggest that parents who consume SFDs in secret more frequently tend to have a higher overall SFD consumption frequency. Previous studies have noted similarities between parental consumption of energy-dense foods, including SFDs, and their children’s food consumption (Hall et al., 2011; Longbottom et al., 2002; Raynor et al., 2011; Robinson et al., 2015; Vepsäläinen et al., 2018b; Vereecken et al., 2010; Vollmer et al., 2015; Wroten et al., 2012). Therefore, it would not have been unexpected if their children also consumed SFDs more frequently.

Parental secretive eating could, on the other hand, have associations with factors such as parent’s stricter perceptions of suitable frequency of child’s SFD consumption. Our qualitative results indicated that some parents eat SFDs in secret because they think that children should not eat SFDs as frequently as adults. In contrast, parent who does not eat SFDs in secret may consider higher SFD consumption frequency suitable for children. Possible association between parent’s stricter perceptions of suitable SFD consumption frequency for child and parental secretive eating might be a possible beneficial factor for children’s healthier eating habits, as parents’ looser perceptions of suitable SFD consumption frequency have been shown to associate with 3-6-years child’s higher SFD consumption frequency in the DAGIS study (Paasio et al., 2022).

4.3. Reasons for parental secretive eating

Reasons for parental secretive eating found in this study indicated that there are several motivations driving this behavior. Motivations were related to family’s food rules, parent’s own behavior, food related perceptions, and parenting goals, as well as to child’s behavior and food consumption. Many of our participants had more than one motivation for the secretive eating suggesting that interplay of multiple home food environment related factors should be considered when explaining the mechanisms behind this behavior in future studies.

4.3.1. Family food rules

Several parents among our sample ate in secret if family food rules were different for adults and children in the household. The “sweets day” (a Finnish tradition to allow children to eat candies and chocolate only once a week, typically on Saturdays) was mentioned by participants as a common reason for parental secretive eating. In many responses, this practice was the sole explanation for parental secretive eating. This raises the question of whether parental secretive eating would be less prevalent among Finnish parents if “sweets day” was not a common practice in Finnish families (Korpipää et al., 2017). It is also noteworthy that the “sweets day” practice is common only in Nordic countries (Christensen et al., 2022; Johansson & Ossiansson, 2012; Nowicka et al., 2021), which could influence the prevalence of parental secretive eating in other cultures.

Majority of parents who described their secretive eating as motivated by their family’s food rules more thoroughly explained that they did not want their child to eat SFDs as often as they did themselves, or that they wanted their child to eat SFDs as little as possible. In other words, these parents engaged in secretive eating to promote healthy eating habits for their child. As discussed in chapter 4.2., a parent’s perception of suitable SFD consumption frequency is associated with their child’s SFD consumption – parents with looser perceptions tend to have child who consume SFDs more frequently (Paasio et al., 2022). Our results suggest that parents who eat SFDs in secret might have stricter perceptions of suitable SFD consumption frequency for children, but this should be studied further using quantitative methods.

4.3.2. Avoiding child's requests

Many of our participants felt that their child develops a desire for and request SFDs when they observe their parents consuming these foods. This observation aligns with findings from American parents (Harris et al., 2023) and could be a more international motivation for parental secretive eating compared to a specific food rule like “sweets day”. By eating in secret, parents avoided the need for outright refusal. Thus parental secretive eating may decrease the necessity for imposing direct restrictions that are positively associated with a child's SFD consumption (DeCosta et al., 2017; Fisher & Birch, 1999; Jansen et al., 2007, 2008) and the temptation toward prohibited items (DeCosta et al., 2017; Jansen et al., 2007, 2008; Ogden et al., 2013). Additionally, by parental secretive eating, parents avoid the contradictory situation of restricting SFDs for their child while modeling SFD consumption themselves.

4.3.3. Aspiration for healthy modeling

The third reason for parental secretive eating was parents' aspiration for healthy modeling. Several parents aimed to model only SFD consumption that was, in their opinion, suitable for their child, and wanted to avoid unhealthy modeling that they called “bad example”. This purpose would seem to be beneficial for the child, as modeling is a clear factor in shaping children's eating habits (Brown & Ogden, 2004; Dickens & Ogden, 2014; Mazarello Paes et al., 2015). However, it is important to remember that parents are constant models for their children (Rhee, 2008) and they may unintentionally model less healthy food consumption even if they try to be healthy models (Palfreyman et al., 2013).

Several mothers reported that they had high temptation towards sweets and chocolate. They named this temptation as a “vice” and a “bad habit” that they did not want to pass to their child. Additionally, a father mentioned that he may “succumb” to eat SFDs at weekdays where the word “succumb” indicates that the relationship with SFDs may not be straightforward. If the parent has a problematic relationship with SFDs or other foods, it may be hard to avoid modeling this relationship for their child. Children may adopt parent's temptation toward SFDs (Haines et al., 2019; Niemann et al., 2014) and this may cause problems when the child grows older and gets more autonomy on food choices. In addition, avoidance of modeling less healthy food consumption and the habit of using less healthy foods to reward or soothe the child was characteristic of the same parents in a study examining patterns of food parenting practices (Gevers et al., 2015). All these factors may weaken the benefit that parents wish to accomplish with parental secretive eating.

There is also a risk that if a parent does not model moderate consumption of SFDs, the child may not learn that SFDs are a normal part of the diet and may adopt an inflexible relationship with SFDs. Inflexible relationship with food has been shown to associate with for example disordered eating (Coimbra & Ferreira, 2020; Sandoz et al., 2013) and strict restrictions with higher desire for prohibited foods in children (DeCosta et al., 2017; Jansen et al., 2007, 2008; Ogden et al., 2013). However, based on the results of this study, it remains uncertain whether parental goal of healthy modeling can be achieved through parental secretive eating. Nonetheless, it's important to recognize that parents try to support their child's healthy eating habits, despite the possible need for improvement in their own dietary habits.

4.4. Methodological choices

Due to the novelty of the topic, there is no validated method to examine parental secretive eating. Eating in secrecy was not explicitly asked, as we wanted to assess secretive eating without using stigmatizing words: “Do you avoid eating the following foods in the presence of your child/children?”. Secretive eating was led from the inference that if the parent does not choose either the “I don't eat this food at all”, or “never” answer option, then the parent consumes SFD items examined in secret from their child. The questions in prior studies examining

avoidance of unhealthy modeling were similar to our study: “I consciously refrain from eating energy-dense snack foods when [child's first name] is around” (Gevers et al., 2015), “If I would like to eat/drink sweets/soft drinks with added sugar, I would restrain myself because of the presence of my child” (Vereecken et al., 2004, 2010), but answer options distinguished them from this study. There was no option: “I don't eat this food at all” or similar in previous studies.

It is important to note that “parental secretive eating” and “secretive eating frequency” variables were formed, so that the responses of “I don't eat this food at all” were combined with “never” and “rarely” in the first mentioned variable, and with “never” in the last-mentioned variable. Behavior behind these responses was very different – some participants did not eat any SFD items examined in the present study and some participants did consume at least one of these SFDs but did not avoid eating these in the presence of their child. However, parents who did not consume any of examined SFDs were rare (mothers, n = 13, 4%; fathers, n = 8, 7%).

We explored associations between parental secretive eating and mothers'/fathers'/children's SFD consumption with linear regressions. This could have also been investigated in a simpler way using correlations. However, as multiple factors, such as age, gender, and parental educational level, can possibly confound these associations, we wanted to adjust the analyses for these factors. We first investigated each independent variable at a time (Model 1) to better understand the possible confounding. In Model 2, we used a full model, where all independent variables were simultaneously included. This approach is beneficial, as it enhances the transparency, validity, and interpretability of the regression analyses and thus contributes to a more comprehensive understanding of the factors potentially influencing SFD consumption.

4.5. Suggestions for future research

Future studies should explore parental secretive eating with other less healthy foods (i.e., salty foods, chips, popcorn) and investigate whether the observed differences between mothers and fathers can be explained by the time spent at home with their child. The associations between parental secretive eating and children's SFD consumption should also be studied regarding the amounts consumed, not just the frequency of consumption. Additionally, it would be worthwhile to explore whether the association between parental secretive eating and a child's SFD consumption varies depending on the parent's motivation for parental secretive eating. Future studies should also examine potential differences in motivations for parental secretive eating between mothers and fathers. Furthermore, studies are needed to examine associations between parental secretive eating and other factors affecting eating habits, such as the home food environment.

4.6. Strengths and limitations

The strengths of this study include the novelty of the research topic. To the best of our knowledge, this was the first study to focus on parental secretive eating and its association with diets in the family. Additionally, it is still rare to consider fathers separately in food parenting studies, although there is evidence that father's diet is also associated with children's diet (Hebestreit et al., 2017; Vepsäläinen et al., 2018b; Vollmer et al., 2015; Wang et al., 2011). Consideration of mothers and fathers separately, and reasonable sample sizes were a clear strength of this study. In addition, the FFQs used in the study were designed for the DAGIS project, having known validity and reliability compared to 3-day records in children (Korkalo et al., 2019b; Määttä et al., 2018). Finally, the utilization of both quantitative and qualitative research methods enabled a more in-depth examination of the topic.

There are also limitations to note. The potential for variation in the interpretation of answer options to the secretive eating question could not be entirely avoided. For example, the word “rarely” can have different meanings for one participant compared to another. Some

participants might have chosen different options if we had instead classified the answer options by, for example, times per week. However, as this study was explorative, we did not have hypotheses regarding how often parents may eat SFDs in secret, and using verbal classes seemed more suitable. The generalizability of the results may be limited by the fact that our sample was quite highly educated compared to the Finnish national population, which may have introduced some bias in our results. However, we adjusted for the parent's educational level in our models. Finally, as this study had a cross-sectional design, we cannot draw any conclusions regarding the direction or causality of the associations.

4.7. Conclusions

In conclusion, among Finnish parents of 3–6-year-old children, parental secretive eating is common and associated with higher parent SFD consumption. No associations between parental secretive eating and child's SFD consumption were detected. Reasons for parental secretive eating were linked to social home food environment: family food rules, avoiding child's request, and aspiration for healthy modeling. Additional research is needed to determine whether parents can indeed prevent their own eating habits from influencing their child through secretive eating. Further studies are also required to consider the varying reasons for parental secretive eating and other factors affecting eating habits, such as the home food environment, including the availability of SFDs at home, parents' eating habits, and food parenting practices. Parental secretive eating may play an important role in determining SFD consumption in families with preschoolers. This new view to SFD consumption in families enriches our comprehension of how parents try to nurture positive eating habits in their preschool children even if their own eating habits are less healthy.

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Ethical statement and consent to participate

The study was reviewed by the Research Ethics Committee in the Humanities and Social and Behavioral Sciences of the University of Helsinki (22/2017; May 16, 2017) and found ethically acceptable. A parent or legal guardian of each participant provided an informed consent.

CRediT authorship contribution statement

Tuuli Sarvanne: Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization. **Sami Kokko:** Writing – review & editing, Supervision, Conceptualization. **Anna M. Abdollahi:** Writing – review & editing. **Nithya Serasinghe:** Writing – review & editing. **Satu Kinnunen:** Writing – review & editing. **Reetta Lehto:** Writing – review & editing, Investigation, Data curation. **Henna Vepsäläinen:** Writing – review & editing, Supervision, Methodology, Investigation, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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